

EM Resident

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Post-Intubation Hemodynamic Collapse

In the Critically Ill Patient



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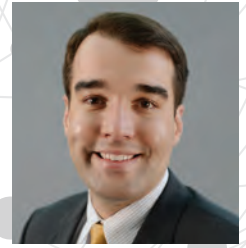
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The Future of EMRA



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“Prediction is very difficult, especially about the future.”

Both baseball legend Yogi Berra and Nobel laureate Neils Bohr are credited with versions of this saying. **Regardless of who gets credit for the witticism, it certainly holds true for EMRA and emergency medicine.** On every shift, we are faced with uncertainty, which we tirelessly battle with clinical decision rules, diagnostic imaging to “rule out the worst case scenario,” and shared decision making with patients. From risk stratifying a patient with chest pain, to deciding if someone diagnosed with pneumonia is safe to go home or needs to be admitted, our job is to work with limited information and make the best decisions possible for the patient in front of us. Of course, no decision rule or algorithm is perfect. Social issues, financial challenges, and health literacy all have an impact on patient compliance. We have all seen patients bounce back despite the best of intentions and best care on an initial visit. As one of my mentors, Dr. Chandra Aubin, taught us in residency, we should be grateful for these return visits and tell our patients, “Thank you for giving us a second chance to care for you.”

Economics is an interest of mine, and had I not become an emergency physician, studying the science of incentives and motivation would have been a welcome career option. EMRA and our specialty enjoy the strong positions we hold today (hard to predict at our origins 40 years ago!) thanks to the intrinsic motivation and passion of our past and present members. As hard as it is to get ourselves to feel motivated sometimes, it is exponentially harder to do the same for others, be it our patients or our colleagues.

EMRA offers a cadre of benefits and opportunities to members to augment their intrinsic drive and abilities. As we have matured into a 12,000-member organization, offering print and electronic publications; almost \$80,000 of scholarships and awards annually; and leadership opportunities second to none, now our challenge is to answer the difficult question, “What’s next?” To phrase this differently, as if EMRA were a patient, “What’s EMRA’s disposition and follow-up plan?” With the patient analogy, I by no means intend to imply that EMRA is ill. Just the opposite — we are financially stronger than ever, and today have the largest membership base that we have ever held. **As EMRA president, my concern is that I do not want us to become ill with complacency in our success, and miss the opportunity to continue to push ourselves as an organization to become even better.**

By the time you are reading this, the EMRA Board of Directors will have met for our January strategic planning and board meeting. Your elected leaders will have spent a long weekend focusing their collective talent and energy into trying to make EMRA stronger and more successful in fulfilling our mission as the voice of emergency medicine physicians in training, and in securing the future of our specialty. **As dedicated as your EMRA board is, we need your support, ideas, and feedback to best serve you and future members of our great organization. Please take a moment to reflect on what you value most from EMRA membership, but also on what you feel is perhaps lacking that we should add to better meet**

the needs of future EMRA members. In *Think Like a Freak*, the latest book from *Freakonomics* authors Levitt and Dubner, the authors try to go beyond the interesting data and anecdotes from their previous writings, and instead share their approach to looking at problems and challenges. They suggest that the first step to finding a solution is to first have clearly and correctly identified a problem or challenge (Engineering 101). Beyond problem identification, thinking like an outsider, or someone with a fresh perspective, also can be invaluable. Our board needs the ideas and input of not just EMRA veterans, but also new members to keep us relevant and forward thinking.

I guarantee you that no matter how much you feel you are taking advantage of EMRA member benefits, there is more you can be getting out of your membership. Start by using the complementary educational benefits like EMedHome and EM:RAP, but don’t stop there! Join a committee or division to meet colleagues with similar interests and land the fellowship or job you’ve always wanted, or nominate a deserving colleague for an EMRA award to be given national recognition for how they have helped you and others. Apply for a scholarship to attend the ACEP ED Directors Academy, SAEM Annual Meeting, or ACEP15 (all of which now offer complimentary or waived registration for members who are scholarship recipients!).

Share with us what motivates you, and together our collective passion can make EMRA membership more rewarding tomorrow than anyone could have ever predicted today. *

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The **Why**, and the **What's Next**

I'm on the four-year plan. Four years of high school was followed by four years of college. This was followed by four years of medical school, and then four years of residency. There were a few times I took short one- to two-year detours from the route to pursue other life goals, but when it was time to get back "on track," the four-year plan was there waiting for me. Now, nearing the end of this educational path, it's time to decide on next steps. Without the safety net of a predefined structure, I feel a little uneasy. Like approaching the edge of a cliff, you really don't know what awaits until you look over. If only there was something I could do to ease the burden of choice. Feeling this overbearing quandary caused by my lack of decision, I've searched every online database for a four-year fellowship program, and found none.

Well, what now? At the completion of my last block, where am I left? I've proven to myself that I could reach the proverbial holy grail of career choices. I saw "being a doctor" through to the end. But now here I am, wondering what's next. I'm not sure what I was expecting. Maybe more balloons or confetti. Now that I'm completing that goal, what else should be obtained? **Where do I turn my focus?**

It's a question I feel I'm not alone in asking, and it's one that creates a tremendous sensation of apprehension. Maybe that's the reason so many grads change jobs in the first two years after residency. We are all still trying to determine our "what's next?" and what our place is.

To figure it out, you have to remind yourself of the reasons you got on this track to begin with. Perhaps it was the

fame or fortune of a medical degree. Those are becoming increasingly hard to come by in our field. Sure, eventually most of us will be financially well off, but not Daddy Warbucks. If you're like me, you're probably staring down the double barrel of a shotgun full of student loan debt, wondering how you can make it out in one piece after it's all said and done. No, surely money cannot have been a true motivating factor. From the current perspective, that seems illogical. Eating buckshot won't help you lay a golden egg. Also, it leaves a bad taste in your mouth.

No. Money's not the reason we do medicine.

Fame? While there is often a fair amount of acknowledgement that comes with being a physician — and certainly many of us go on to do great things — emergency medicine inherently doesn't enjoy the

prominent reputation of many other fields. Sure, maybe you might be the lucky one to land a position on a prominent network television show, or be elected to serve as a state representative, but for the 99%, we're just the doctor that "I saw downstairs. Or was it even a doctor...?" Often, when involved in small talk, well-meaning patients will ask, "So, you're a resident — what kind of doctor are you going to be?" "Emergency medicine doctor," is generally my reply. This is often followed by a "Yeah, but what's your specialty?" Sometimes the dialogue becomes so predictably scripted, that instead I'll sarcastically respond with "Doctor? No, no, I'm a mechanic. I just work here on weekends."

Hard to believe that it's fame that motivates us.

People do certainly notice all the work that you put in in pursuit of a particular specialty or interest, and that can be a motivating factor. As can owning a new sports car. We may sometimes astound others with our medical knowledge, and that can gratifyingly stroke the ego. But what I think is **usually less emphasized in resident education is something that actually draws much more attention — the effort we put into our patients.** Emergency medicine is a rapidly expanding field. As it grows, we are increasingly becoming involved in more medical specialties and topics. What sometimes we might be guilty of is losing sight of the greatest good we do for our fellow men, and instead focusing on the just plain good things we do for our peers, specialty, and practice.

Ask a nurse or a hospital administrator who their favorite physicians are. In most cases you'll find that they don't mention the doctor who's published 15 papers this year, or the one who developed a new protocol. While those are great things that should not be undervalued, the greater good comes from placing more of our interest in our patients. **When we care for others, people notice.**

As I personally reflected on the topic, in context of my own concerns about next career steps, I was reminded of a speech I heard last year at ACEP in Chicago. Dr. J. Brian Hancock, the winner of ACEP's John

Wiegenstein Leadership award, shared some advice he received from his father: **"Take care of your patients, and your career and your success will take care of itself."**

He's right.

I realized that it doesn't really matter in the end if I pursue a fellowship in administration or hyperbarics; research or EMS. Ultimately, it doesn't matter if I go on to fellowship at all, or if I take a career in academics or private medicine. What matters most is that my focus stays where it should always be — on the people who come to me for help. When we fulfill our first responsibilities to our patients, regardless of the work scenario, our careers will take care of themselves. **The ladder to becoming a successful physician is represented by rungs of empathy, justice, and beneficence, and less so by personal goals and aspirations.**

Despite the uneasiness that comes from abandoning the four-year plan, I've taken solace in knowing that regardless of my career choices, I'll always find myself where I want to be if I put patients first in my practice. Sometimes, though, that can be very hard to do — and that comes with the job.

Twice I've raised my voice to patients. I am ashamed to admit it, and wish I could say that the circumstances were justifiable. The first time was with a large, belligerent, bipolar individual in room B26 who was becoming increasingly angry and yelling just inches from the face of my calm and collected, yet slight-of-build, nurse. Coming to her aid, my adrenaline told me the best way to react was through a forceful vocalization of my displeasure and to reaffirm my alpha status as the physician in charge. Seldom is that the right answer in such a scenario, but this time it seemed to work. However, as I walked away, I noticed how internally horrible I felt about what I had just done.

The second time was with a middle-aged man whose cardiac status was tenuous, but stable. His peripheral vasculature had long ago run out, leaving us with no options other than a central

line or drilling into his bone to start potentially life-saving resuscitation. I took it for granted that definitive access was acceptable to him after 20 minutes of pincushioning his extremities. Nonchalantly informing him that I was about to stick a large needle into his body, he erupted with a surprising string of angry profanity. Unthinking, I matched his tone and told him what I thought of his outburst. This time, it proved ineffective in resolving the conflict, and ultimately he was admitted without access, to his own detriment. Luckily, he survived that admission. It was a similar experience as the first patient, but this time no psychiatric disorder and no underlying lack of comprehension of how human interaction works. He was just scared. My shame afterwards was greater than my anger in the heat of the moment.

These were the two lowest points in my career thus far. Far below the young trauma patients I couldn't save, and even further below the patients to whom I unintentionally caused harm or death. Regardless of those outcomes, I was always trying to help and do the right thing, which brings some consolation. With these two patients, though, I thought of myself first, and now those moments will stay with me forever, reminders of the most important lesson I hope to leave with my junior residents.

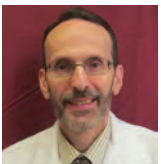
In a generation of physicians who've been influenced by the Dr. House approach to care, it is important to remember that no medical foundation or extracurricular pursuit will replace the interactions and commitments you have between you and your patients. We are all founded on this same principle. No matter at what career stage or transition we find ourselves, we have that constant. We shouldn't ever need to change our focus, just to refine it. Sometimes we will stumble or make missteps. Maybe we will regret what we say to a patient. Perhaps we will wish we had taken a different job or fellowship, but, ultimately, we will all go on to do good — and even great — things. However, **none of our future accomplishments will ever supersede doing the right thing — serving others first, and putting ourselves second.** ★



The Info on Informatics



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Subspecialty Training in Clinical Informatics

Clinical informatics is a new medical subspecialty that focuses on medical data, clinical processes, and computational systems applied to the practice of medicine.^{1,2} In other words, how we can use computers to maximize patient care, improve outcomes, decrease costs, and improve efficiency of care. The subspecialty was approved by the American Board of Medical Specialties in 2011, with the first board certification exam given in 2013 through the American Board of Preventive Medicine.

Clinical informatics is interdisciplinary and draws on elements from clinical medicine, the health care system, and information technology. While there is some overlap, it is not simply “doctors using computers,” medical computer

The subspecialty was approved by the American Board of Medical Specialties in 2011, with the first board certification exam given in 2013 through the American Board of Preventive Medicine.

programming, genomics, or epidemiology. Instead, clinical informatics strives to improve the practice of medicine by integrating medical data, clinical processes, and computational systems intelligently. Ideally, the use of clinical informatics can help identify people with certain diseases earlier, maximize their care, and improve coordination of care among a team of medical professionals.

Physicians who specialize in clinical informatics assess the information needs of providers, patients, administrators, nurses, regulators, and researchers. They analyze clinical processes and implement clinical information systems that augment those processes. They provide leadership and expertise in the evaluation, procurement, customization, development, and management of information technology. They work with a myriad of different hospital computer systems, including electronic health record systems, decision support systems, practice management tools, network and communication systems, imaging systems, telehealth systems, clinical research systems, public health systems, and genomic systems. They find employment as chief medical information officers (CMIOs), researchers, educators, and in industry — all of which are in high demand and with job growth four times as fast as the health care field in general.^{3,4}

Training Requirements

The creation of this new subspecialty has standardized the training requirements for those entering the field. These fellowship programs, as approved by the Accreditation Council for Graduate Medical Education (ACGME), must be at least 24 months in length, with fellows dividing their time between informatics activities, didactics, research, and clinical work in their primary specialties.^{5,6}

Applicants for fellowship must have completed a residency in at least one of the member boards of the American Board of

Medical Specialties. In addition, they must hold an unrestricted medical license in the United States or Canada.⁷ Applicants do not need to have a technical background and there is no prerequisite training in computer science or any related discipline. However, they need to demonstrate a strong interest and aptitude for clinical informatics.

Prerequisite Activities

When considering this subspecialty, it is recommended that applicants engage in activities throughout medical school and residency that solidify their interest and demonstrate their commitment to the field. Some preliminary suggestions on how to get involved in clinical informatics are listed below.

- **Participation.** The American Medical Informatics Association (AMIA) is the premier academic society for biomedical and health informatics and has been the driving force behind the new clinical informatics subspecialty (www.amia.org). You can get involved in the AMIA through their student working group, annual fall symposium, career mentorship program, and educational activities. Other professional societies include the IEEE Engineering in Medicine and Biology Society (www.embs.org), the ACM Special Interest Group on Bioinformatics, Computational Biology, Biomedical Informatics (www.sigbioinformatics.org), and the Healthcare Information and Management Systems Society (www.himss.org).
- **Experience.** A good way to gain experience in clinical informatics is to do an elective rotation as a medical student or resident. Depending on your interests, you have a number of options. You can do a research elective where you perform a literature review on a relevant topic, develop a training curriculum, design a new computational tool, or evaluate a clinical process. Alternatively, you can

complete a practical elective where you might join an informatics team that is implementing, installing, or evaluating a new electronic health record system. Participation in institutional informatics governance committees is another useful venue to gain experience and show interest.

- **Education.** Clinical informatics is an interdisciplinary specialty that draws from clinical medicine, the health care system, and information technology. You can take a class at a local university in one of these related disciplines. In addition, you can participate in the clinical informatics grand rounds at your school. If your program does not have one, there are several clinical informatics grand rounds available online.
- **Literature.** It is important to keep up with the clinical informatics literature. This includes the *Journal of the American Medical Informatics Association*, which is the principal journal in the field. Other important journals include the *International Journal of Medical Informatics*, the *Journal of Biomedical Informatics*, *Methods of Information in Medicine*, the *Journal of Medical Internet Research*, and *Computers in Biology and Medicine*.
- **Activities.** If your medical school or residency program has a special interest group in clinical informatics, get involved. If it does not have one, consider creating one yourself. Another suggestion is to talk to your chief resident and offer to present articles on clinical informatics at your program's journal club or give a lecture on the topic. At the national level, you can get involved in informatics policy at the National Learning Consortium through the Office of the National Coordinator for Health Information Technology (www.HealthIT.gov).

All of these activities can be used to learn more about the new subspecialty of clinical informatics. They can help practicing physicians who may want to break into the informatics workforce. In addition, for those seeking board certification, they can be used as prerequisite activities for subspecialty fellowship training. ★

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Reclaiming the Negative Space

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The writers at theNNT.com are trying to reshape the way we look at statistics. The new wave of emergency medicine physicians is trained around the principle of evidence-based medicine. Free online access medicine (FOAM) is revolutionizing the way we access expert opinion on a variety of topics. From critical care to ultrasound, leaders in their respective fields are discussing new and innovative ways to practice. TheNNT.com represents one of these innovations. Expertise found on theNNT.com is in the area of literature analysis. Expert contributors include Drs. David Newman and Ashley Shreves of Mount Sinai Medical Center, Gary Green at UCSF, Koustav Mukherjee at Bronx-Lebanon, Joshua Quaas at Mount Sinai-St. Lukes, Daniel Runde at University of Iowa, Graham Walker at Stanford University, and Shariar Zehtabchi at SUNY Downstate Medical Center. All of the contributors are EM physicians dedicated to providing patient-centered data on relevant topics in a consistent, easy to use, and understandable format.

The Negative Space

The argument for using theNNT.com as your primary statistics source is a compelling one. As is apparent, the site is based on the number needed to treat (NNT) and discusses the attributed risk reduction; therefore, it does not exaggerate the true impact of your intervention. I recently sat down with David Newman, one of the cofounders of theNNT.com website. He revealed to me that the NNT as a statistic

Taking into account the negative space, we have a more complete picture of the positive and negative effects of treatment and can make more informed decisions with our patients.

is about incorporating negative space. To make his point, he referred to the famous Henri Matisse painting, *La Danse* (Image 1).

When initially presented with this metaphor, I was lost. Art history is not a prerequisite for medical school, and I would be surprised if the topic made it on to board exams. When asked to describe the painting, I naively said that it is a painting focused on five dancers. It turns out I was not seeing the complete picture. The true artistry of the painting lies in its use of negative space (the sky and mountains that border the dancers). Similarly, in medical literature we focus

heavily on statistics, like relative-risk reduction, without seeing the full context that incorporates the rest of the data. We focus on the dancers, and ignore the majority of the painting.

The tutorial on theNNT.com asks us to imagine a theoretical new drug that has been shown to have a 20% relative-risk reduction. As health care providers, we get very excited about numbers like this. If we can reduce someone's morbidity or mortality by 20%, it would be irresponsible not to, right? What theNNT.com attempts to do is put that number back



Image 1. *La Danse* by Henri Matisse

STATISTICS

into its full context or, in other words, to reclaim the negative space.

Imagine a drug that, when compared to a placebo, reduces the risk of morbidity from 10% to 8%. This statistically significant relative risk-reduction of 20% only affects 2% of the population. Reporting this number as a 20% risk reduction is not false, but completely ignores the negative space — the whopping 90% of the population who are unaffected regardless of the intervention.

The Math

$$NNT = \frac{1}{ARR}$$

Figure 1. Formula for calculating the NNT

If we take a look at the way the number needed to treat is calculated (Figure 1), you begin to understand why it is thought to be a more accurate indication of the data set as a whole. Harkening back to statistics (and without causing too much PTSD from board review), the NNT is calculated by $1/ARR$ (absolute-risk reduction). The ARR is calculated by the control event rate minus the experimental event rate (CER-EER). This is where the NNT gets its value. By creating a singular whole number that reflects the total number of patients needed to treat to prevent one adverse effect, it incorporates all of the negative space.

Now let's take a look at a real medication example — daily aspirin for primary prevention of heart attacks, strokes, and death. The 2009 Cochran review showed a 12% proportional-risk reduction. That is an impressive number, but what if we were to look at the NNT for this data? The study reports a reduction from 0.57% in the control group to 0.51% in the treatment group. This leads to an NNT of 1 in 1667 for any event, 1 in 2000 for prevention of a non-fatal heart attack, and 1 in 10,000 for preventing a non-fatal stroke.

There were no prevented deaths. This means that 1667 people would need to be treated to prevent one event. 99.94% of patients would see no benefit. The 12% proportional reduction in risk, when put into a more complete picture, doesn't look as appealing as it once did.

Like any statistic, the NNT is situation- and patient-population-specific. Let's take a look at the same drug, aspirin, in our emergency department population. Take a patient who presents to the ED with ST elevations. Using the NNT system for prescribing aspirin in this situation, the NNT goes from 1667 to 42. This means that only 42 people need to be treated to save one life. 2.3% of people treated will see a benefit — not insignificant in our business. As EM physicians, our role is to employ techniques that will have the most potential positive impact on the lives of our patients.

Easy to Understand Rating System

As residents, our time is very limited and learning and retaining information is a constant struggle. TheNNT.com has developed a simplified rating system (Figure 2) to help guide clinical decision making. A green recommendation means benefits outweigh harms. Yellow indicates a lack of clarity about the benefits and more clinical judgment should be used with the treatment. Red means no benefit, or benefits and harms balance out. And finally, a black recommendation warns that harms outweigh benefits. In the example discussed earlier, aspirin in the setting of a diagnosed MI is green, while aspirin for preventing a first heart attack or stroke is red. An example of a yellow

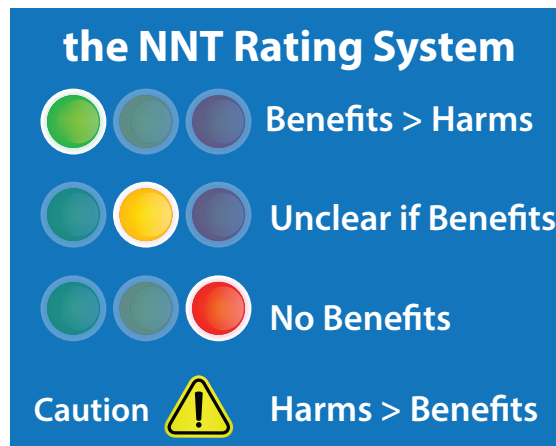


Figure 2. Color-coded rating system for stratifying strength of evidence based on the NNT.

recommendation would be anticoagulation for DVT, something we do every day. The NNT for this population was incalculable because in the only two small trials ever done, the drug showed no mortality benefit, while the number needed to harm (cause a major bleeding event) was between 50 and 100.

The NNT and Patient-Centered Care

How can these statistics be used to improve patient-centered care? As we move away from paternalistic medicine towards patient-centered medical care, we have to find a better, simpler way of communicating our knowledge base to our patients. The NNT can even help in this endeavor. Imagine you are working with a diabetic patient, trying to control their blood sugar. The authors at theNNT.com show that tight glycemic control (closely monitoring blood sugar with aggressive medical management) has surprisingly shown only one statistically significant effect. There was no added benefit for stroke prevention, heart attack, kidney failure, or prevention of death. The only significant finding in this five-year study was that for every 250 people treated, one limb amputation was prevented. The number needed to harm, on the other hand, was six. For every six people treated with tight glycemic control, one was hospitalized with a complication. These numbers seem to lean heavily against such tight monitoring and treatment. This, however, is where the doctoring comes in — a patient might be willing to risk a 1/6 chance of hospitalization to avoid a 1/250 chance of limb amputation. Understanding and using the NNT will make it easier for us to help our patients make informed choices based on their own values.

As a profession, we are moving towards a more analytical way of thinking. We are asking ourselves not only "what should I do for this patient?" but also "what might I be doing for this patient?" Intervention may not always be the best answer. Taking into account the negative space, we have a more complete picture of the positive and negative effects of treatment and can make more informed decisions with our patients. ★

Cost-Effective Equality & Residency

Author Anonymous

All residencies are not created equal. Each hour you spend working as a resident has different value per program. Think of it as the *cost effectiveness* of a program. This metric refers to the amount of education and the other benefits of the program you may get per hour of work you do in residency. This metric is individual-specific. You may value location versus your salary, or opportunities to travel versus opportunities for advancement in a subspecialty. If you're someone who is praying to just get into, or happy just to be in, a residency, then you might not find this article useful. But most medical students and residents are high-achieving leaders who were, or are, doing any number of creative activities outside of medicine.

You have options as you go through your interviews, and each program should be weighed individually as the cost of choosing the wrong one could be significant. You need to ensure your program is a program with high cost effectiveness for you. This may mean a program where residents can seamlessly take advantage of opportunities in research, leadership, community service, or anything that piques your interest. The limiting factor is not always availability of opportunities, it's actually usually infrastructure.

Once you've chosen a program that has the right availability of opportunities to match your interests, you may be surprised to find that the accessibility to those opportunities is not what you thought. In any other industry, minor inefficiencies in the system may go unnoticed or worked around without any significant distress. Unfortunately, due to residents' time constraints and responsibilities, just the slightest hitch in the system — say, someone not replying to an e-mail — can mean the failure of access to the opportunity. Thus, abounding opportunities is likely not enough; accessibility to opportunities needs to be accounted for. What are programs doing to facilitate opportunities? What are some levels of infrastructure they have set up? You should ask both questions to residents and residency leadership.

There's always the other side of the coin — the devil's advocate, so to speak. Being a top-notch EM physician is a priority to every resident and thus the driving mission of every residency. Residents must abide by a certain set of requirements to complete their training and each program has their own spin on the curriculum. Many programs like to take pride in their creative ways to implement it. This can be very exciting, but it can also be restrictive.

Though there is a set curriculum, residencies are still far from standardized. For example, there is no set number of hours that each EM resident is expected to have worked clinically during residency. While a focus on this aspect of residency is definitely very appreciated, **providing a robust curriculum is not enough anymore** — just like getting good grades is not enough to get into medical school. Current residents have been bred to want more. The system has selected for them to be higher achievers than

The reason certain residencies have a robust global health or research program and others have mediocre ones is not that the opportunities don't exist — it's the degree to which you have to fight the system for them.

Most medical students and residents are high-achieving leaders who were, or are, doing any number of creative activities outside of medicine.

ever before. The balance between work, extracurriculars, and life is not new to residents, but the over-representation of work in that equation might be.

Programs should feel the charge to step up to the expectations of each resident's needs. Many programs are doing this well; others may want to be able to accommodate, but don't know how.

There are many ways that programs have thought of to ensure accessibility to their available opportunities. The suggestions below are from residencies around the country who are finding ways to include residents in extracurricular EM activities.

- Involve a resident in every publication.
- Use a scheduling system for accommodating requests seamlessly.
- Ensure strong knowledge and relationships with an associate teaching institution.

- Provide information, access, and support for opportunities in advocacy.
- Enable access to funding for national and regional conference attendance.
- Set up infrastructure for IRBs and statistical help for research.
- Facilitate resident involvement in hospital-wide committees.
- Ensure ease of access to global health funding options.
- Actively update websites.
- Use social media for communication.

Many programs do many of these things. Many programs think they're doing these things, but fall short. The reason certain residencies have a robust global health or research program and others have mediocre ones is not that the opportunities don't exist — it's the degree to which you have to fight the system for them. This holds true for

nearly all specialty interests in residency. The struggle varies enormously and really makes the difference.

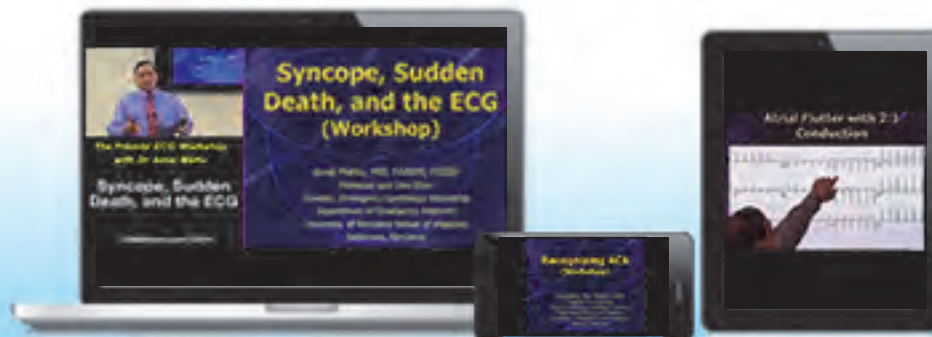
So how can you know what programs are doing? You can check their websites, join their social media outlets, and ask around. Ask program directors what infrastructure there is and ask current residents how that has been working out. If you're in a program already, ask for advice. Know that you are in training and you will be, or are, working very hard. Make sure that you are maximizing the cost effectiveness of your hours worked by being aware of the infrastructure needed for you to accomplish your desired interests during residency.

What is your program doing to integrate residents and create a time cost-effective experience? Tweet @emresidents and show some residency pride! You can also comment online at emresident.org. ★



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One Shift



Samuel Zidovetzki, MD
Resident Physician
University of Wisconsin
Hospitals and Clinics
Madison, WI

There is something unique about being an emergency physician. There are a few other specialties who also see large breadths of pathology and some undifferentiated patients, but probably no other specialty has quite the same patient relationships we have. The quick two- to five-minute interactions we have are sometimes incredibly gratifying, and at other times, unbearably painful. Sometimes we love these relationships, but others, well... they're more love-hate. Either way, these day-to-day interactions are what define our specialty and form the basis for our fondness for emergency medicine. Every shift is a reminder.

“**D**octor, I have abdominal pain. I took a pregnancy test earlier today and it said I was pregnant,” says a young lady as she holds her abdomen and grimaces in pain. “You are pregnant,” I confirm. “However, your pregnancy is not in the uterus. You have a pregnancy growing in your fallopian tube, which has ruptured, and blood is now pooling in your abdomen.” “Oh,”

she replies, looking unsure of how to react. I continue, “Your blood count is low, and your heart rate is high. You are showing early signs of shock and you need to have an emergency operation.” “Wow,” she replies, only able to speak in single syllables. “Good luck. I hope I never see you in the emergency department again,” I say, and we both chuckle.

“I went to my primary care doctor today and they told me to come right in,” says the well-dressed, middle-aged woman sitting upright in bed. “What’s been going on?” I ask. “It says here you have been having diarrhea for three weeks.” She nods, “Yeah, about four times per day I’ve been having diarrhea. My daughter also had it for a week. We probably ate something strange.” She then pauses,

reluctantly adding, “This damn diarrhea is also causing me to lose a lot of weight. I think it’s because I’m not hungry and everything is going right through me.” With the gravity of the situation weighing on me, I meet her eyes through a furrowed brow. “You were sent here by your primary care doctor because your liver enzymes were high....” “Well then what does my CT scan show?” she asks. “That’s what I came to talk to you about,” I respond. “You have cancer in your pancreas, which has spread to your liver and your lungs, and it is blocking your biliary system, causing bile to back up into your blood.” She looks at me and sardonically quips, “Well, thanks for that; I hope I never see *you* in the emergency department ever again,” and we both chuckle a little uneasily.

The next one looks like a dragon, huffing furiously, steam coming out of an oxygen mask turned up full blast, as she futilely struggles to get air into her lungs. I listen with my stethoscope, but despite her maximal effort there is no air movement. “What hurts?” I ask. “Nothing,” she says. “Are you feeling short of breath?” She rolls her eyes and cracks a wry smile at my questioning the obvious. She responds slowly, “I’ve been feeling... crummy

all week... and nothing I do... seems to help. I was reading the... newspaper this morning... and started gasping... for air. I couldn’t eat... my breakfast. And I do... love my eggs.” It takes her nearly a minute to speak these few lines, a few haltering words at a time, punctuated by gasps for breath. These turned out to be the last sentences she would ever speak. Within minutes, she was intubated, loaded into a helicopter, and emergently flown for a higher level of care. I learned later that she was dead by that evening. I was the only witness to her last words, and I will never see her in the emergency department again.

“I hate you, you piece of shit!” — the first words to greet me as I enter the room of a not-so-pleasantly intoxicated young lady who had just face-planted onto the sidewalk. Ignoring her introductory epithet, I ask, “How are you feeling?” in my usual manner. She snarls in response, “I don’t know. Just get me out of here!” “Well, you are very intoxicated and you need to stay here so we can assess you,” is my metered response. “Fine,” she snorts in reply. She begins walking heel-to-toe across the room and moving her finger from her nose to random points in space, perhaps assessing her own coordination, but more likely showing me a defiant satire of her clinical sobriety.

Following her lead, I proceed to perform the neurological exam, asking her to push against my hands. Instead, she shoves her hands into my chest, forcing me against the wall. This unexpected assault leaves me winded, the breath knocked out of lungs. She grits her teeth, and I wonder if I’m about to be bitten. “Not tonight,” I quickly resolve, and swiftly exit the room to find a more peaceful locale. This was not the first time I have been assaulted in the ED and it probably won’t be the last. After meeting her medical needs, I discharge her to the detox facility and say, “I hope I never see you in the emergency department again.” This time I really mean it.

“Doctor, I am pretty nauseated. I have been feeling this way for quite some time,” states a young woman resting comfortably, but looking somewhat anxious. “Well,” I respond, “you are pregnant.” “Oh my God! We have been trying for so long. This is the best day of my life! Thank you, thank you, thank you!” she states, unable to conceal her joy. “Congratulations,” I say with a weary smile. This interaction I needed; it’s been one of those days.... As she leaves the department, I think, “It would be nice to see her again, just not in the emergency department.”

This is the blessing, the curse, the fascination, and the frustration of life working in the ED. Whether it’s a broken arm, an ingrown toenail, or a traumatic spinal cord injury, the experience of each patient is but a part of a kaleidoscope of images, sounds, and experiences for me as an emergency physician. From the vigorous first cry of a newborn baby, to the whispered last words of a dying patient, the ED is an emotional roller coaster. Walking under the **EMERGENCY** sign on my way to a shift, I never know what kind of ride I am in for. However, I am sure I will make a difference for my patients, and that they will make one for me.

We all have different interests within emergency medicine, but these shifts are common to us all, and in a way bind us together as a unified body unlike any other in medicine. EM Resident encourages you to write in and tell us about your shifts and your patient interactions, both difficult and sublime. We are made stronger by sharing our stories — NM. ★



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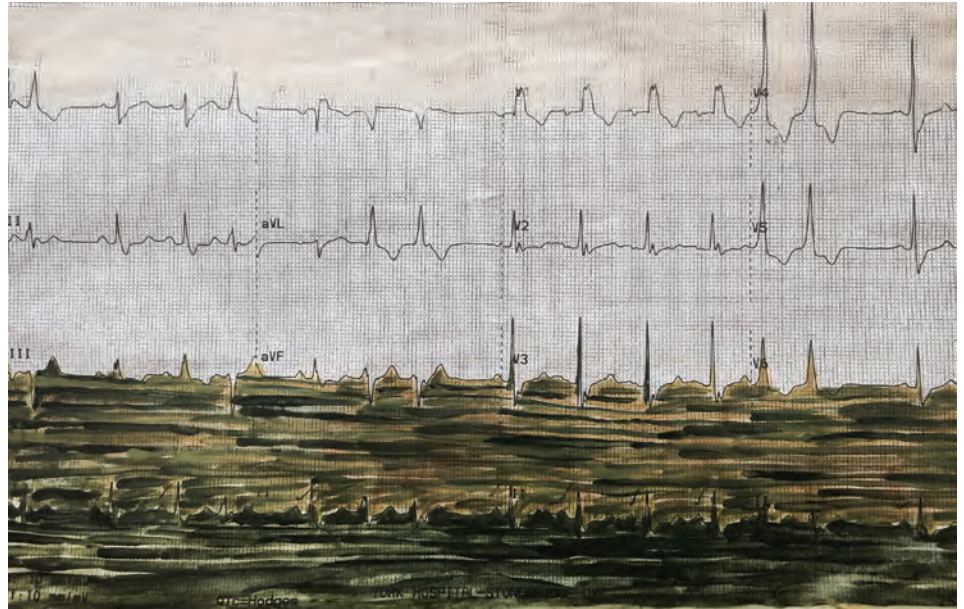
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Energizing through Art

Lindsey Ball, MD
Resident Physician
York Hospital
York, PA

As emergency physicians, every day we are faced with the unique opportunity to be intimately part of our patients' lives for a brief snapshot in time. And as much as we want to see our patients as the multidimensional and complex people they are, the limitations of time and resources leave us with no choice but to simplify our encounter into a digestible case with a clear H&P, differential, and plan. Each patient is a story we may never unravel, encompassing hopes, dreams, passions, cherished memories, regrets, and much more.

We often forget that, just like our patients, we are not one-dimensional diagnosticians. Residency is demanding and draining. Sometimes it feels impossible that I will ever learn everything I need to know. Now, halfway through my intern year, I find that the same things that make me a more effective and happier person also make me a more effective and happier resident. Taking even just a few minutes each day to do something that energizes my spirit has made the insurmountable task of residency suddenly appear manageable. These paintings remind me that each EKG is only a glimpse of a person with a unique story to tell. Behind each routine patient encounter lies mystery and depth that I am only cracking the surface of when I walk into my emergency department shift.



Grassy Hills



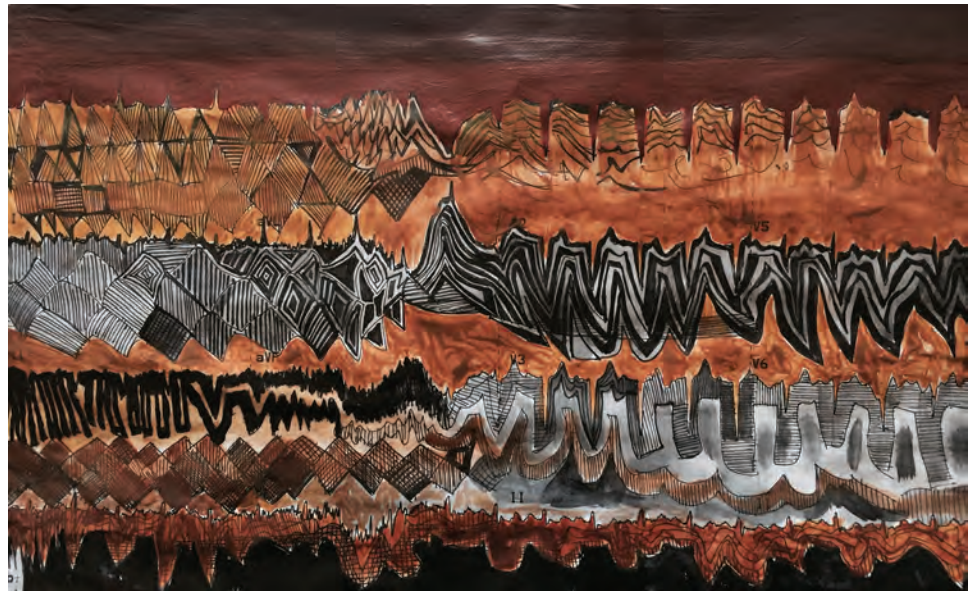
The Sea

Acrylic paints and black ink pen on regular photocopy paper. I paint directly on the actual photocopies, so all the original EKG lines are preserved.

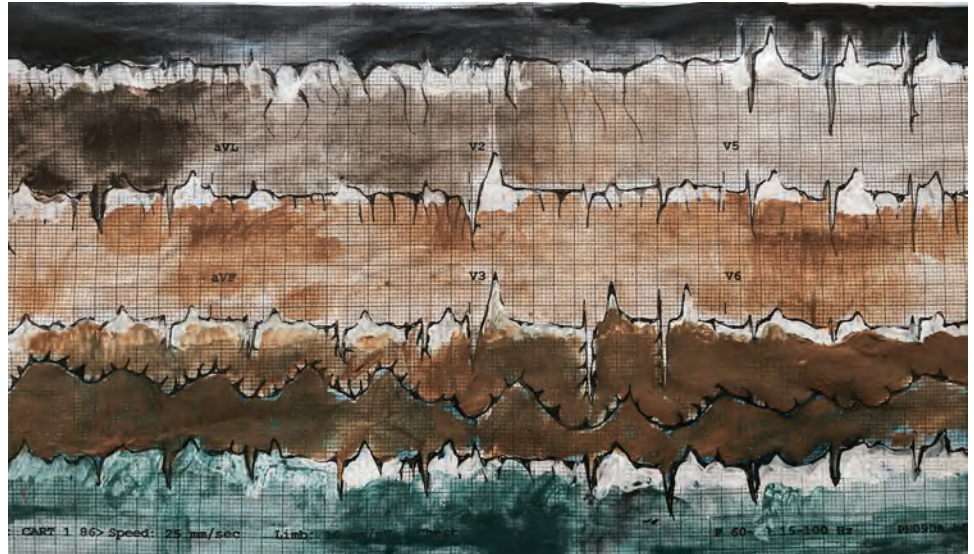
RESIDENT LIFE

These are acrylic paints and black ink pen on regular photocopy paper. I paint directly on the actual photocopies, so all the original EKG lines are preserved (though sometimes accentuated with black ink pen). I use very tiny brushes and a very-fine-tip waterproof pen. I always have a vague idea in mind of what I want to portray in the picture (mainly color scheme and general landscape), though it usually comes out completely different than I expect. I don't have any kind of strict formula or routine. That keeps the process fun and leaves room for flexibility and surprise. ★

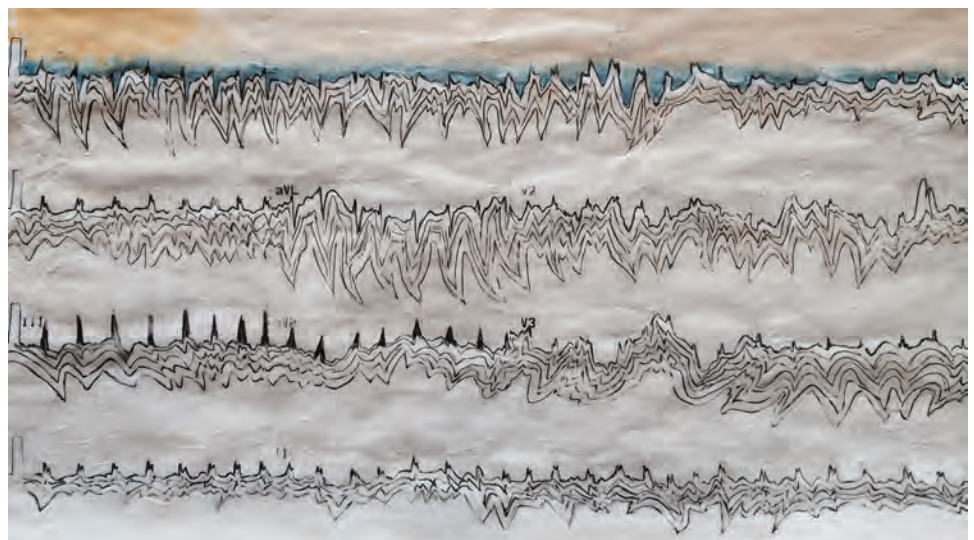
Behind each routine patient encounter lies mystery and depth that I am only cracking the surface of when I walk into my emergency department shift.



Desert Night



Mountain Tops



Snowy Day

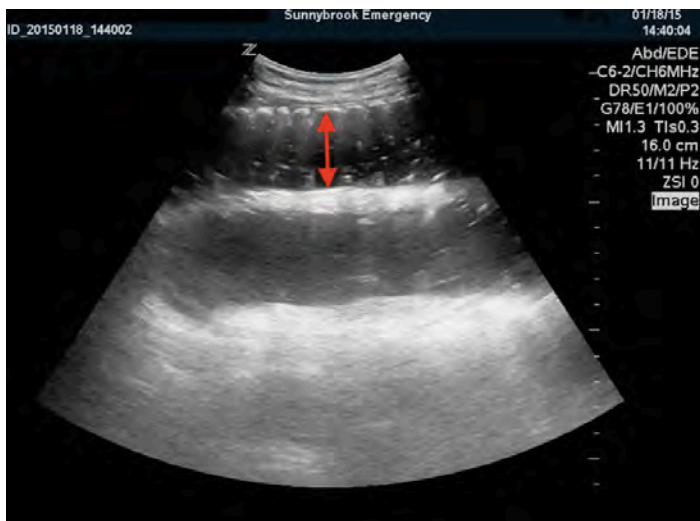


Image 1. Small-bowel obstruction (red arrow), with evidence of “keyboard” sign.



Image 2. Measurement of the bowel diameter, showing a loop at 3.58 cm.

Using Point-of-Care Ultrasound in Small-Bowel Obstruction

Sounding the Bowel

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Case 1. A 72-year-old male with no past medical history presents to the ED with two days of vomiting and severe abdominal pain. Vital signs include a heart rate of 132, blood pressure of 72/35, respiratory rate of 27, and a normal temperature. Volume resuscitation is initiated, and an exam reveals an incarcerated hernia. Bedside ultrasound is preformed, and it reveals several dilated loops of bowel (Image 1) consistent with a small-bowel obstruction. Surgery is consulted, and the patient is taken to the operating room without further delay or imaging studies.

Case 2. A 65-year-old male with a history of a surgically repaired perforated duodenal ulcer presents to a rural emergency department with mild abdominal pain of two days duration. His last bowel movement was one day ago, with good oral intake and no nausea or vomiting. On examination, the patient’s abdomen is large but soft, with no guarding or rebound. Bedside ultrasound exam shows multiple loops of small bowel that are fluid-filled and dilated (Images 2-4). Also noted is a trace amount of free fluid in between loops of bowel (Image 3). In this case, CT confirms the suspected diagnosis of bowel obstruction, likely due to adhesions.

Discussion

Bowel obstruction is a relatively common clinical entity, accounting for 15% of all emergency department admissions for abdominal pain, which equates to approximately 300,000 patients per year in the United States.¹ The current workup includes a plain film X-ray, which can include up to three views, and can be followed by CT imaging if deemed necessary. Abdominal X-rays are fairly

rapid and relatively inexpensive, but have very poor specificity and sensitivity, quoted in the literature as being 50-67% and 46-77%, respectively.² CT imaging is considered the gold standard in imaging modalities, with a sensitivity of 92% and specificity of 93-100%.^{2,3} When rapid and accurate diagnosis is required, particularly in those who require early operative intervention, point-of-care ultrasound (POCUS) can be a useful imaging modality.

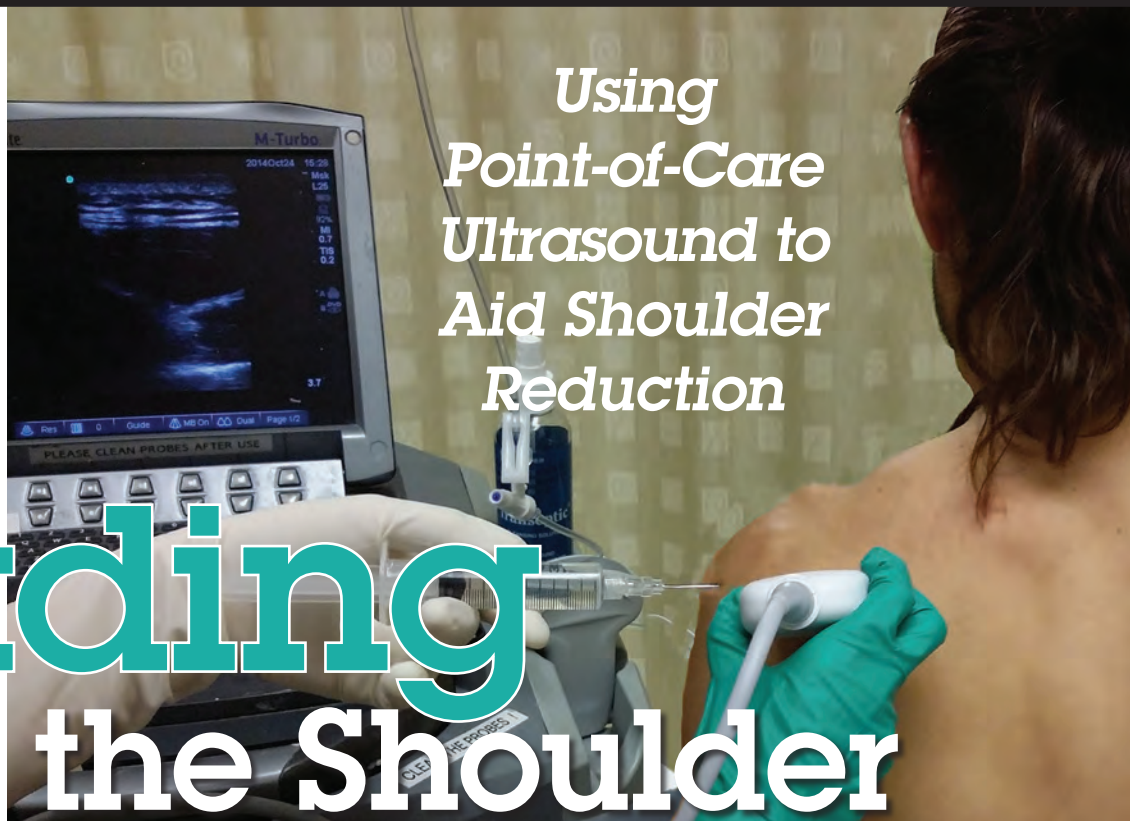
POCUS for bowel obstruction carries a specificity of 90% and sensitivity of 97%, making it far superior to abdominal X-ray.² Scheible, et al, published the first description of the use of ultrasound for diagnosis of small-bowel obstruction in 1979 in the *American Journal of Radiology*.⁵ There are several advantages to using ultrasound over other imaging modalities that include the ability to detect causes of obstruction and the ability to

Questions

1. How can you use point-of-care ultrasound (POCUS) to confirm your diagnosis?
2. How can you use POCUS to provide analgesia?
3. How can you use POCUS to confirm your therapy?
4. Can POCUS eliminate pre- and postreduction radiographic assessments?

Loading the Shoulder

Using Point-of-Care Ultrasound to Aid Shoulder Reduction



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Case

A 16-year-old boy presents to the ED with right shoulder pain after strongly throwing a ball overhand. He denies any direct trauma or history of prior injury. On exam, he holds the affected shoulder in slight external rotation and abduction, with squaring of the shoulder contour. A hollow is appreciable beneath the posterior aspect of the acromion. The motor and sensory exams are intact to the five branches of the brachial plexus and distal pulses are strong. An attempt to range the shoulder is met with significant apprehension.

Anatomy

The glenohumeral (GH) joint is one of the largest joints of the body and has the greatest range of motion. It comprises three bones: the scapula, with its coracoid and acromion bony projections; the clavicle; and the humerus. The humerus articulates with the glenoid fossa of the scapula to form the GH joint. Due to its wide range of motion, the shoulder is the most commonly dislocated joint in the body, with anterior dislocations (as in the patient in this scenario) accounting for 95-97% of total dislocations.¹ These can occur when large forces distract the humeral head from the inferior glenoid fossa, while the biceps and pectoralis muscles pull the humeral head anteriorly.

The Procedure

Plain radiography has been the historic modality for evaluating shoulder dislocation, but there may be a growing role for ultrasound (US) diagnosis. Recent evidence suggests that POCUS can confirm shoulder dislocation with improved sensitivity and efficiency relative to radiography.² With the patient in a seated position and the indicator pointed to the patient's left, the high-frequency linear probe is placed in transverse orientation just below the scapular spine. In this orientation, the bony landmarks of the glenoid fossa and humeral head are identified. Bones reflect sound waves while their cortices cast deep shadows, causing them to appear as bright echogenic lines on ultrasound. In an anterior dislocation,

the glenoid fossa will be empty, and the humeral head will be seen deep to the probe near the bottom of the screen (*Image 1*). Joint effusion or hemarthrosis may also be seen. Consider performing dynamic scanning by imaging a selected point between the humeral head and the glenoid and gently ranging the shoulder to confirm the expected absence of articulation.

Ultrasound may also aid successful reduction of the anterior dislocation. A recent meta-analysis suggested that intra-articular lidocaine provides equal pain control with fewer complications and greater first attempt success rates when compared to intravenous analgesia and sedation.³ There appears to be a role for ultrasound-guided lidocaine placement as part of this

PROCEDURAL GUIDANCE

procedure, though this technique has yet to be evaluated beyond case reports.⁴

The posterior approach in GH joint injection is preferred because of the thin posterior joint capsule and the absence of significant neurovascular structures, bursae, and rotator cuff tendons. Placing the joint in slight flexion with mild distal inline traction may be useful. The acromion and coracoid processes should then be identified by following the scapular spine laterally until it turns anteriorly to become the acromion. The coracoid process should be identified below the lateral third of the clavicle.

Using aseptic technique, the skin should be prepared with betadine or chlorhexidine, and the foot of the US probe should be covered with a transparent dressing and sterile lubrication. Under long-axis visualization, a spinal needle can be inserted inferior to the posterior border of the acromion process (see image previous page). The tip of the needle should be aimed towards the coracoid process about 30 degrees medially, and advanced 2 to 3 cm. Once in the joint space, it is reasonable to aspirate to evaluate for and remove any hemarthrosis. Then, pushing slowly, confirmation of space expansion with injection of lidocaine can be confirmed on ultrasound.⁵ Generally, up to 15 cc of lidocaine can be placed into the joint space.

As always, after performing a reduction, the patient's neurovascular function should be assessed. Reexamination of the joint

with ultrasound can confirm replacement of the humeral head into the glenoid fossa (Image 2). With mild internal and external rotation, the humeral head can be seen articulating with the glenoid. Immobilization should be performed with a sling and swath, with the shoulder placed in internal rotation and the elbow at 90 degrees.

Pearls, Pitfalls, and Further Discussion

A continued discussion on the utility of pre- and postreduction radiographs in the management of shoulder dislocation remains inconclusive. Ultrasound may provide an adjunct role, but its parameters have yet to be defined.^{6,7}

Prereduction radiographs are typically obtained to confirm dislocation, type of dislocation, and presence of fracture. Several prospective trials selectively eliminated prereduction radiographs to demonstrate reduced time to reduction and reduced radiographic use without adverse events. The same studies also suggest both decreased patient discomfort and muscle spasm (which can result in a more difficult reduction).⁸⁻¹⁰ However, this selective practice is still not widely accepted. Although Hill-Sachs deformities, Bankart lesions, and greater tuberosity fractures generally do not alter the initial management of prompt closed reduction, high-energy injuries like humeral neck fracture-dislocations should be identified prior to determining

an optimal reduction strategy. Also, attempting an anterior closed reduction technique on a non-dislocated, or posteriorly dislocated, shoulder can be harmful. Some authors suggest obtaining US views of the humeral head, neck, and shaft to exclude obvious fracture, but this practice has yet to be established.¹¹

Postreduction radiographs are typically obtained to confirm successful reduction and to evaluate for presence of any fractures sustained either iatrogenically or not initially visualized on the prereduction radiograph. Iatrogenic fractures as the result of shoulder reduction remain a rare event.¹² Small prospective, observational studies show that a significant number of associated fractures were not appreciable until the postreduction radiograph, but no injury was clinically significant in terms of changing subsequent emergency department management. It is uncertain what role ultrasound may have in evaluating for postreduction fractures.

Conclusion

Ultrasound may have a future role in safely omitting prereduction and postreduction radiographs, but its optimal application is currently in point-of-care confirmation of successful closed reduction, with some role in shoulder injection. This likely avoids readministration of analgesia in a patient requiring multiple reduction attempts, expedites overall care, and can reduce costs and radiation exposure. ★

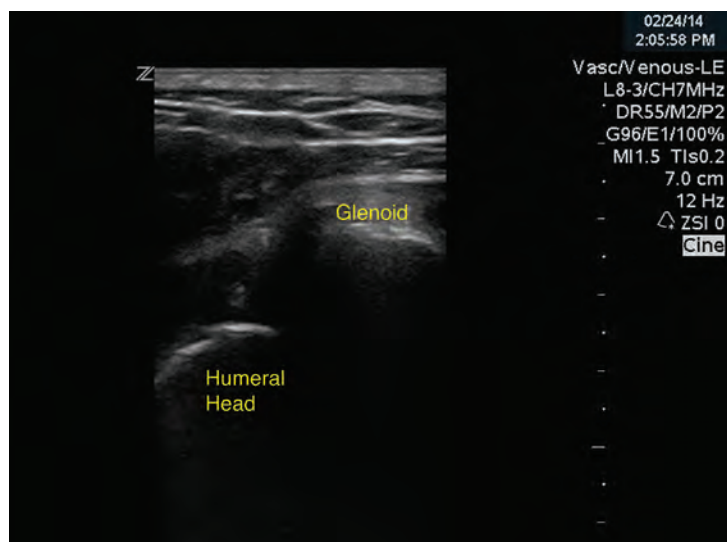


Image 1. Ultrasound of a dislocated shoulder, showing the characteristic empty space between the humeral head and the glenoid – the empty glenoid fossa.

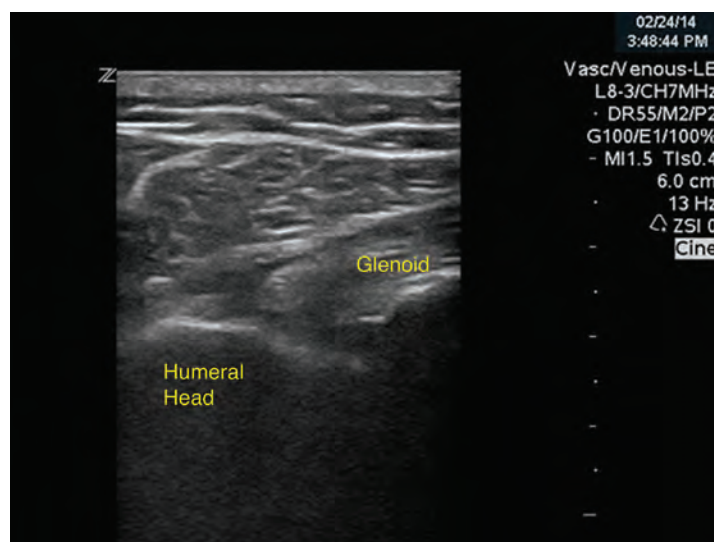


Image 2. Post-reduction ultrasound of the shoulder joint, showing the humeral head again in close proximity to the glenoid.



through
the
tube

Post-Intubation Hemodynamic Collapse

in the Critically Ill ED Patient



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A 72-year-old female with a history of atrial fibrillation presents to your emergency department with a fever. A chest X-ray shows a right lower lobe pneumonia. The patient is severely tachypneic and hypoxic. Her oxygen saturation is 90% while on 100% non-rebreather. The monitor shows atrial fibrillation with rapid ventricular response and her blood pressure is steadily dropping despite fluid resuscitation; it is now 80/40. You quickly discuss goals with the patient and family and decide to intubate. You use rapid sequence intubation with 20 mg of etomidate and 100 mg of succinylcholine and place the endotracheal tube successfully on the first pass. However, immediately after intubation the patient becomes increasingly hypotensive, then bradycardic, at which point she arrests....

Introduction

Endotracheal intubation (ETI) is a life-saving procedure used by emergency department physicians to provide definitive oxygenation, ventilation, or airway protection for the severely ill patient. Unfortunately, ETI can precipitate rapid and unexpected decompensation, particularly among ED patients who are at high risk for cardiovascular collapse.¹ In fact, 25% of patients develop transient hypotension after emergent ETI² and there is a 30-fold increase in adverse events among ED intubations compared with those performed in the operating room (OR).³

Emergency department intubations are critically different from OR intubations in two ways. First, an ETI in the OR setting is almost always planned well in advance, allowing time for the patient's gastric contents to empty. Contrast this to an emergency department ETI, which is almost never planned in advance and, thus, patients frequently have (or are presumed to have) a full stomach. Second, patients who require ETI in the ED are *by definition* acutely ill and are more likely to have hemodynamic instability than those undergoing ETI in the OR, where medical optimization of a patient's condition is sought prior to procedure.

Rapid sequence intubation (RSI) was developed to provide optimal conditions for quick, safe ETI outside of the OR. It comprises three basic elements: pre-treatment, induction, and paralysis.⁴ RSI is especially helpful in addressing the issue of NPO status because the rapidity of the RSI protocol helps minimize the risk of aspiration. However, RSI does little to protect or prevent post-intubation hemodynamic decompensation. The effective emergency provider *must* develop his or her own techniques for preventing and responding to post-intubation instability.

Physiology

Post-intubation hypotension is a reflection of changes to one or more factors affecting circulatory physiology: gas exchange, venous return, intrathoracic pressure, and cardiac output.

Gas exchange. Adequate exchange of oxygen and CO₂ is critical to cardiovascular

functioning. ETI is intended to secure adequate gas exchange in critically ill patients. However, gas exchange is easily imperiled by complications of ETI. Esophageal intubation, bronchial main-stem intubation, tension pneumothorax, inappropriate ventilator settings, and mechanical problems with the ventilator circuit are all potential complications of ETI that affect gas exchange. Each of these complications may ultimately result in precipitous hemodynamic collapse. Fortunately, these problems can be quickly assessed and addressed.

Venous return and intrathoracic pressure. Venous return (VR) is the second critical element of cardiopulmonary physiology, determining cardiac preload and, thus, cardiac output. Simply described, VR is proportional to the difference between extrathoracic and intrathoracic pressure (ITP) — venous blood returning from the venules in the tissue beds must overcome ITP in order to return to the right heart. During spontaneous respirations, ITP is either negative or zero at its peak. However, intubation and positive pressure ventilation (PPV) affect return of venous blood to the heart in several ways.

When patients are placed on PPV, intrathoracic pressure increases above zero, which in turn impedes venous return. This phenomenon may not become clinically relevant in a healthy patient who has plenty of room on the Frank-Starling curve. But in patients whose preload was barely adequate prior to PPV, the decrease in VR and preload may lead to a significant decrease in end-diastolic filling pressure and cardiac output. Furthermore, elevations in ITP are also exacerbated by gas trapping; inadequate attention to ventilator settings for patients intubated with obstructive lung disease (e.g., COPD or asthma) may lead to drastic rises in ITP and critical loss of VR.

Venous return is also affected by the volume of “stressed” venous blood in the system, which in turn is affected by overall volume status of the patient and adrenergic action on the vascular system. Critically ill patients presenting to the emergency department frequently have intravascular volume depletion. These patients maintain their stressed venous volume based on the action of sympathetic hormones on the tone of the peripheral vasculature. During ETI, patients receive sedative-hypnotic medications that counteract this sympathetic drive and lead to relaxation of the vasculature, further decreasing the volume of blood returning to the heart.

Cardiac output. Cardiac output (CO) is affected by multiple factors, which in turn are affected by ETI. Cardiac output is proportional to stroke volume (SV) and heart rate (HR):

$$CO = HR \times SV$$

ETI can decrease both stroke volume *and* heart rate. Sedative-hypnotic agents may affect chronotropy (HR). For instance, many severely ill patients maintain their CO with compensatory tachycardia. This reflex can be blunted by RSI medications. ETI can also decrease SV by either decreasing VR or inotropy. Venous return is decreased via vasodilation, which leads to decreased end-diastolic volume and SV. Increasing ITP under PPV conditions also increases impedance of VR and decreases CO. Inotropy is also decreased by certain sedative-hypnotic agents, decreasing CO. Specifically, the negative inotropic effects of propofol are well studied. Etomidate is thought to be beneficial in terms of cardiac function, but its solvent (propylene glycol) has slightly negative inotropic effects.⁵ Most sedative hypnotics may lead to vasodilation by blunting of compensatory adrenergic stimuli and decreasing coronary artery perfusion pressure, which, in turn, can lead to negative inotropy.

In patients with multiple comorbidities or severe underlying heart disease, ETI may precipitate cardiac ischemia or dysrhythmia leading to collapse.

Gas exchange is easily imperiled by complications of endotracheal intubation.

Patient factors. In addition to the factors listed above, patient-specific factors have a profound effect on post-intubation hemodynamics — in fact, some clinicians believe it is the comorbidities and not the ETI that are primarily to blame for post-intubation hemodynamic collapse.⁶

Familiarize yourself with two key patient-specific factors when planning your intubation:

1. What is the underlying cause of the patient's respiratory failure — hypoxic, hypoventilatory, metabolic, or airway protection?
2. Is there underlying heart or lung disease or underlying volume depletion? These factors all have a considerable effect on cardiovascular response to ETI.⁷

Management

Post-intubation hypotension has diverse presentations and clinical implications. It is important to take into account the entire clinical picture; quick decisions are required! That being said, avoid springing into action over the numbers on the monitor alone. For example, a young healthy trauma patient may sustain a transient drop in blood pressure after intubation that is likely to be well tolerated and may require minimal intervention beyond IV fluid infusion. However, as demonstrated in the case above, post-intubation hypotension can quickly lead to cardiovascular collapse and cardiac arrest in susceptible patients. Management techniques are considered below, categorized into pre-intubation and post-intubation care.

Pre-intubation. For patients with signs or symptoms of shock prior to intubation, post-intubation hypotension can be common and severe. Avoid assessing shock by blood pressure alone! Be aware that patients in compensated shock may be closer to hemodynamic collapse than their blood pressure initially indicates. Consider the following preventative measures:

1. **Fluids.** Ample fluid resuscitation prior to intubation can help stave off the deleterious effects of vasodilation, dehydration, and decreased VR in the patient with septic or hemorrhagic shock. If time allows, try to bolus the patient with fluid directly prior

to intubation. It may be possible to infuse a liter of NS while setting up for intubation if you have adequate peripheral access or a pressure bag.

2. **Vasopressors.** In patients who are hypotensive prior to intubation (or those hovering near hypotension), consider preparing and hanging a vasopressor *before* the intubation. Ideally, pressors are only initiated after adequate fluid resuscitation. In reality, there are clinical scenarios that may not afford you time to complete fluid resuscitation prior to ETI. For instance, it is not uncommon for a patient to present in a mix of cardiogenic and septic shock. These patients may be suffering from severe pulmonary edema in addition to sepsis, making it difficult to adequately resuscitate without airway protection. Some clinicians may choose to start vasopressors prior to intubation on a case-by-case basis, while others may find it helpful to have the pressor hanging for *immediate* use after intubation. The logistics of initiating vasopressors can be time consuming. Depending on your shop and nursing availability, if you wait to order vasopressors until after you see post-intubation hypotension, your patient may suffer serious decompensation while the medication is being retrieved, pumps programmed, etc. In patients presenting with septic shock, consider selecting your pressor based on the surviving sepsis protocols.

3. **"Push-dose pressors" (PDPs).** PDPs, also known as bolus-dose pressors, have been increasingly used as a treatment for post-intubation hypotension and have received a lot of press in EM educational outlets. In theory, PDPs are similar to drip pressors, except they are tailored for quick-on, quick-off indications. The concept of using a pressor in small bolus form for the treatment of hypotension after ETI was borrowed from the anesthesia literature. While the use of bolus-dose pressors is widespread in

anesthesia practice (typically boluses of epinephrine and phenylephrine), the literature to date is mostly derived from OB anesthesia, where PDPs are used to reverse transient hypotension after spinal anesthesia during Cesarean delivery.^{8,9} Critics of PDPs are concerned that the safety and efficacy in critically ill ED patients is unproven and recommend careful use in appropriate clinical scenarios. Keep your eyes open for more information as this debate evolves.^{10,11}

4. **RSI medications.** In the patient who is hypotensive prior to intubation, or hovering near hypotension, consider avoiding vasodilator induction agents, such as propofol or midazolam.¹² Ketamine is frequently cited as the drug of choice for hypotensive patients.^{13,14} Some experts have recommended using reduced doses of sedative-hypnotic agents in patients who are already in compensated or decompensated shock, regardless of whether the medication is "hemodynamically stable."¹⁵ This may mean trying 10 mg instead of 20 mg of etomidate. Always have the complete dose drawn up in case the initial dose is not sufficient. Finally, don't confuse reduced dosing of sedative-hypnotics with reduced dosing of paralytics. Paralytics improve your chances of first-pass success and, in critically ill patients, first-pass success is paramount.

Post-Intubation

When assessing post-intubation hemodynamic collapse, you must consider each of the above factors simultaneously: gas exchange, venous return, and cardiac output, as well as patient-specific factors. Perform a rapid assessment of your patient and, if possible, simultaneously recruit help from your team. Can the respiratory therapist detach the ventilator and listen for exhale or assess compliance? Can your nursing colleagues ensure adequate fluid resuscitation and prepare meds? Act in parallel; not in sequence!

CRITICAL CARE

1. *Problem — inadequate gas exchange.* Your only indications of poor gas exchange may be hypoxia, hypercapnia, or change in breath sounds. Steal a moment to evaluate your patient, monitor, and ventilator for clues (this means being familiar with the layout of your vent screen). Are you seeing a change in O₂ or CO₂ on the monitor? Are the ventilator settings concerning (e.g., low tidal volumes or high peak pressures)? In this case, gas exchange may be the primary issue. Consider using the mnemonic “**DOPES**” to troubleshoot a patient with post-intubation hemodynamic collapse. DOPES helps cue the EM physician to readily fixable causes of post-intubation complications (Table 1).

Following the mnemonic, start by disconnecting the patient from the ventilator and perform bag-valve-mask ventilation. This eliminates the chances that the circuit is the problem and helps gauge lung compliance. Second, check the airway: Has the tube been displaced from its initial marking? If it is too deep (main-stem) or too shallow (oropharynx), the tube placement will need to be addressed immediately. Next, check for equal breath sounds and good end-tidal CO₂. If there is concern for pneumothorax, decompress immediately. Listen for the quality of breath sounds. If wheezing has developed, this may represent severe bronchospasm, underlying parenchymal disease, or ARDS and may require adjustments to the ventilator. Use deep suction to assess for obstruction due

to mucous plugging. Poorly sedated patients may be biting the tube and causing obstruction of airflow.

2. *Problem — decreased cardiac output.* Inadequate CO can lead to cardiovascular collapse and decreased tissue perfusion of vital organs such as the brain, heart, gut, and kidneys. Signs may be immediately obvious (hypotension, cardiac rhythm change on the monitor from poorly perfused coronaries) or more subtle (skin mottling, change in capillary refill). Unless you have started high-dose vasopressors, hypotension and decreased perfusion is likely caused by changes in VR or HR. Patient-specific factors will help guide your workup. In patients with septic or hemorrhagic shock, consider fluid and pressor management as described above under “pre-intubation.” For patients with underlying obstructive lung disease, always rule out tension pneumothorax, breath stacking, and barotrauma first – each entity can drive up ITP and decrease VR and CO. In patients with multiple comorbidities or severe underlying heart disease, ETI may precipitate cardiac ischemia or dysrhythmia leading to collapse. Evaluate the rhythm on the monitor, obtain a 12 lead EKG, and assess HR and signs of perfusion. In this case, your management will depend on underlying rhythm, presence of a pulse, and evidence of ischemia.

3. *Problem — adequate sedation.* In some cases, your patients may narrowly dodge adverse outcomes

during RSI, only to develop hemodynamic collapse when post-intubation sedation is initiated. While it is critical to be on the lookout for this complication of sedation packages, do not be lured into thinking your patient must do without sedation. Be creative! It may be necessary to avoid protocolized sedation packages that will endanger your patient. Be sure to talk to your nurse and develop a plan before you leave the room.

Ketamine may be a good resource. While commonly used as an RSI medication, ketamine can also be used in the sedation package. If your patient is thrashing and waking up from ETI, consider starting with a bolus of 1-2 mg/kg IV then a drip at 0.5 mg/kg/hr. This may be a strategy that you need to discuss with nursing and pharmacy staff at your hospital first. Fentanyl is also your friend for these patients. It has a quick onset and short duration of action, allowing you to pause if MAPs are looking low. Fluid boluses and even drip pressors may be a necessary adjunct to keeping your patient adequately sedated (as opposed to leaving the sedation off to avoid pressors, with a thrashing and miserable patient).

Conclusion

While definitive evidence has yet to be supplied, preventative measures, high clinical suspicion, and patient-specific adaptations of intubation technique and care are likely to minimize the degree and frequency of post-intubation hemodynamic instability. ★

Table 1. DOPES mnemonic

“DOPES”	Description	Signs	Treatments
Displaced	ETT in right main stem, oropharynx, esophagus	Increased or decreased depth at the lip, unequal breath sounds, distended abdomen	Pull tube back, check placement with laryngoscopy, reintubate if necessary
Obstruction	Mucous plugging, tube biting	Transmitted upper airway sounds, agitation	Deep suctioning, improved sedation
Pneumothorax	Collapsed lung	Decreased breath sounds, shift of mediastinum, JVD	Needle decompression, tube thoracostomy
Equipment failure	Ventilator malfunction or disconnection	Vent may alarm	Disconnect the patient and bag
Stacking	Gas trapping	Extremely high plateau or peak pressures, incomplete return to baseline of flow-versus-time graph	Disconnect and allow for exhale, adjust ventilator settings (pressure control), increase E time, decrease tidal volume, lower PEEP



Cracked

A Review of Basilar Skull Fractures

A 57-year-old intoxicated female presents after a fall from standing height. She denies any headache, vision changes, loss of consciousness, or neck pain, and takes no medications. Vital signs are unremarkable, but on exam she is noted to have left-sided hemotympanum with bloody otorrhea. A CT scan of the head and neck are reported as negative, but on further review of thin slices, a subtle oblique fracture of the left temporal bone is discovered, along with an associated small left temporoparietal subarachnoid hemorrhage (Figure 1; Figure 2). The patient is admitted to the intensive care unit where she develops self-limited vertigo but is later discharged home in stable condition.

Simply stated, a basilar skull fracture refers to any fracture found at the base of the skull. The temporal bone is involved in 75% of cases, but the occipital, sphenoid, and ethmoid bones may also be involved.¹ Temporal bone fractures occur in 18-40% of all skull fractures. They are most common in men between the ages of 21 and 30. This predisposition is not related to any true anatomic differences, but to the greater number of males involved in high-risk activities.² Traumatic cerebrospinal fluid (CSF) leaks occur in 10-30% of basilar skull fractures and most often present as CSF rhinorrhea.³

Cerebrospinal fluid also accumulates in the middle ear space, and can ultimately expectorate through a perforated tympanic membrane and manifest as CSF otorrhea. In the absence of a TM perforation, hemotympanum may be seen on exam.

Cerebrospinal fluid mixed with blood forms the halo sign when allowed to drip onto filter paper. Contrary to traditional teaching, this sign is not specific to CSF, and may result in false-positives.

Ecchymosis over the mastoid process is known as Battle's sign and typically indicates a fracture of the posterior cranial fossa. Purple discoloration around the eyes, also known as "raccoon eyes," can be the result of a fracture to the frontal portion of the skull base. Conductive hearing loss, anosmia, nystagmus, and vomiting after head injury should also raise suspicion of a basilar skull fracture.

Prior to the advent of high-resolution CT (HRCT) scanners, the diagnosis of temporal bone fractures was predominantly clinical. The combination of hemotympanum and bloody otorrhea is 75% more common *with* temporal bone fractures than *without* fracture: for this reason hemotympanum and bloody otorrhea are ominous physical exam findings.

Clinical exam, however, has actually been shown to miss 14-35% of radiographically evident temporal bone fractures.^{2,4,5} Plain films may miss as many as 70-80% of fractures.⁶ Basilar bone fractures (specifically temporal bone fractures)



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may also be missed on initial CT scan of the head. Recent studies have shown that maxillofacial CT and HRCT of the temporal bone are comparable and most suited for the diagnosis of temporal bone fracture.

All patients with basilar skull fractures should be admitted for observation. Management is based on anticipated complications. Most post-traumatic CSF leaks heal with a conservative management of bed rest and head elevation.

The use of prophylactic antibiotics for meningitis is one area of controversy. A large meta-analysis of 1241 patients showed no statistically significant decrease in the incidence of meningitis in patients who were given antibiotics.⁷ However, the incidence of bacterial meningitis rises significantly if the CSF leak persists for more than seven days. Therefore, in such cases, antibiotics may be indicated.⁸ Basilar fractures rarely require surgical repair, but in cases of persistent CSF leak, significant cranial nerve compression, or increased intracranial pressure, operative repair may be indicated.⁶

Maintaining a high index of suspicion for the presence of an epidural hematoma is essential, even if this is not seen on initial imaging studies. Any associated intracranial hemorrhage warrants prompt neurosurgical consultation.

Traumatic facial nerve palsy is another well-known complication of basilar skull fractures. It generally presents two to three days after the injury and should be managed in consultation with an otolaryngologist; glucocorticoids may be beneficial.⁹ Anosmia due to olfactory

Prior to the advent of high-resolution CT scanners (HRCT), the diagnosis of temporal bone fractures was predominantly clinical.

nerve injury has been known to occur in as many as 7% of cases of anterior skull-base fractures. Only 10% of patients with traumatic anosmia are expected to recover their sense of smell, and even then only in a delayed fashion of usually months to years.¹⁰

Central skull base fractures, frequently involving the sphenoid sinus and temporal bone, are associated with vascular complications. The internal carotid and basilar arteries are particularly vulnerable due to their course through the central skull base and cavernous sinus.

Vascular complications include transection, dissection, and pseudoaneurysm formation. Stroke due to arterial dissection is reported in as many as 31% of carotid artery injuries.¹¹ High-risk patients should undergo CT angiography.

Another rare but unique vascular complication associated with central skull-base fractures is formation of a carotid cavernous fistula (CCF). CCF forms as a direct connection between the ICA and the cavernous sinus and can result in exophthalmos, blindness, stroke, and even death.¹²

Conclusion

It is of utmost importance to maintain a high clinical suspicion for temporal bone fracture in patients with traumatic head injuries. When suspected, the appropriate imaging should be ordered and associated injuries should be ruled out. Imaging may include either a maxillofacial CT (if facial trauma is noted) or a CT of the temporal bones (if maxillofacial imaging is not required). CT of the head is not the ideal initial imaging study. Missed fractures or delayed diagnosis can lead to debilitating symptoms for patients and potentially life-threatening complications. ★



Image 1. Small left temporoparietal subarachnoid hemorrhage.

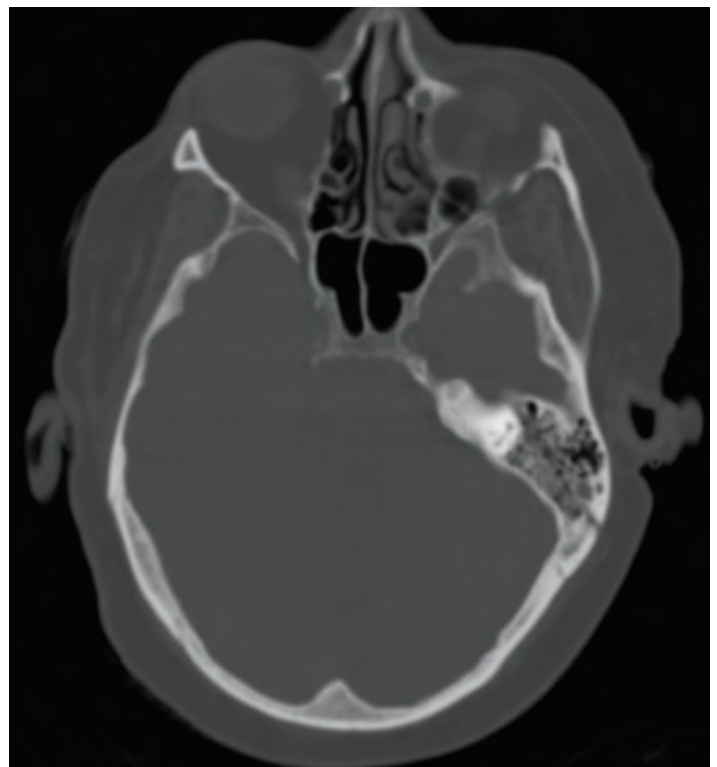


Image 2. Subtle left temporal bone fracture, seen through the mastoid on CT imaging.



Team members construct a flutter valve for a mannequin with a tension pneumothorax.

Wilderness Medicine Races

EDUCATION in the Elements



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“On your mark, get set, go!” My five teammates and I charge up the snow-blanketed hill, venturing into the dense timber of the state park. Armed with our essential survival gear and a topographical map denoting six places where our medical knowledge and improvisational ability would be tried, we navigate to our first destination. On arrival, an emergency medicine physician and medical student present the scenario to our team:

“Your team is hiking along the bluffs of the Iowa River. Your friend peeks over the bluff and slips, falling 12 feet.” We look over the edge of the trail and see a mannequin dressed in winter clothes lying in the snow under a thorny bush....

Like other organizations around the country, the Wilderness Medicine Interest Group at the University of Iowa Carver College of Medicine holds an annual race. The medical scenario-based race is designed for first- and second-year students. Scenarios are written by senior medical students in the interest group with the oversight of EM residents and physicians. The race is held at a state park in January or February when snow, ice, wind, and temperatures below 0° F add elements of adversity to the already challenging medical scenarios. Over the past four years, more than 120 junior students have raced and more than 30 senior students have designed scenarios (*Table 1*). The race aims to integrate the application of pre-clinical knowledge, clinical information, teamwork, improvisation, and triage while introducing students to wilderness medicine (WM).

In recent years, WM races have seen a rapid rise in popularity. The races challenge participants to navigate a course and respond to medical emergencies with only the equipment they are carrying. Races may be locally organized (e.g., by a medical school or emergency medicine department) or managed by

The races challenge participants to navigate a course and respond to medical emergencies with only the equipment they are carrying.

a race organization. Usually, races are designed to simulate medical decision making outside of a traditional hospital setting, to force participants to improvise basic medical equipment, and to solve normally routine problems in an austere environment.¹

MedWAR and SimWars

The largest WM race series is held by the organizers of the Medical Wilderness Adventure Race (MedWAR; www.medwar.org). MedWAR was started in 2000 by two EM physicians, Dr. Michael Caudell and Dr. David Ledrick, at the Medical College of Georgia. Since 2001, these events have spread across the U.S. and Canada, hosted by medical schools, the National Outdoor Leadership School (NOLS), and EM departments.² There are several events scheduled for 2015, with several expansions planned for next year. Typically, MedWAR participants (the majority of whom are medical

professionals) spend half a day on WM didactic education then compete in an eight-hour race that includes various navigational events including canoeing, hiking, ropes courses, and management of various medical scenarios.¹ Teams of EM faculty and residents compete in nearly every MedWAR — often winning against teams of first responders. While many medical students, residents, and physicians have participated in MedWAR races, few hospitals or residencies have incorporated this sort of event into their training programs.

A related event, not specific to WM, is the Simulation Wars (SimWars) competitions held at national conferences. SimWars pits teams from various universities or disciplines against each other in competition to solve medical situations in front of an audience.³ These events are now held at EMRA and SAEM conferences.



A team struggles to start a fire to melt snow during a frostbite scenario.

Table 1. Themes and Scenarios from the 2011-2014 Winter Wilderness Medicine Races at the University of Iowa, Carver College of Medicine

Theme	Scenarios from 2011-2014
<i>Assessment and Stabilization</i>	Water rescue, immobilization and sled transport, triage/reverse triage, intubation, lightning strike, CPR
<i>Soft Tissue Care and Trauma Management</i>	Puncture wound tourniquet, hunting accident, animal attack, laceration preparation and repair, burn management
<i>Orthopedic Injuries</i>	Ski accident compound fracture, ski accident splinting, bicycle wreck splinting
<i>Bites, Stings, and Poisons</i>	Poisonous plants and allergies, poisonous snakes
<i>Infectious Diseases</i>	Microbiology and rehydration, water purification, game meat preparation
<i>Environmental Injuries</i>	Hypothermia, frostbite
<i>Medical Management</i>	High altitude sickness/high altitude pulmonary edema, pregnancy, tension pneumothorax, diabetic ketoacidosis
<i>Survival</i>	Avalanche rescue beacon set up, severe weather recognition, shelter construction, improvised carrier, fire building, compass orienteering

Races as an Educational Method

Races and competitions remain a novel method of training medical students, residents, and faculty. Traditional training methods include didactic education, procedure clinics, and simulations. One of the cornerstones of many educational programs is simulation. The ability for students to learn new skills in a protected, “psychologically safe” learning environment has been demonstrated to be an effective method of medical education;⁴ however, simulation competitions, which are less “safe” may be more realistic in that medical decisions are made under stress and errors have negative consequences.³ Nonetheless, even simulation competitions fail to

replicate the environment in which most WM takes place — the outdoors.⁵ Races could be a more realistic way to train WM students at all skill levels because the race adds a sense of urgency, stresses of battling the elements, difficulty in locating victims in the wilderness, and physical and mental fatigue.

Since 2000, there have been dozens of MedWARs and other WM races, but does a race actually improve participant knowledge or skills? Little research has been done regarding this question. One study, by Drs. Irons and Dery, assessed performance on a complex scenario before and after one MedWAR in 2011.⁶ The authors found that the MedWAR

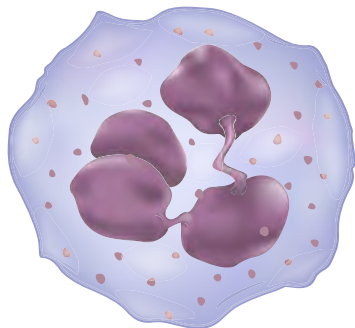
experience significantly improved performance on both the scenario and the written test, indicating that the race may be an “effective teaching platform.” Furthermore, research at the University of Iowa shows improved performance on multiple-choice WM knowledge tests by first- and second-year medical students after completing the race (unpublished data). Further research is warranted to identify whether this educational format is transferrable to real-world situations and patients. In the meantime, races remain an educational alternative to the more traditional classroom setting and a fun way for medical students, residents, and staff physicians to gain practical experience in WM.



...We frantically scramble down the hill, arranging ourselves around the mannequin and firing questions at the scenario proctors. After being given vital signs and the exam, we diagnose the patient with a sucking chest wound and a pneumothorax.

Sifting through our backpack filled with our ten essential items, we splay them across the packed snow. The plastic seal around the box of matches is trimmed into a four-by-four-inch square and tape adhered to all but one corner of the penetrating chest wound, creating an impromptu flutter valve. After a small educational session with the proctors, we glance at the map and snake through the woods to the next scenario. Five more scenarios and kilometers later, we barge into the wood-stove-heated lodge, better known as the finish line. *

THE White COUNT



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A 25-year-old previously healthy male presents with a three-week history of flu-like symptoms, including myalgia, rhinorrhea, mild cough, and subjective fevers. He also complains of vision loss restricted to his right upper visual field for three to four days. He denies weakness, numbness, problems with balance, or shortness of breath. Routine labs are drawn, revealing a WBC count of 306,000/ μ L with more than 90% blasts.

Hyperleukocytosis is arbitrarily defined as a WBC count greater than 100,000/ μ L.¹ Although there are a few conditions that can present with elevated WBCs, hematologic malignancy tends to be the major cause of such an extremely elevated value. Hyperleukocytosis can be from a severe leukemoid reaction, which is when the WBC count is greater than 50,000/ μ L in patients in whom leukemia has been ruled out. This can occur in infections (typically *Clostridium difficile* and disseminated tuberculosis), carcinomas, or severe hemorrhages.² However, as mentioned, WBC counts higher than 100,000 is most prevalent in hematologic malignancies, mainly in acute myeloid leukemia (AML), chronic myeloid leukemia (CML), and acute lymphoblastic leukemia (ALL).³

In order to distinguish between leukemic and non-leukemic causes of hyperleukocytosis, a peripheral blood smear with a manual count should be done in addition to the necessary blood work and imaging. A significant presence of blasts makes a hematologic malignancy more likely. It is important to do a manual count because automated counters can erroneously count nucleated RBCs as leukocytes.⁴

When patients have hyperleukocytosis, they should be evaluated for any signs or symptoms of respiratory distress or neurological symptoms, including headaches, vision changes, confusion, or dizziness. Such clinical findings are indications of leukostasis, an emergent condition in which signs of tissue hypoxia are found. Less common findings can include EKG changes demonstrating a myocardial infarction or right heart strain, renal insufficiency, bowel infarction, and acute limb ischemia.¹

Symptomatic hyperleukocytosis, or leukostasis, occurs when patients with hyperleukocytosis have end-organ damage, most commonly involving the brain or lungs. Leukostasis is a clinical diagnosis and does not correlate to any particular quantity of leukocytes. The increase in blood viscosity from the presence of excessive white blood cells impedes blood flow leading to tissue hypoxia. For this reason, blood transfusions and diuretics must be avoided, as they can further increase the viscosity.

Though any organ can be affected, common causes of early deaths in these cases are intracranial hemorrhage and respiratory failure. Although it is unclear why intracranial hemorrhage is one of the

leading causes of mortality, it is theorized that the increased number of blasts create friction and provoke endothelial damage, subsequently causing hemorrhage.⁵ Leukostasis is more common in AML than ALL, and rarely seen in chronic leukemia.³ The definitive method of management of acute leukemia is induction chemotherapy, which requires prompt referral to a center capable of emergently treating blood cancers. Nevertheless, important management decisions can be made by the emergency physician prior to the admission or transfer of these leukemic patients. In cases of hyperleukocytosis, primary workup should include checking a complete blood count, complete metabolic panel, coagulation studies, a chest X-ray, an EKG, and a urine analysis to evaluate for any end-organ damage from tissue hypoxia.

Two major diseases that should be considered in any patient with hyperleukocytosis are tumor lysis syndrome (TLS) and disseminated intravascular coagulation (DIC). TLS can occur in any hematologic malignancy, even prior to treatment (though less commonly so) if cell turnover is high enough. DIC can occur with acute promyelocytic leukemia and can lead to bleeding and thrombotic complications.⁶ Thus, it is important to check the uric acid,

LDH, and phosphorus levels for TLS, along with fibrinogen levels and fibrin split products for DIC.

Tumor lysis syndrome is a phenomenon that occurs due to the destruction of malignant cells. As these cells are lysed, the cellular contents, including potassium, phosphorus, and nucleic acids, are released into the systemic circulation. Purines, a nucleic acid breakdown product, are metabolized into uric acid, which is detectable in serum. As the levels of these metabolites continue to increase, they cause various toxic effects,

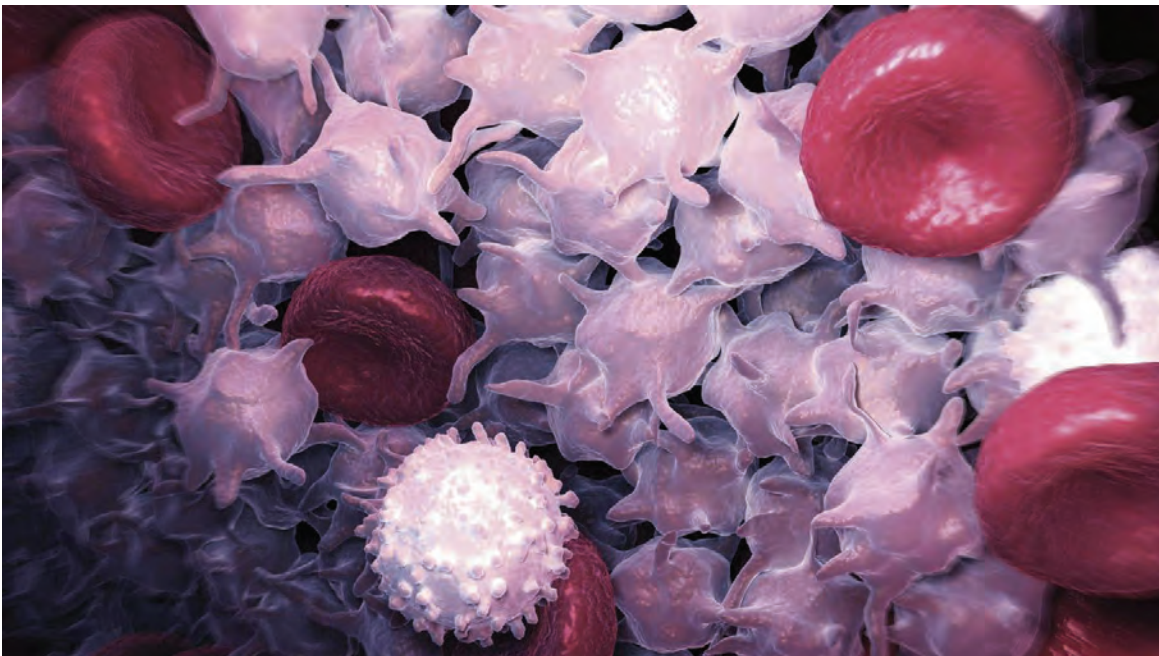
Once the initial clinical assessment is completed and prophylactic medications are administered, there are some preemptive measures that can be done acutely to prevent further complications. Prior to initiating chemotherapy, the WBC is typically lowered in order to decrease the potential for tumor lysis syndrome. Aggressive hydration is initiated primarily. It is recommended that maintenance fluids, preferably without potassium or calcium, be started at two to four times the normal rate depending on the severity of the WBC count.⁴

hydration.¹¹ Centers that use leukapheresis will generally continue therapy until the WBC count is reduced to approximately 50,000/ μL .¹²

The patient in this case had leukostasis resulting in visual changes. He received both hydroxyurea and two rounds of leukapheresis while he was awaiting formal diagnosis of his disease from a bone marrow biopsy. These therapies lowered his WBC count to 58,000/ μL within the first 24 hours and his visual symptoms resolved. His initial uric acid level was 8.0 mg/dL and his LDH was

ETIOLOGY AND MANAGEMENT

Acute Hyperleukocytosis and Leukostasis

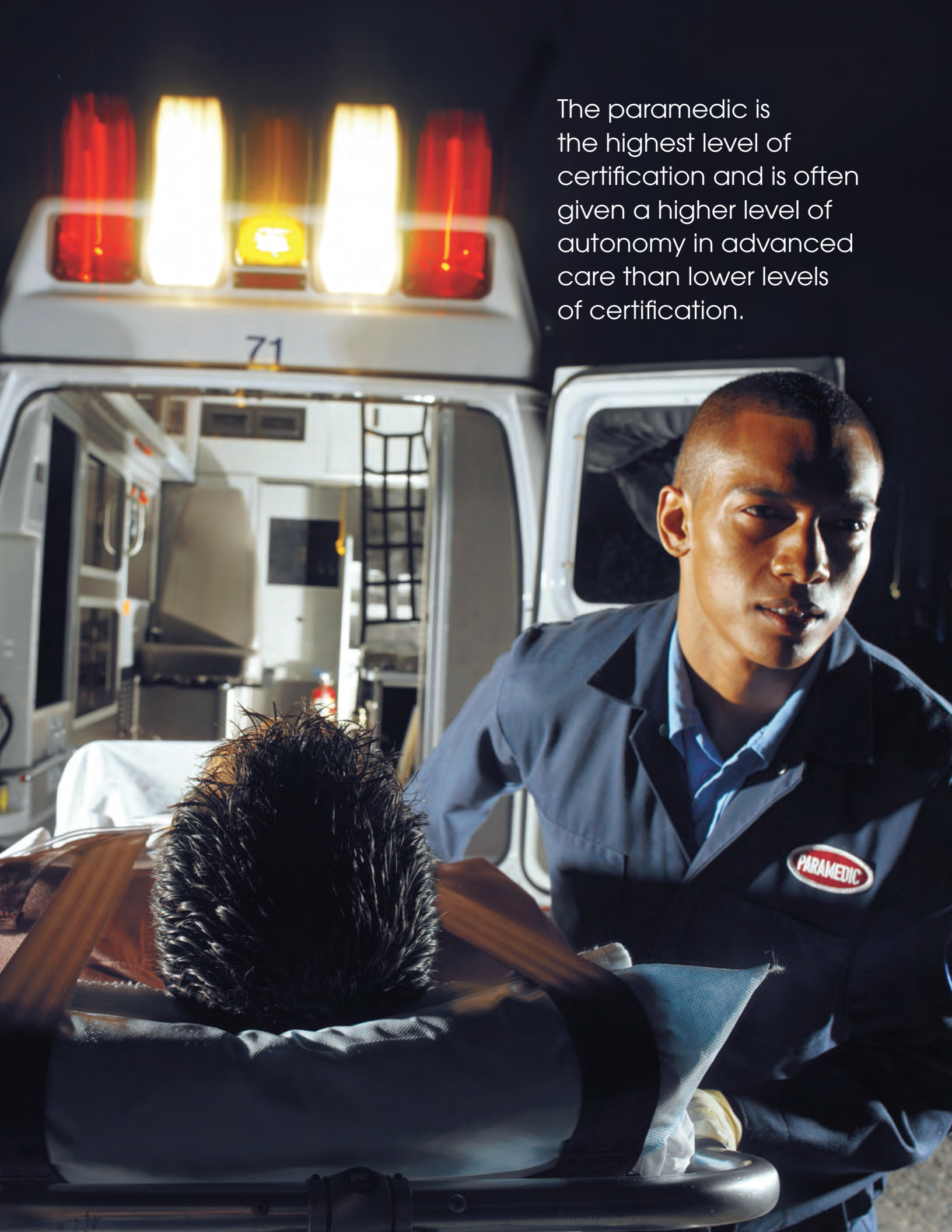


The definitive method of management of acute leukemia is induction chemotherapy, which requires prompt referral to a center capable of emergently treating blood cancers.

including heart failure, acute kidney injury, muscle cramps, tetany, and seizures. Due to the severe consequences of this phenomenon, early detection and monitoring is critical. Allopurinol in combination with intravenous fluids should be given immediately in patients with hyperleukocytosis due to a suspected leukemia as prophylaxis for TLS.⁷ Rasburicase can be given if the uric acid level is increased.⁸

Rapid leukocytoreduction can be accomplished by both leukapheresis and hydroxyurea. There is divergent data on leukapheresis, with some studies showing an early mortality benefit,^{9,10} while others show no mortality benefit. Decisions on whether to initiate leukapheresis are center-specific. Some studies suggest that if leukostasis is not a concern, then leukapheresis can be delayed and leukocytoreduction can be achieved chemically with hydroxyurea and

3,506 units/L. He was given a dose of rasburicase due to early tumor lysis syndrome and was started on allopurinol. He was subsequently diagnosed with AML and received induction chemotherapy. This patient's presentation was relatively mild given his severe hyperleukocytosis. It is critically important in patients with hyperleukocytosis to do a thorough evaluation and to consider all of the potential sequelae that can occur. ★



The paramedic is the highest level of certification and is often given a higher level of autonomy in advanced care than lower levels of certification.

A Quick and Dirty Guide

EMS



Information Every Physician Should Know

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The world of EMS represents a mosaic of different systems and practices that share a common goal.

If the emergency department had a mouth, it would undoubtedly be the doors that open to the ambulance bays. Spend five minutes with a triage nurse and you'll be able to appreciate the insatiable appetite that the ED has. To those who have not worked in the pre-hospital environment, the flow of these patients is often taken for granted. In reality, it is the endpoint of a well-orchestrated system that functions to deliver sick patients from the environment to definitive care.

Emergency medical services, or EMS, is a branch of first responders concerned with medical treatment in the pre-hospital environment. The individuals who operate the ambulance, namely paramedics and emergency medical technicians (EMTs), vary in their scope of care depending on their level of certification and area of operation. While there are regional differences, the National Registry of EMTs certifies four levels of care.

Certification Levels

Formerly called a "certified first responder," the emergency medical responder (EMR) is an entry-level certification in EMS that is often possessed by police and firefighters. The 40- to 60-hour course teaches CPR, basic first aid, and patient assessment. The EMT is the next step up and provides basic life support certification, including the ability to administer oxygen. Whereas the EMR cannot independently transport patients, the EMT can. Above EMT is the advanced EMT (AEMT), whose skill sets are expanded to include low-risk, high-benefit interventions, including intravenous access, cardiac monitoring, and advanced airways. Several variants of the AEMT may exist locally, including the EMT-critical care in New York. Attempts at consolidating the different certifications under the umbrella of "AEMT" are underway. Finally, the paramedic is the highest level of certification and is often given a higher level of autonomy

in advanced care than lower levels of certification.

Variants of paramedic may be seen, including critical-care paramedics, rescue paramedics, and hazardous materials paramedics, whose scope of practice may be expanded under the authorization of an agency's medical director.

Critical care paramedics often engage in emergent transports between facilities, and may have the training to use ventilators, intra-aortic balloon pumps, medication pumps, and other complex equipment. Rescue medics are frequently trained as integral members of a technical rescue team and may have expanded protocols to address issues arising in austere environments. Hazardous materials paramedics may have an expanded formulary to address toxic exposures that would otherwise be rare to other paramedics. Ultimately, the care rendered by an agency is dependent on state and local protocols and medical director authorization.

EMERGENCY MEDICAL SERVICES

The level of autonomy of EMS providers is often misunderstood by physicians, who do not understand the overarching nature of treatment protocols in the practice of pre-hospital providers. For this reason, it is always appropriate for emergency medicine physicians to familiarize themselves with the regional certification levels and treatment protocols. These are usually available from the local regional EMS council (REMSCO).

Agency Types

Emergency medicine service agencies exist in a number of different flavors, including hospital-based, fire- and police-based, volunteer, private companies, and others. The interplay of these agencies has much to do with the type of patients that they bring into the ED. In many places, private

companies and hospital-based companies are more engaged in non-emergent transport of patients between health care facilities and residences, while in other communities these same agencies may dominate the 911 environment. Some fire departments endorse EMS, while others do not. Volunteer agencies, including fire departments and volunteer ambulance corps (VACs), provide a substantial amount of manpower and equipment that is often underappreciated. It is important to recognize that volunteer providers require the same training and certification as paid technicians. Once again, **familiarization with the role that each of these agencies plays in the community can be helpful in understanding the EMS climate.** For example, in New York City, the

pre-hospital environment is dominated by the Fire Department of New York. In order to manage the abundance of calls that occur daily, the FDNY certifies other agencies as “911-Participating Members,” and encourages the use of the FDNY communication systems and protocols.

Physicians in EMS

The physician’s role in EMS can be significant. Physicians may be involved in the training of pre-hospital personnel, especially when they are used in internal training programs for hospital systems or when they are used to provide CME units for regional EMS providers. Every EMS agency also requires a physician medical director who is responsible for guidance and oversight and who has the capacity to approve and extend protocols. Emergency department physicians may also be called on to provide on-line medical direction (“medical control”) to medics in the field who are requesting certain interventions. In these cases, the **paramedics are protected by the treatment decisions made by the physician.**

Some systems employ physicians in first-response vehicles to assist providers with on-scene care. Physicians may also sit on a regional emergency medical advisory committee (REMAC) that helps govern the practice of pre-hospital emergency care in the region.

While many physicians express interest in riding in ambulances regularly, there is neither a consensus nor a national policy statement addressing certification, training requirements, or protection from liability for physicians wishing to work as paramedics. Frequently, these issues need to be addressed at a local level, taking into consideration insurance coverage and regional policies and procedures. It may be appropriate to contact the REMSCO or REMAC for direction.

Ultimately, the world of EMS represents a mosaic of different systems and practices that share a common goal. Emergency medicine physicians can substantially improve relations with these providers by gaining an understanding of the construct in which they work. Through this kind of communication and teamwork, we can ensure compassionate, efficacious, and longitudinal care for our patients. ★

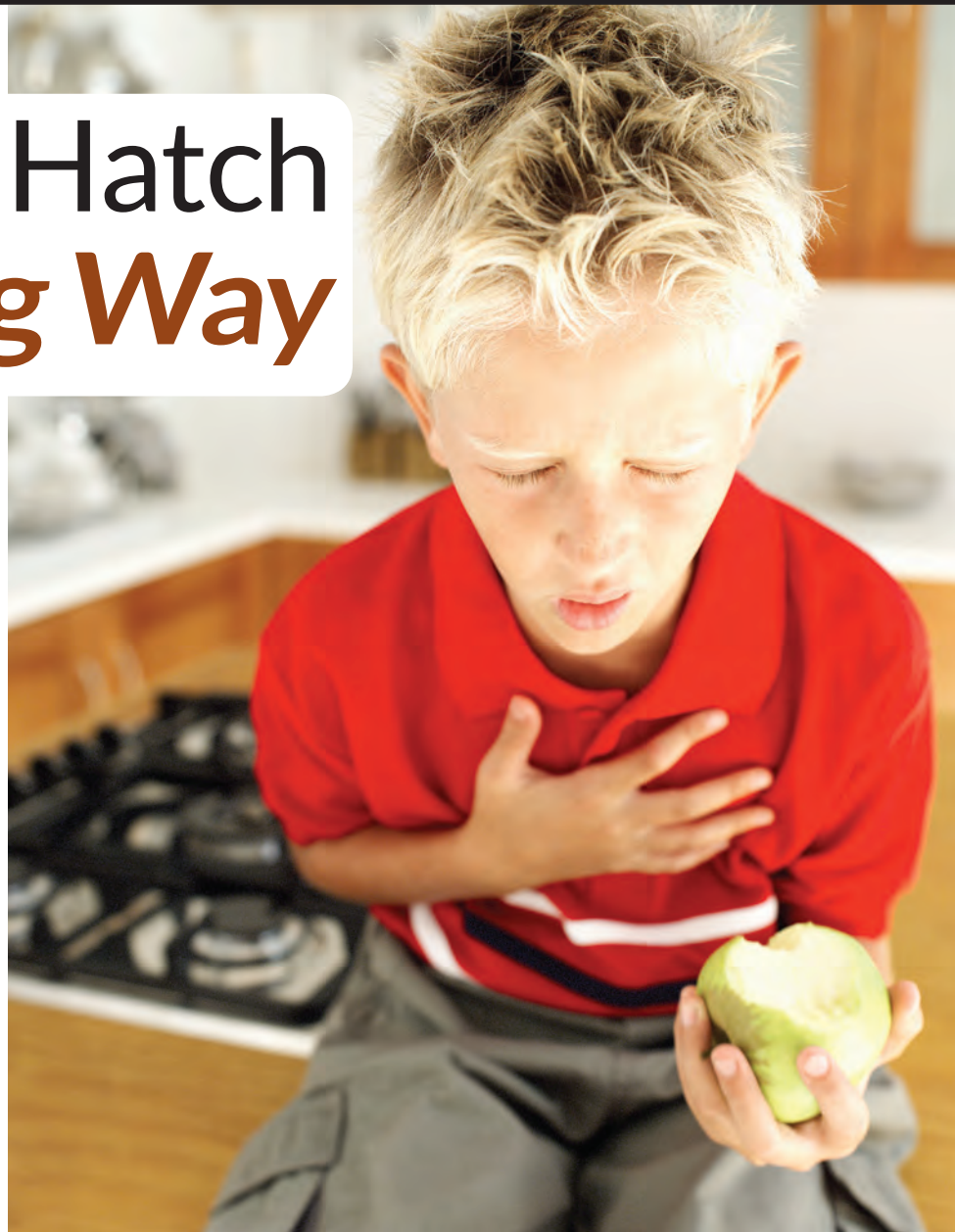
Critical care paramedics often engage in emergent transports between facilities and may have the training to use ventilators, intra-aortic balloon pumps, medication pumps, and other complex equipment.



Down the Hatch the *Wrong Way*

Foreign-Body Aspiration: A Pediatric Airway Emergency

The longer a foreign-body aspiration goes undiagnosed, the more likely there will be secondary complications.



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Foreign-body aspirations are potential life-threatening emergencies and are the leading causes of unintentional injury in children less than one year old.^{1,2} Infants and toddlers are particularly at risk for several reasons: they explore their world by placing objects in their mouths, they are very playful and active when eating, and they do not have developed dentition in order to chew food properly. Delayed diagnosis at any age can lead to significant morbidity and mortality. **In the United States in 2007 alone, there were 3,700 deaths related to aspiration or ingestion of food or other objects** ultimately causing airway obstruction.³ Suspected foreign-body aspiration in a child with respiratory symptoms requires immediate medical evaluation.

Commonly aspirated foods by infants and toddlers include peanuts, sunflower seeds, carrots, raisins, grapes, and hot dogs. In preschoolers, nonfood items such as coins, paper clips, pins, and pen caps are more commonly aspirated.³

Presentation

Patients presenting with a foreign body aspiration are often stable. Nonetheless, a sudden onset of coughing and choking in an otherwise healthy child is highly suspicious for aspiration. Symptoms at presentation include cough, stridor, dyspnea, stupor, cyanosis, and respiratory arrest.⁴ The classic triad of new-onset cough, wheezing, and asymmetric breath sounds is only seen in 16-40% of cases and is neither sensitive nor specific for foreign-body aspiration.^{2,4-6} In general, patients

Table 1. Location incidence of aspirated foreign bodies in children.

Location of Aspirated Foreign Body	Percentage Found
Larynx	3%
Trachea/carina	13%
Right lung	60% (52% main bronchus)
Left lung	23% (18% main bronchus)
Bilateral	2%

Adapted from Eren, et al.

with tracheal foreign bodies present with dyspnea and are more easily diagnosed. Bronchial foreign bodies, which account for 80-90% of aspirations, are more likely to cause decreased breath sounds, and children usually have a delayed diagnosis (*Table 1*).⁷ Partial or insignificant obstructions can make the diagnosis difficult and are often misdiagnosed as URIs, bronchiolitis, pneumonia, or asthma. In a child with chronic cough, recurrent pneumonias, persistent croup, or “asthma” that fails standard medical therapy, one should always have “retained foreign body” on the differential diagnosis.

Evaluation

Chest radiographs are usually the first diagnostic study ordered and can be helpful to confirm the diagnosis of foreign body, but they cannot be used to exclude the diagnosis. The majority of foreign bodies aspirated are radiolucent — chest radiographs are normal in more than 50% of tracheal foreign bodies and 25% are normal in bronchial foreign

Bronchial foreign bodies, which account for 80-90% of aspirations, are more likely to cause decreased breath sounds, and children usually have a delayed diagnosis.

bodies.^{2,4,6} End-inspiratory and end-expiratory films can be helpful in the older or more cooperative child. Decubitus radiographs are of little diagnostic value.⁸ There are several secondary signs on chest radiograph that can be seen with aspiration (*Table 2*).² Fluoroscopy and CT have also been used as alternatives for diagnosis, with CT sensitivity reaching 100%.^{2,5} However, if clinically suspected, a foreign body aspiration must be ruled out by bronchoscopy.

Management

Children with respiratory distress require immediate intervention and basic life support measures to ensure airway, breathing, and circulation are intact. Blind sweeping of the mouth is not recommended. Infants require back blows and chest compressions, and children older than one year require abdominal thrusts. In severe cases of complete airway obstruction, direct laryngoscopy and foreign body removal with Magill forceps should be attempted emergently. If the foreign body is not visualized, endotracheal intubation should be performed, which will potentially dislodge the foreign body and move it more distally. In the rare cases

in which the patient cannot be ventilated after the measures above, needle cricothyroidotomy can be a temporizing life-saving procedure.⁴

Those patients without complete airway obstruction or severe respiratory distress should be placed in a quiet room in a position of comfort until rigid bronchoscopy can diagnose and relieve the obstruction. **Bronchoscopy should be performed if foreign body aspiration is suspected, even if radiographic studies are normal.** This should be performed under general anesthesia in a controlled setting such as the operating room. Depending on the institution, bronchoscopy can be performed by an otolaryngologist, pulmonologist, or surgeon. Bronchoscopy complication rates are very low, ranging between 1-10% and the majority of patients are discharged within 24 hours of the procedure.^{2,5,6,9}

Complications

The longer a foreign body aspiration goes undiagnosed, the more likely there will be secondary complications. Most common complications include atelectasis, bronchiectasis, and post-obstructive pneumonia. Airway granulomas, bronchoesophageal fistula, and pneumothorax are much less common.^{3,5,9}

Conclusion

Foreign body aspirations account for several thousand emergency department visits annually.^{1,2} Timely diagnosis is critical, and current management algorithms are clear and well established. Educational and legislative efforts have been effective intervention strategies promoting prevention of this common pediatric emergency.³ Foreign-body aspiration is a fully preventable event, and age-specific anticipatory guidance should be reviewed with caregivers when appropriate. ★

Table 2. Characteristics of subsets of airway obstruction.

Type of Obstruction	Physiology of Obstruction	Radiographic Findings
Bypass valve	Partial obstruction of inspiration and expiration; there is aeration beyond the obstruction, even if diminished	Normal
Check valve	Air entry on inhalation, but little air escape on expiration	Hyperinflation of the affected lung
Ball valve	Partial obstruction in which the object intermittently prolapses	Mediastinal shift toward involved lung and early atelectasis and collapse
Stop valve	Complete bronchial obstruction with no aeration on inspiration or expiration	Consolidation of the involved segment with possible collapse

Adapted from Srivastava, et al.



THE STATE OF DISASTER



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A REVIEW OF U.S. DISASTER PREPAREDNESS PROGRAMS

This fall, the first cases of Ebola were diagnosed and treated in the United States. Although the spread of this disease fell far short of the disaster movie scenario envisioned by many, the impact of this potential catastrophe was significant. It turned the attention of many in medicine and health policy to the issue of disaster preparedness. Specifically, the case of Thomas Eric Duncan in Dallas raised many questions about how emergency departments prepare for potential public health crises. **As members of the front line for public health, how do we prepare for the unexpected?** And what role does federal policy play in our ability

to be prepared for the next crisis, whether it is an emerging infectious disease, mass shooting, or act of terrorism?

One of the most important programs that helps hospitals and EDs to be prepared is the Hospital Preparedness Program (HPP). This program is administered under the Department of Health and Human Services, specifically the Office of the Assistant Secretary for Preparedness and Response. It was created following the terrorist attacks of 2001 as a way to prepare hospitals in the event of a large-scale terrorist or bioterrorist attack. Today, it aims to “improve surge capacity and enhance community and

hospital preparedness for public health emergencies.”¹

In order to achieve this goal, the program funds local and state efforts in areas of planning and coordination, along with disaster drills among first responders and others who are vital to the disaster response. Examples of drills that have been awarded grants in the past include natural disasters, active shooters, and mass-casualty incidents.

Despite the importance of this work, the HPP has suffered from budget cuts in recent years. **Due in part to political disagreements, sequestration, and compromises over other issues,**

the 2014 funding for the HPP was approximately half that of 2003.^{2,3}

ACEP and others have urged Congress to provide funding for this program at the previously approved levels so that this important work can continue.³

Another critical aspect of disaster preparedness is the regionalization of emergency and trauma care. A 2006 Institute of Medicine report provided a harsh assessment of emergency preparedness, noting that care is “highly fragmented” and “very poorly prepared” for public health emergencies.⁴ As a means of addressing this critical problem, the Affordable Care Act (ACA) authorized the creation of programs designed to tackle these challenges through grants for innovative solutions to these problems and support for rural emergency systems. As described above, however, the existence of a program is not the same as full funding of the program. In a time of budget cuts and struggles over every aspect of the ACA, the continued funding of these critical programs remains in doubt. As a consequence of the political conflicts and standoffs that characterized the most

recent Congress, passage of a bill that would have provided continued funding for these programs languished in the Senate for much of 2014.⁵ ACEP supported passage of this bill and urged members of the Senate Appropriations Committee to vote on the bill.³

As the unexpected emergence of Ebola reminded us, one of the most frightening components of public health disasters is unpredictability. Emergency physicians are a crucial part of the early response to any disaster. Funding for programs that will better prepare us and the systems in which we work are integral to our ability to respond to these crises. Although it is easy to forget the importance of these programs and policies in the face of so many other more controversial areas of health policy, it is important that we support their continued funding so we have the training and resources to be prepared for anything.

Health policy affects all aspects of emergency medicine. Want to learn more about current health policy issues and what you can do to effect change? Register for the ACEP 911 Legislative Network to get

weekly e-mail updates from Capitol Hill with advocacy action plans. You can also join us in Washington, DC, each May for ACEP’s annual Legislative Advocacy Conference and Leadership Summit to directly campaign for change among your elected representatives. For more information, please contact the EMRA Health Policy Committee at healthpolicycte@emra.org.

Policy Pearls

- As emergency physicians, we are on the front lines for unexpected disasters and public health crises, from emerging infectious diseases to terrorist attacks.
- The federal government funds a significant amount of preparedness activities, through programs such as the Hospital Preparedness Program and the regionalization of emergency care.
- When there is no active crisis, the importance of these programs can be forgotten and funding is often significantly reduced.
- It is important to recognize the value of these programs and advocate for their importance so that we can be prepared for the unexpected. ★

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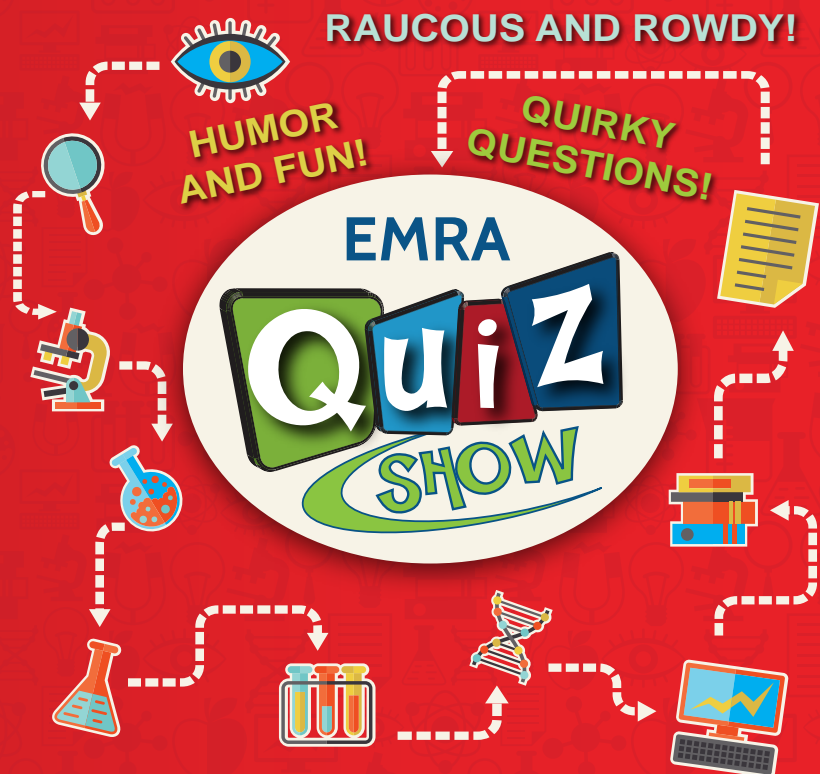
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Unconventional EMBOLISMS

A 26-year-old female presents to your ED with four days of fever, shortness of breath (SOB), cough, and substernal chest pain. In two previous visits over the same time, she was diagnosed with a URI and discharged. Her vitals on presentation are: BP 136/80, P 90, R 19, T 98.3, O₂ Sat 88% on RA, but improving to 96% on 3LNC. A chest X-ray shows diffuse bilateral pleural effusions (Image 1), acutely changed from the X-ray she'd received at her visit two days earlier (Image 2). On reassessment, she is noted to be tachypnic with a respiratory rate of 34 breaths per minute and desating to 83% when taken off O₂. Further history reveals that, just prior to the onset of her symptoms, she'd had "her hips done," referring to gluteal injections received at an unlicensed beauty shop five days earlier.



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Her symptoms began with a dry cough and SOB within hours of the procedure. A CT scan of the chest (Image 3) shows findings concerning for an embolism. She is admitted to the ICU and later intubated for worsening respiratory distress. Bronchoscopy the next day demonstrates frank alveolar hemorrhage, consistent with the diagnosis of silicon embolism. After a four-day ICU stay, she is successfully extubated and discharged home on a steroid taper.

Most residents are very familiar with pulmonary embolisms (PEs), as they are a commonly seen condition in the emergency department. The presentation can vary on a wide spectrum of severity ranging from relatively mild symptoms to cardiovascular compromise, respiratory failure, and cardiac arrest. While the most common type of embolisms seen in emergency departments are due to inappropriate activation of the clotting cascade leading to a deep vein thrombosis with subsequent embolization to the pulmonary vessels, there are other types of emboli that can also occur. What makes treating this other type of emboli so tricky is that unlike traditional PEs, they are not the result of coagulopathy and cannot be treated with blood thinners like lovenox or heparin. Taking a thorough history is crucial to making the right diagnosis and starting the appropriate treatment.

Silicon Embolism

As the incidence of cosmetic procedures has increased, so has the incidence of silicon emboli. Silicon is touted as ideal for cosmetic surgery because it is chemically

inert, thermally stable, and causes minimal tissue reactivity. However, complications can arise, particularly when procedures are performed by those unfamiliar with the potential risks.¹ As early as the 1980s, clinicians began documenting cases of patients developing respiratory compromise after cosmetic procedures involving silicon injection.² Silicon emboli usually occur in the setting of such procedures, although more commonly in procedures where silicon is injected directly into the subcutaneous tissue, rather than as part of a prosthesis or implant.³ Like most PEs, silicon embolisms can present with a range of severity, from mild chest pain to hypoxia. The typical presenting symptoms include hypoxemia, fever, and a petichial rash.⁴ Alveolar hemorrhage is commonly reported

in more severe cases, and neurologic dysfunction can be present in as many as one-third of all patients. The presence of neurologic symptoms — such as confusion, altered mental status, or seizure — is a poor prognostic indicator and is associated with rapid decline and up to 100% mortality.⁵

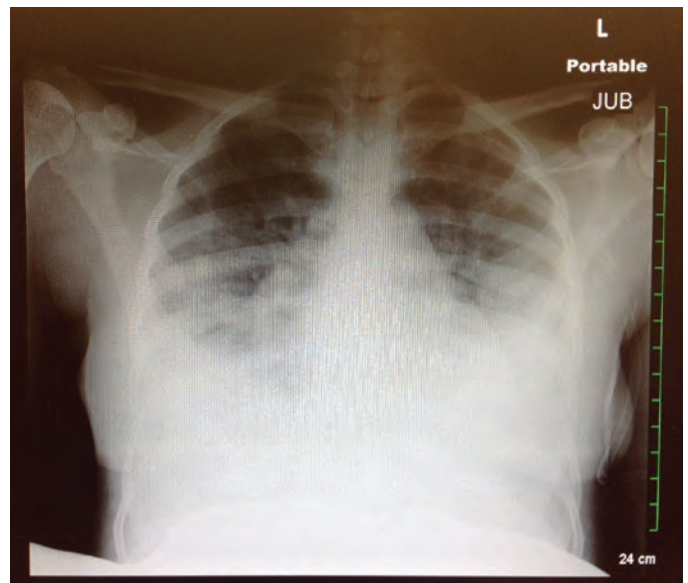


Image 1. Chest X-ray showing signs suspicious for bilateral pleural effusions.

Diagnosis. The diagnosis of a silicon embolism must be made within historical context (typically a recent cosmetic procedure) and requires CT imaging.⁴ It is important to note that bronchoscopy almost never demonstrates the presence of silicon particles in the lungs and is usually only significant for frank hemorrhage. The absence of foreign matter in the bronchiolar aspirate does not exclude the diagnosis of silicon embolism.¹

Treatment. Treatment for silicon embolism syndrome is largely supportive.⁴ Steroids are frequently given to decrease airway inflammation, although evidence to support this practice is largely anecdotal. Patients may need intubation and ventilator support if symptoms are severe. Patients with silicon emboli should *not* receive anticoagulation. Inappropriately anticoagulating these patients carries the potential for disaster as it may worsen alveolar hemorrhage and cause an acute decline in respiratory function.

Fat Embolism

A fat embolism typically presents with the triad of hypoxemia, petichial rash, and neurologic abnormalities.⁶ Fat emboli are associated with fractures of the pelvis and long bones, occurring more frequently in closed fractures than in open ones.⁴ The exact pathogenesis is unknown, but the two prevailing theories are that they are either the result of traumatic disruption of fat globules from the bone marrow into the blood stream or from the formation of toxic intermediates during degradation of intravascular lipids.⁶ Whatever the cause, symptoms usually begin 24 to 72 hours after the inciting event.⁷ Neurologic symptoms may range from confusion and altered mental status to seizures. However, unlike patients with a silicon embolism, neurologic symptoms in patients with fat embolisms carry no increased mortality and are usually fully reversible.⁸

Diagnosis. Like silicon embolism, the diagnosis of fat embolism is made by the presentation of hypoxia with CT findings suggestive of PE in the appropriate clinical setting. A peticheal rash is said to be pathoneumonic of fat embolism, but because the rash occurs in less than 50% of patients, most patients will just present with hypoxia or respiratory distress. Bronchoscopy may or may not show fat particles in the lungs, but it is not considered necessary for the diagnosis.⁴

Treatment. The treatment for fat embolism syndrome is supportive. Again, steroids may be considered for airway inflammation, but there is limited data to support this practice.⁴ Most patients with fat embolisms will recover fully. Just as in the patients with silicon embolism syndrome, there is no role for anticoagulation in these patients.

Conclusion

When evaluating a patient for a potential pulmonary embolism, it is crucial to consider the circumstances under which they present. Always be sure to take a thorough history of the events leading up to the onset of their symptoms, ask about recent cosmetic procedures, and be mindful of any patient with a recent fracture who complains of shortness of breath. Making the correct diagnosis is vital in these patients, as inappropriate anticoagulation may have disastrous consequences. ★

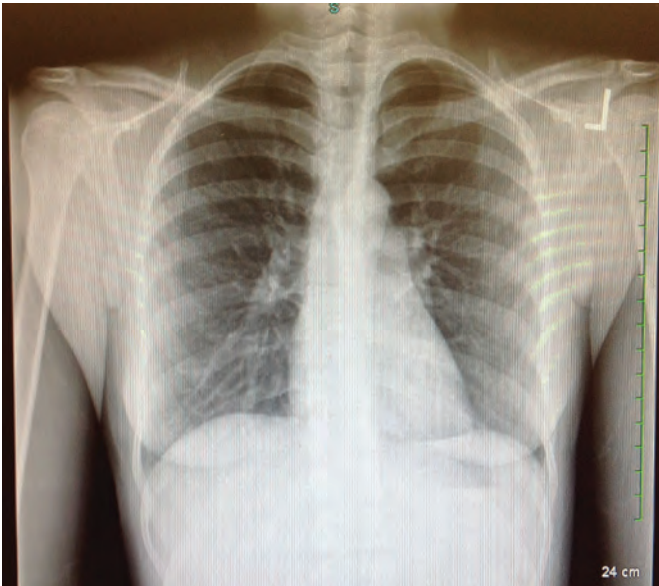


Image 2. The same patient's chest X-ray from a few days earlier.

Anticoagulating these patients carries the potential for disaster.



Image 3. A sagittal view of the CT scan showing findings consistent with an embolism (white arrow).

Uncomfortably Numb

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Case Scenario

You are in the middle of a busy shift when you receive a pre-hospital call that EMS is 15 minutes out with an active cardiac arrest. The patient is a 45-year-old woman who was being prepped for a shoulder procedure at an outpatient surgery center. She received a brachial plexus nerve block with lidocaine and shortly thereafter developed generalized seizures. She then became hypotensive and progressed to asystole arrest. As you prepare for the patient's arrival, you remember hearing about lipid emulsion therapy for local anesthetic systemic toxicity and wonder if there is any utility for it in this case.

Local
anesthetic
systemic
toxicity and
treatment



Local anesthetics are routinely used in the emergency department and elsewhere for acute pain relief. Common applications include preparing a wound for suturing, as nerve blocks, and using topical creams for IV placement. Local anesthetic systemic toxicity (LAST) is an uncommon, but very real, complication of anesthetic use and can result in significant patient morbidity and mortality.¹ It is important to be familiar with the clinical presentation and treatment of LAST.

Clinical Presentation

A local anesthetic's desired effects are achieved by inhibiting pain-sensing peripheral nerve fibers through a blockade of intracellular sodium channels. This inhibits neuron firing and prevents pain signals from reaching the brain. However, as serum concentrations rise, the sodium channel blockade will also start to alter nerve conduction of other organ systems,

specifically the myocardium and brain. **CNS excitation-related symptoms will occur first as the anesthetics block CNS inhibitory pathways.**

Neurological symptoms include the sense of a metallic taste, oral or tongue numbness, tinnitus, lightheadedness, dizziness, visual and auditory disturbances, and disorientation. This spectrum can progress and lead to muscle spasms, tremors, and even generalized tonic-clonic seizures. **Eventually, severe toxicity will cause CNS depression, producing coma and respiratory arrest.**^{2,3} While a typical pattern has been described (*Figure 1*), in reality, the actual clinical presentation can be highly variable and can occur anywhere from seconds to minutes after anesthetic injection.³

Cardiac toxicity is generally the most feared complication of LAST and is typically preceded by CNS symptoms. Similar to CNS toxicity, cardiac toxicity

results predominantly from the binding and inhibition of sodium channels by local anesthetics, although several other proposed mechanisms have been described.⁴ **Undesirable effects on cardiac conduction and inotropy can result in arrhythmias, shock, and ultimately cardiovascular collapse.** Of note, while both lidocaine and bupivacaine can cause systemic toxicity, bupivacaine appears to be significantly more cardiotoxic.²

Table 1. Other overdoses commonly treated with lipid emulsion therapy⁶

Tricyclic antidepressants
Beta-blockers
Calcium channel blockers
Lamotrigine
Olanzapine
Bupropion

Treatment

As in most toxic states, providing good supportive and critical care to the patient is imperative in LAST. Securing the airway to prevent hypoxia is the highest priority. LAST-related seizures and cardiac arrests can be prolonged, but still have favorable neurological outcome. Therefore, airway management is vital.

Benzodiazepines are the first line against seizures seen in LAST. Propofol can be used cautiously as a second-line agent in treating local anesthetic-related seizures, though it should not be used in any patient who is also exhibiting cardiovascular instability, as this agent may potentiate LAST cardiotoxicity. Despite the potential benefits of lipid infusions in these patients, propofol does not contain enough lipid content to provide a benefit over the potential risk of further cardiac toxicity. **Controlling seizures and preventing hypoxia should be a top priority,** however, as any state promoting acidosis will reduce intravascular protein binding of the drug in toxic states and increase the risk of cardiac events.

Sodium bicarbonate has been used to both support sodium channel function and to counteract acidosis, though literature on its use in this setting is lacking. Patients with hypotension are frequently refractory to fluids, and often require vasopressors. If epinephrine is used as a pressor, smaller than typical doses should be administered because in high doses it can adversely

work to impair resuscitation efforts and reduce the efficacy of lipid rescue. While all of these interventions may be life-saving, they may not be enough in severe anesthetic toxicity.^{2,3,4}

Lipid Emulsion Therapy

Lipid emulsion therapy is a treatment option that has continued to gain momentum over the last several years. There has been an increasing amount of evidence that has shown its benefit in treating local anesthetic systemic toxicity. The concept behind this mechanism is commonly referred to as the “lipid sink.” **Intra-arterial lipids rapidly bind the lipophilic anesthetic, and extract it from the target tissues.** Dosing with lipid therapy begins with a 20% lipid emulsion at a rate of 1.5 mL/kg (lean body mass) for the initial bolus, followed by 0.25 mL/kg/min for 30 to 60 minutes.⁵ The bolus can be repeated one to two times as needed for persistent cardiovascular collapse or asystole. The infusion rate may be doubled if blood pressure declines or remains low.⁶

Despite the potential promising effects of lipid emulsions, randomized and nonrandomized control trials are still lacking regarding its use. Most of the data is anecdotal and comes from case reports or animal studies. While all of these resources have significant limitations, more and more physicians are continuing to have success with lipid emulsion therapy and the risk of harm with treatment is

Figure 1. The progression of symptoms in lidocaine toxicity.

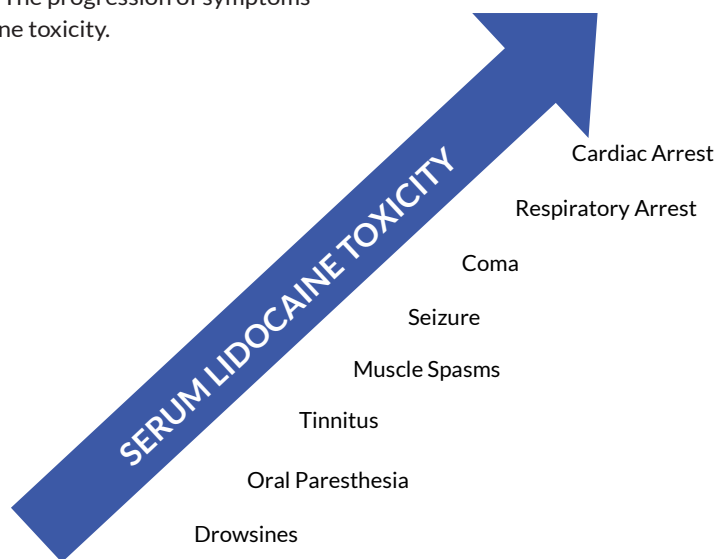


Table 2. Recommended dosing for common local anesthetics⁹

Lidocaine	4mg/mL
Lidocaine w/ epinephrine	7mg/mL
Bupivacaine	1.5mg/mL
Bupivacaine w/ epinephrine	3mg/mL

very low. The American College of Medical Toxicology (ACMT) guidelines state that lipid emulsion therapy is a reasonable treatment consideration.⁷ The American Society of Regional Anesthesia and Pain Medicine guidelines recommend considering it in the treatment of LAST as soon as the airway is secured.⁴ The majority of literature describing the benefits of lipid emulsion therapy is in treatment of local anesthetic toxicity; however, there are many case reports describing its success in other toxicity states as well (*Table 1*).^{6,8} While most of these drugs differ in their mechanisms of action, their lipophilic nature could explain why lipid emulsion therapy has had some success. In the severely local anesthetic toxic patient in which lipid emulsion therapy either is not available or does not work, cardiopulmonary bypass by extracorporeal membrane oxygenation (ECMO) should be considered.

Prevention

While knowing how to treat LAST is beneficial, its prevention is key. Systemic toxicity can occur in several ways, the most common being direct injection of the anesthetic into an artery. Ultrasound-guided injections can help visualize any nearby blood vessels to prevent unintended intra-arterial administration. Incremental injections of three to five mL at a time and routine aspiration prior to injection can also further prevent LAST.⁴ It is essential to be aware of the dosing for local anesthetics (*Table 2*),⁹ as toxicity can occur from injecting a large dose or from multiple injections at a therapeutic dose.²

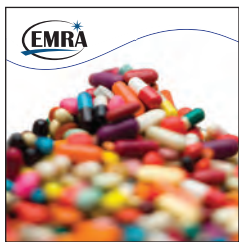
Case Resolution

After consulting your toxicologist, a lipid emulsion therapy is made to be ready at bedside when the patient arrives. The patient receives the dose of lipids within minutes of arrival and quickly has return of spontaneous circulation. Despite the prolonged resuscitation, the patient has a favorable neurological outcome. ★



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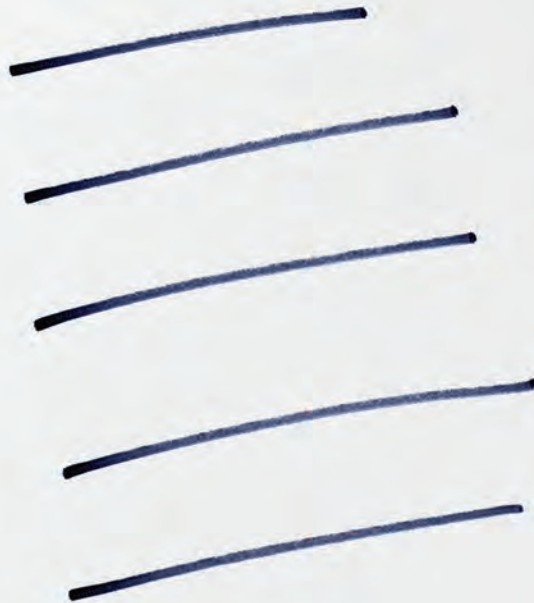
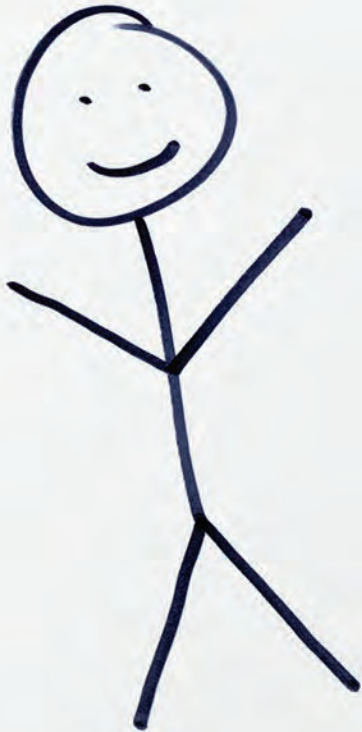


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BOARD REVIEW

QUESTIONS

Provided by *PEER VIII*. *PEER (Physician's Evaluation and Educational Review in Emergency Medicine)* is ACEP's gold standard in self-assessment and educational review. These questions are from the latest edition of *PEER—PEER VIII*, which made its debut at ACEP's 2011 Scientific Assembly. To learn more about *PEER VIII*, or to order it, go to www.acep.org/bookstore.

1. Which of the following statements regarding a patient with fever is correct?
 - A. Bradycardia with a fever can occur in Lyme disease
 - B. Chills occur in response to a declining body temperature
 - C. Heart rate increases by 30 beats/min for each 0.55°C rise in temperature
 - D. Rectal temperatures are typically 2°C higher than oral temperatures
2. A 60-year-old man with a history of alcohol abuse presents with epigastric pain. Initial laboratory test results are as follows: WBC count, 20,000 cells/mcL; blood glucose, 450 mg/dL; AST, 375 IU/L; and lipase, 400 U/L. What is the appropriate disposition?
 - A. General medical floor
 - B. ICU
 - C. Observation unit
 - D. Surgical floor
3. Which of the following statements regarding closure of scalp lacerations is correct?
 - A. Blindly clamping a vessel is the best way to gain control of active bleeding
 - B. Complications of scalp wound infection include osteomyelitis and brain abscess
 - C. Hair should be shaved prior to suturing or stapling a scalp wound
 - D. Hair should not be washed for 24 to 48 hours after wound closure
4. Which of the following pairings of murmur and underlying cause is correct?
 - A. Diastolic murmur that radiates to the carotid—mitral regurgitation
 - B. Short, soft diastolic murmur—aortic regurgitation
 - C. Systolic murmur that radiates to the axilla—aortic stenosis
 - D. Systolic murmur that radiates to the axilla—mitral stenosis
5. In a previously healthy patient with severe pneumonia who is awaiting admission to the ICU, which of the following antibiotic regimens should be started in the emergency department?
 - A. Ampicillin-sulbactam and vancomycin
 - B. Azithromycin and levofloxacin
 - C. Ceftriaxone and levofloxacin
 - D. Ertapenem and vancomycin

BOARD REVIEW

ANSWERS

1. The answer is A, Bradycardia with a fever can occur in Lyme disease.

(Marx, 83-86; Tintinalli, 1042-1044, 1082-1088)

Although an elevated body temperature is typically associated with tachycardia, there are certain disease processes that produce a relative bradycardia, such as the concomitant use of beta-blockers, or even an overt bradycardia. Overt bradycardia in association with a fever is classically described with infection and inflammation of the cardiac structures themselves, including Lyme disease, endocarditis, and rheumatic fever. Rectal temperatures are often 0.7 to 1°C higher than oral temperatures. Axillary and tympanic temperatures are quite variable and cannot be reliably related to a core temperature measurement. In adult patients, the heart rate can increase by 10 beats/min for each 0.55°C rise in temperature; the respiratory rate can increase by 2 to 4 breaths/min per 1°C rise in temperature. Chills occur when a fever causes the hypothalamus to reset the thermostatic normal to a higher temperature. Since the body temperature is low, the patient shivers or has chills until the body temperature is raised to this new febrile level as set by the hypothalamus. Sweating occurs as the patient's fever declines.

2. The answer is B, ICU.

(Marx, 1172-1180; Tintinalli, 558-562)

Using the Ranson criteria, a patient with a WBC count of 20,000 cells/mL, blood glucose level of 450 mg/dL, and AST 375 IU/L is classified as having severe pancreatitis, with a predicted mortality rate of at least 15%, necessitating admission to an ICU. The Ranson criteria are used to predict mortality associated with pancreatitis. At the time of admission, points are given for age older than 55, WBC count greater than 16,000 cells/mL, glucose greater than 200 mg/dL, LDH greater than 350 IU/L, and AST greater than 250 U/L. Additional points are calculated during the first 48 hours of admission and then tabulated. A score of 3 or more is associated with at least a 15% mortality rate and indicates the need for admission to the ICU. This patient already has a Ranson score of 4. A general medical admission, surgical floor admission, or observation unit admission is inappropriate in light of the high mortality. Monitoring in an ICU is indicated in most patients with severe pancreatitis who have no indication for surgical management. Pancreatitis is typically caused by gallstone ductal obstruction or alcohol abuse. Pancreatic ductal obstruction increases the pressure on pancreatic enzymes, while

alcohol abuse has a direct toxic effect. Both result in premature activation of trypsinogen and zymogen within the pancreas and subsequent autodigestion. Patients typically present with epigastric pain that radiates to the back along with nausea and vomiting; they are often afebrile. Serum lipase level has a higher sensitivity and specificity than serum amylase when diagnosing pancreatitis but has no correlation with morbidity or mortality rates.

3. The answer is B, Complications of scalp wound infection include osteomyelitis and brain abscess.

(Laughlin, 126-128; Marx, 703-711; Roberts, 623-625)

When scalp lacerations involve the galea aponeurotica, bacteria can penetrate the layer of loose connective tissue beneath it, gaining access to the venous sinuses of the brain. A wound infection can therefore cause osteomyelitis, meningitis, or brain abscess. It is of utmost importance to make sure that all foreign bodies are removed and that cautious and conservative debridement is performed prior to closure of the galea and superficial layers of the wound to avoid this complication. It is controversial whether the galea should be closed as a separate layer or whether it can be closed along with the superficial layers of the wound. Blindly clamping bleeding vessels is unlikely to be helpful in gaining control of bleeding. Using Raney clips and administering an anesthetic agent with added epinephrine are helpful in controlling active bleeding. Hair may be washed a few hours after closure; the patient does not need to wait 24 to 48 hours to remove remaining blood and debris. Although care should be taken to avoid getting hair in the wound, in most cases shaving is unnecessary. Hair can be removed by clipping around the wound or moved out of the way using a petroleum-based antibiotic ointment or tape.

4. The answer is B, Short, soft diastolic murmur-aortic regurgitation.

(Marx, 1072-1074; Tintinalli, 415-423)

Murmurs are described based on the following features:

- Intensity, from barely audible in a quiet room (= 1) to heard without the stethoscope (= 6)
- Timing, systole or diastole
- Location on the chest at which best heard
- Shape, crescendo or decrescendo, and so on
- Pitch, harsh, blowing, or rumbling, and so on
- Presence or absence of radiation

Mitral stenosis classically presents with a loud S1 and an opening snap in early diastole (just after S2), with a low-pitched, rumbling mid-diastolic apical murmur. Aortic regurgitation is

described as a soft early diastolic, decrescendo murmur heard best at the left upper sternal border with the patient leaning forward. It is often associated with a widened pulse pressure and can be associated with a rapidly rising and falling carotid pulse, spontaneous nail bed pulsations, and a to-and-fro murmur over the femoral artery. Mitral regurgitation classically presents as a blowing holosystolic murmur that radiates to the axilla. It is best heard with the bell when the patient is in the left lateral decubitus position. Patients with aortic stenosis classically have a harsh crescendo-decrescendo systolic murmur heard best at the right second intercostal space that radiates to the carotids and is associated with an S4 gallop. In comparison, ventricular septal defects have a characteristic loud, harsh, blowing holosystolic murmur heard best over the lower left sternal border (third or fourth intercostal spaces); when large, they can be accompanied by a displaced point of maximal impulse and a palpable thrill.

5. The answer is C, Ceftriaxone and levofloxacin.

(Mandell, S27-S72; Tintinalli, 479-486)

Severe community-acquired pneumonia requiring ICU admission requires broad antibiotic coverage against *Streptococcus pneumoniae* and *Legionella*. Double antipneumococcal coverage in severe pneumonia has been shown to improve outcome. The use of a beta-lactam (ceftriaxone) and a respiratory fluoroquinolone (levofloxacin) meets this goal. Selection of appropriate antibiotic coverage is part of the Centers for Medicare & Medicaid Services (CMS) core measures design to improve patient care. Vancomycin provides excellent coverage against *Staphylococcus* and *Streptococcus* but does not cover *Legionella* or *Pseudomonas*. The addition of vancomycin is suggested if methicillin-resistant *Staphylococcus aureus* is a concern as part of good clinical care, but it is not part of the 2010 CMS guidelines. Azithromycin and levofloxacin cover atypical pathogens like *Legionella*, but azithromycin, which is a macrolide, does not provide the same antipneumococcal coverage that a beta-lactam does. Common beta-lactams include ceftriaxone, cefotaxime, ampicillin-sulbactam, and ertapenem. Levofloxacin also has the advantage of providing coverage against *Pseudomonas* as well as *Legionella* and *Pneumococcus*. If *Pseudomonas* is suspected, an antipseudomonal beta-lactam like cefepime, imipenem, meropenem, or piperacillin-tazobactam should be used in combination with levofloxacin.

Lesions



Case 1. The Patient

A 15-year-old female presents to the ED for the fourth time in three weeks because of low-grade fever, malaise, and chest pain. Over the past day she developed a painful skin eruption on the right index fingertip pad. The patient has a mild headache and diminished visual acuity in the right eye. Physical examination reveals an ill-appearing patient with

a temperature of 101°F and heart rate of 110 beats per minute. Funduscopic examination of the right eye shows a white, centered retinal hemorrhage lateral to the disc. A II/VI systolic murmur is heard.

What is the lesion in the image and what is the diagnosis?

Case 2. The Patient

A 41-year-old male presents to the ED for three days of fever and painless skin eruption to the left palm. The patient has been known to inject feces into his veins, and has lost fingertips due to this behavior. Physical examination reveals a mildly ill patient with a temperature of 100.6° F and heart rate of 117 beats per minute. A II/VI systolic murmur is heard.



What is the lesion in the image and what is this diagnosis?

R. Jason Thurman, MD
Lawrence B. Stack, MD
Vanderbilt University
Nashville, TN

See the
DIAGNOSES
on page 48

PHOTOS COURTESY OF LAWRENCE B. STACK, MD

The Diagnoses

Case 1. The Diagnosis

Osler's Node/Infective Endocarditis

This patient has acute infective endocarditis (IE). The fingertip eruption is an Osler's node, named after Sir William Osler. The finding is due to an embolic manifestation of IE that initially is a micro-abscess that becomes sterile and propagates an immune-mediated vasculitis giving these lesions a palpable purpura or nodular feature. Osler's nodes are purpuric, slightly raised and tender, and are typically found on the pads of the fingers or toes. They may occur at any time during the course of IE, and last from hours to days. Splinter hemorrhages though less specific for IE, are thin, brownish-red eruptions underneath the fingernails that follow the direction of nail growth. They represent immune complex deposition in small peripheral vessels causing a vasculitis.

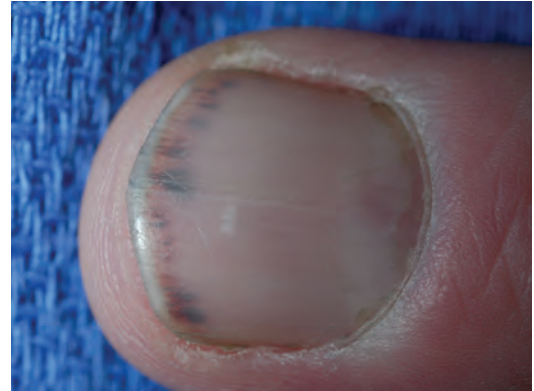


PHOTO COURTESY OF R. JASON THURMAN, MD

Case 2. The Diagnosis

Janeway Lesion/Infective Endocarditis

Patient 2 also has IE. The palmar eruption is a Janeway lesion which is an embolic manifestation of IE frequently caused by *Staphylococcal aureus*, and histologically appears as subcutaneous abscess. Bacteria can be cultured from the eruption (which is a painless), irregular erythematous macule, or patch on the palms or soles. Janeway lesions may persist for days to weeks. ★

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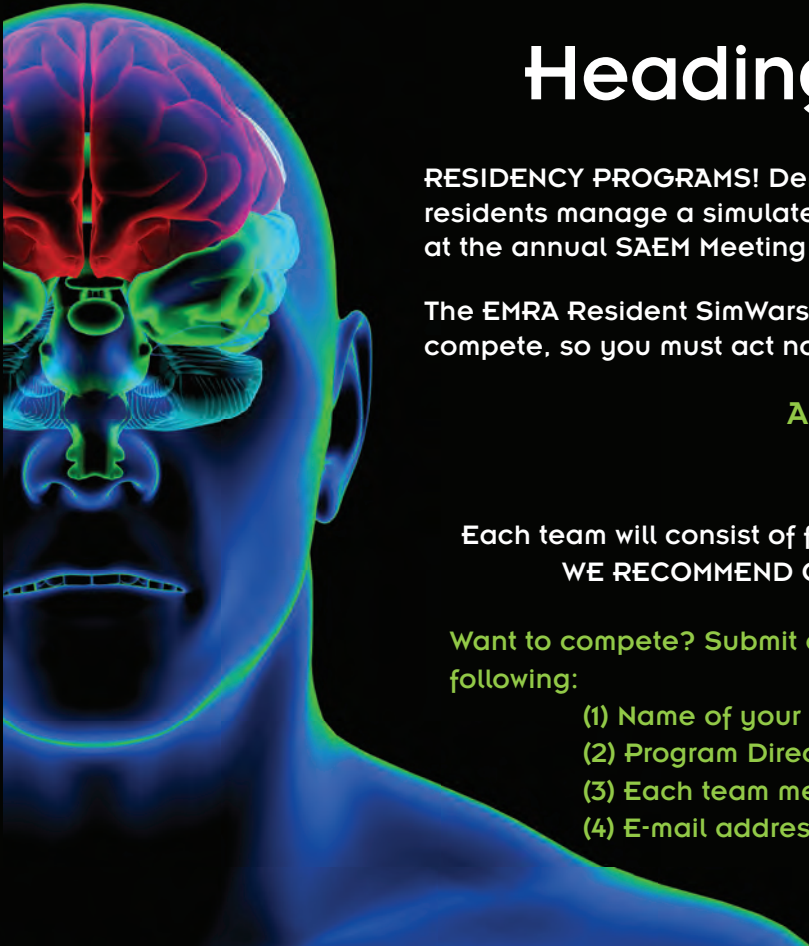
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- Apr 15** EMRA Committee & Division
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- May 12** SAEM Annual Meeting
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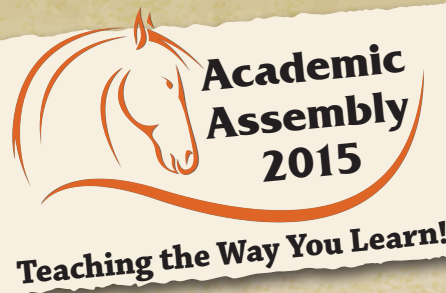
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RISK MANAGEMENT PITFALLS

Acute Urinary Retention in the Emergency Department

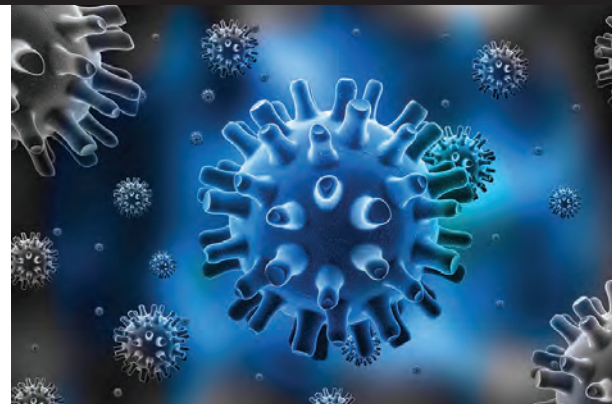


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- ❶ “My female patient was having difficulty urinating, so I assumed that it was a UTI and omitted the pelvic exam.”
A thorough pelvic examination is important in ruling out uterine prolapse or other organ obstruction as a cause of acute urinary retention in women.
- ❷ “I treated a patient in the ED for acute urinary retention and removed his Foley prior to his discharge, but he is back again today!”
Up to 70% of men with acute urinary retention due to benign prostatic hypertrophy will have recurrence if the bladder is drained only during the ED visit and the catheter is removed prior to discharge.
- ❸ “I went to place a suprapubic catheter in my patient and aspirated air.”
Remember the potential bad outcomes involved with a misplaced suprapubic catheter and the importance of using ultrasound during placement and for confirmation of successful Foley, Coude, and suprapubic catheter insertion.
- ❹ “The nurse kept telling me that the patient had severe low back pain. It was busy in the ED, so I gave him two Percocet tabs and 4 mg of IV morphine before I assessed him. It turned out all that he needed was bladder decompression.”
Urgent bladder decompression is the definitive treatment for acute urinary retention, and it treats pain and saves money on unnecessary testing. Also, treating the patient’s pain acts to improve his ED experience.
- ❺ “The resuscitation was busy, and I couldn’t find saline, so I injected air into the Foley balloon. Now it doesn’t work.”
Injecting air into the Foley balloon may cause it to sit inappropriately within the bladder, interfering with its function.
- ❻ “I placed a Foley in an elderly man with acute urinary retention and discharged him home. Now he has returned with paraphimosis.”
Remember to reduce the foreskin in uncircumcised patients, as it may cause paraphimosis.
- ❼ “I did a CT scan on a patient with abdominal pain. It showed a markedly full, distended bladder. Maybe I should have done an ultrasound first.”
A thorough history and physical examination is needed to differentiate acute urinary retention as a cause of abdominal distension and pain, and bedside ultrasound may be used to confirm the diagnosis instead of other costly diagnostic modalities.
- ❽ “The patient seemed reliable, and I assumed he would follow up at the urology clinic. Little did I know that they didn’t have any appointments for three months!”
Remember the importance of prompt urological follow-up and the complications of chronic catheter usage. It is essential to ensure that the patient does actually have follow-up prior to discharge.
- ❾ “I removed the fluid from the Foley balloon, and now it will not come out.”
There is a risk of balloon cuffing when fluid is removed too quickly from the catheter balloon. Consider instilling 0.5 to 1 mL of water into the balloon to smooth the already-formed cuffs.
- ❿ “I sent home an elderly patient with tamsulosin and an indwelling catheter, but she came back after passing out at home.”
Though prescribing alpha blockers is recommended, orthostatic hypotension is a common side effect in patients taking these medications. Adequate instruction on the side effects of all medications prescribed must be given to the patient and family. Tamsulosin may be taken at night to reduce the impact of side effects. ★

RISK MANAGEMENT PITFALLS

Pediatric Herpes Simplex Virus Infections



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- ❶ **“The mother of the ill-appearing 15-day-old infant did not have a history of herpes, so the infant most likely has a bacterial infection rather than neonatal herpes.”**
Almost two-thirds of women who acquire genital herpes during pregnancy are asymptomatic and have no clinical findings to suggest genital HSV infection, as they have never had an HSV outbreak, nor have their partners had an outbreak.
- ❷ **“The lumbar puncture was not bloody, so the patient probably does not have HSV.”**
While the presence of red blood cells and xanthochromia on a lumbar puncture may be seen on CSF studies in patients with HSV encephalitis or CNS involvement, 5% to 10% of patients have normal CSF studies. Red blood cells in the CSF is not a feature of neonatal infection, even with CNS involvement. Polymerase chain reaction should be completed on the CSF of all patients suspected of having HSV encephalitis or CNS involvement. In most cases of herpes with CNS involvement, patients have either an elevated CSF white blood cell count or elevated CSF protein level, which may heighten the emergency clinician’s suspicion for CNS herpes infection.
- ❸ **“The three-day-old infant had pustules on the skin, so he probably has neonatal herpes.”**
The presence of pustules on an infant does not necessarily mean the patient has HSV. Pustular melanosis and erythema toxicum are both benign pustular eruptions that can mimic HSV.
- ❹ **“The baby was born via Cesarean delivery, so herpes does not need to be ruled out.”**
While Cesarean delivery has successfully reduced the number of neonatal herpes cases, HSV may be transmitted to an infant despite Cesarean delivery.
- ❺ **“I did not see any dendrites on the fluorescein examination, so the patient does not have ocular herpes.”**
All patients who are suspected of having ocular herpes should be evaluated by an ophthalmologist. Findings may be subtle, and those with expertise in the evaluation of the cornea should be involved when there is any clinical concern for ocular HSV infection.
- ❻ **“The child had swelling and pain near the fingertip, so I performed an incision and drainage.”**
Routine incision and drainage is not recommended in patients with herpetic whitlow. Herpetic whitlow is a self-limited disease. Vesicles may be unroofed to help relieve symptoms, but deep incisions should be avoided.
- ❼ **“No lesions are visible on the external genital examination, so the patient does not have a herpes outbreak.”**
Patients with herpes outbreaks may not have lesions visualized on external examination. If lesions are not noted, a pelvic examination should be performed to evaluate for the presence of cervical lesions.
- ❽ **“The Tzanck prep was negative on the skin lesion of the 15-day-old infant, so HSV was ruled out.”**
While the Tzanck prep may be a relatively reliable test for cutaneous lesions, it does not definitively rule out neonatal herpes. If suspicion is high for neonatal herpes infection, infants require the following testing: (1) CSF for indices; (2) HSV PCR and bacterial culture; (3) viral culture swabs from the base of any vesicles as well as swabs from the mouth, conjunctiva, nasopharynx, and rectum; (4) HSV PCR on whole blood; and (5) LFTs.
- ❾ **“The CT scan on the febrile teenager with altered mental status was negative, so HSV PCR does not need to be sent on the CSF.”**
CT scans are less sensitive than MRI, but they may show changes (such as edema and hemorrhage) in patients with herpes encephalitis. However, early in the illness, CT and MRI may be normal, so clinical suspicion should guide management and workup.
- ❿ **“LFTs are not part of the routine sepsis rule-out. They play no role in the evaluation of febrile infants.”**
Elevation of serum aspartate transaminase levels >10 times normal have been associated with increased mortality in neonates with disseminated herpes. Elevation of LFTs has been noted in neonates with disseminated HSV, and LFT levels may serve as a screening tool for disseminated disease in those infants undergoing a sepsis rule-out. ★

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PROCEDURAL GUIDANCE (P. 19)

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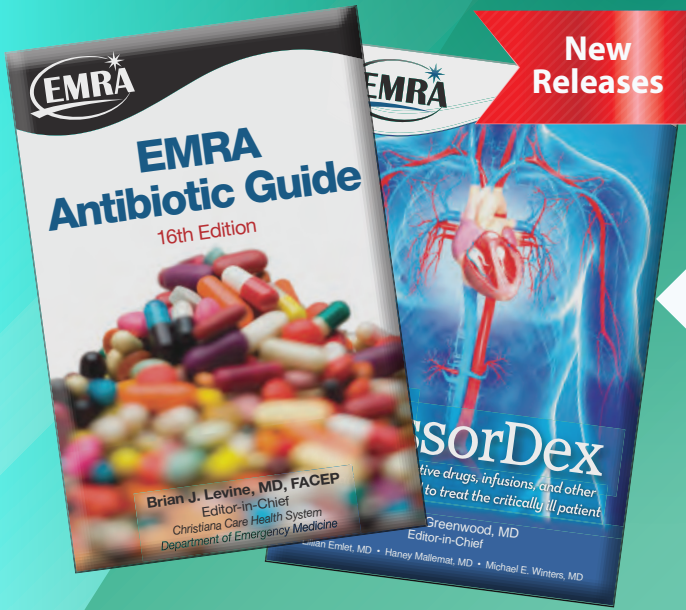
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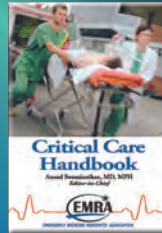
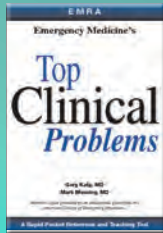
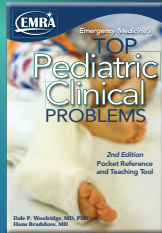
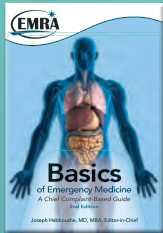
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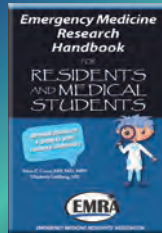
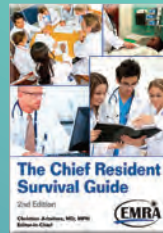
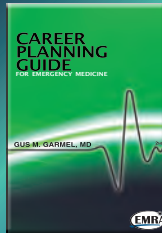
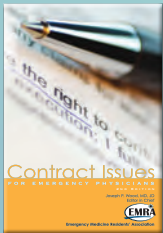


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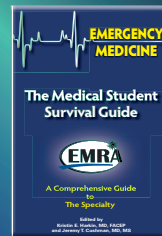
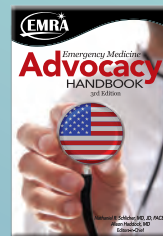
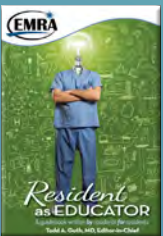
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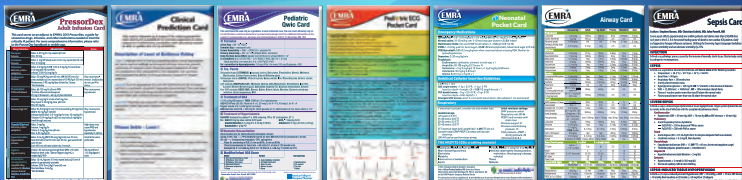


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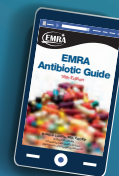
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CONNECTICUT

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ILLINOIS

Chicago Heights/Olympia Fields: Franciscan St. James Health (2 campuses seeing 34,000 and 40,000 pts./yr) is affiliated with Midwestern University's emergency medicine residency program. Situated just 30 miles south of Chicago, the location makes a variety We are an exclusively physician owned/managed group with open books, equal voting, equal profit sharing, equity ownership, funded pension, full benefits and more. Contact Ann Benson (careers@emp.com), Emergency Medicine Physicians, 4535 Dressler Rd. NW, Canton, OH 44718, 800-828-0898 or fax 330-493-8677.

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Presbyterian Healthcare Services (PHS) is New Mexico's largest, private, non-profit healthcare system and named one of the "Top Ten Healthcare Systems in America." Over 600 providers are employed by PHS and represent almost every specialty. PHS is seeking BE/BC Emergency Medicine trained physicians to work in our Emergency Medicine department in Albuquerque and will consider BC/BP Family Medicine, Internal Medicine or Emergency Medicine trained physicians in Ruidoso, NM.

Albuquerque thrives as New Mexico's largest metropolitan center with a population of 700,000. Albuquerque has been listed as one of the best places to live in the United States by *Newsweek*, *U.S. News & World Report*, *Money* and *Entrepreneur* magazines! Albuquerque is considered a destination city for most types of outdoor activities with 310 days of sunshine.

Ruidoso is a mountain community at seven thousand feet altitude with snow skiing in the winter and horse racing in the summer. The community is best surveyed from the Chamber website at ruidosonow.com. We currently have six Family Practitioners, one General Surgeon, one Radiologist, two Internists, two Obstetrician/Gynecologists, three Orthopedic Surgeons as part of a group practice with Podiatrists, two inpatient Hospitalists that cover 24/7, four Emergency Room physicians and four nurse practitioners. We are part of the Presbyterian Healthcare Services network and are a twenty-five bed Critical Access Hospital. Emergency Medicine physicians will enjoy a flexible work schedule a monthly requirement of twelve, 12 hour shifts with midlevel support.

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For more information regarding Albuquerque, contact Kelly Herrera, kherrera@phs.org; 505-923-5662; For more information regarding Ruidoso, contact Aracely Pena, apena6@phs.org; 505-604-7590.

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NEW YORK

Albany area: Albany Memorial Hospital has a newer ED that sees 44,000 pts/yr. and hosts EM resident rotations. Samaritan Hospital in Troy is a respected community hospital, minutes from Albany, which also treats 45,000 ED pts/yr. Outstanding partnership opportunity includes equal profit sharing, equity ownership, funded pension,

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Brooklyn: Emergency Medicine Physicians Needed. NES Healthcare Group is seeking Pediatric Emergency Medicine Physicians for Lutheran Medical Center (LMC), Brooklyn, NY. LMC is a Level I Trauma Center and a designated stroke center. Candidates must be BP/Certified Peds and have current EM experience. Peds EM desirable/UC experience and must have ACLS, ATLS and PALS certifications. Competitive compensation, incentive program, CME allowance and malpractice coverage provided. Contact: Jennifer Hughes, Physician Recruiter, 800.394.6376, fax 631.265.8875, jennifer.hughes@neshealth-care.com.

Cortland: Cortland Regional Medical Center is a modern, full-service facility situated in the Finger Lakes Region between Syracuse and Ithaca. A broad mix of pathology makes up 33,000 ED pts./yr., and there is strong support from medical staff and administration. Outstanding partnership opportunity includes equal profit sharing, equity

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NORTH CAROLINA

Charlotte/Statesville: Iredell Memorial Hospital is a respected community hospital situated north of Charlotte and seeing 41,000 ED pts./yr. Statesville is easily commutable from desirable north-Charlotte suburbs like Mooresville (highly regarded schools), with access to lakeside, small town and rural residential options as well. The dedicated ED physicians are part of EMP which is exclusively physician owned/managed group with open books, equal voting, equal equity ownership, funded pension, comprehensive benefits and more. Contact Ann Benson (careers@emp.com), Emergency Medicine Physicians, 4535 Dressler Rd. NW, Canton, OH 44718, 800-828-0898 or fax 330-493-8677.

Morehead City: Modern community hospital on the Atlantic coast minutes from Atlantic Beach! This 135-bed facility sees 39,000 emergency pts./yr. and is active in EMS. Outstanding



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New Bern: Respected 313-bed regional medical center located at the intersection of the Trent and Neuse Rivers just off the central coast, 70,000 ED pts./yr. Outstanding partnership opportunity includes equal profit sharing, equity ownership, funded pension, open books, full benefits and more. Contact Ann Benson (careers@emp.com), Emergency Medicine Physicians, 4535 Dressler Rd. NW, Canton, OH 44718, 800-828-0898 or fax 330-493-8677.

OHIO

Cincinnati: Mercy Hospital-Anderson is located in a desirable suburban community and has been named a "100 Top Hospital" ten times. A great place to work with excellent support, the renovated ED sees 43,000 emergency pts./yr. Outstanding partnership opportunity includes performance pay, equal equity ownership, equal voting, funded pension, open books, comprehensive benefits and more. Contact Ann Benson (careers@emp.com), Emergency Medicine Physicians, 4535 Dressler Rd. NW, Canton, OH 44718, 800-828-0898 or fax 330-493-8677.

Columbus: Doctors Hospital is host to an award winning osteopathic emergency medicine residency training program where 79,000 ED patients are treated annually. Outstanding partnership opportunity includes performance pay, equal equity ownership, equal voting, funded pension, open books, comprehensive benefits and more. Contact Ann Benson (careers@emp.com), Emergency Medicine Physicians, 4535 Dressler Rd. NW, Canton, OH 44718, 800-828-0898 or fax 330-493-8677.

Concord, Madison and Willoughby: INCREASED PAY and LOAN REPAYMENT PROGRAM! Lake Health is situated in the eastern Cleveland Suburbs. TriPoint Medical Center was built in 2009 and treats 31,000 emergency pts./yr. The Madison Medical Campus hosts a freestanding ED seeing 12,000 pts./yr. West Medical Center is a state-of-the-art acute care hospital serving 37,000 ED pts./yr. Outstanding partnership opportunity includes \$60,000 bonus/loan repayment, performance pay, equal equity ownership, equal voting, funded pension (\$34,500/yr.), open books, comprehensive benefits and more. Contact Ann Benson (careers@emp.com), Emergency Medicine Physicians, 4535 Dressler Rd. NW, Canton, OH 44718, 800-828-0898 or fax 330-493-8677.

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Springfield: INCREASED PAY and LOAN REPAYMENT PROGRAM! Springfield Regional Medical Center is a brand new, full-service hospital with supportive, new administration committed to emergency medicine, is 45 miles west of Columbus and 25 miles northeast of Dayton. 75,000 emergency patients are treated annually. EMP is an exclusively physician owned/managed group with open books, equal voting, equal equity ownership, funded pension (13.27% in addition to pay), CME/expense account (\$8,000/yr.)

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Urbana: Mercy Memorial Hospital services the SW Ohio region's residents in Champaign County, the facility treats approximately 18,000 emergency pts./yr. EMP is an exclusively physician owned/managed group with open books, equal voting, equal equity ownership, funded pension, comprehensive benefits and more. Contact Ann Benson (careers@emp.com), Emergency Medicine Physicians, 4535 Dressler Rd. NW, Canton, OH 44718, 800-828-0898 or fax 330-493-8677.

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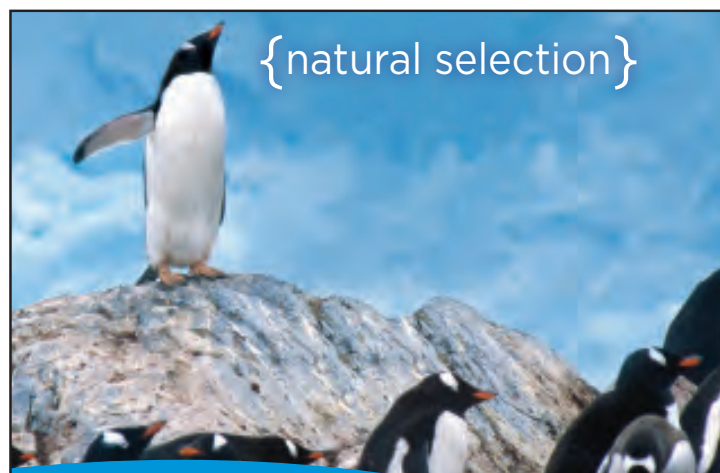
Tulsa: Saint Francis Hospital South is a modern community hospital built in 2007 near the desirable Broken Arrow, Bixby and Jenks communities. 28,000 emergency patients are treated annually, and a full continuum of care is supported by the St. Francis system. Outstanding partnership opportunity includes equal profit sharing, equity ownership, funded pension, open books, full benefits and more. Contact Ann Benson (careers@emp.com), Emergency Medicine Physicians, 4535 Dressler Rd. NW, Canton, OH 44718, 800-828-0898 or fax 330-493-8677.

OKLAHOMA

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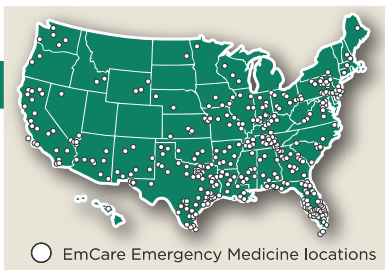
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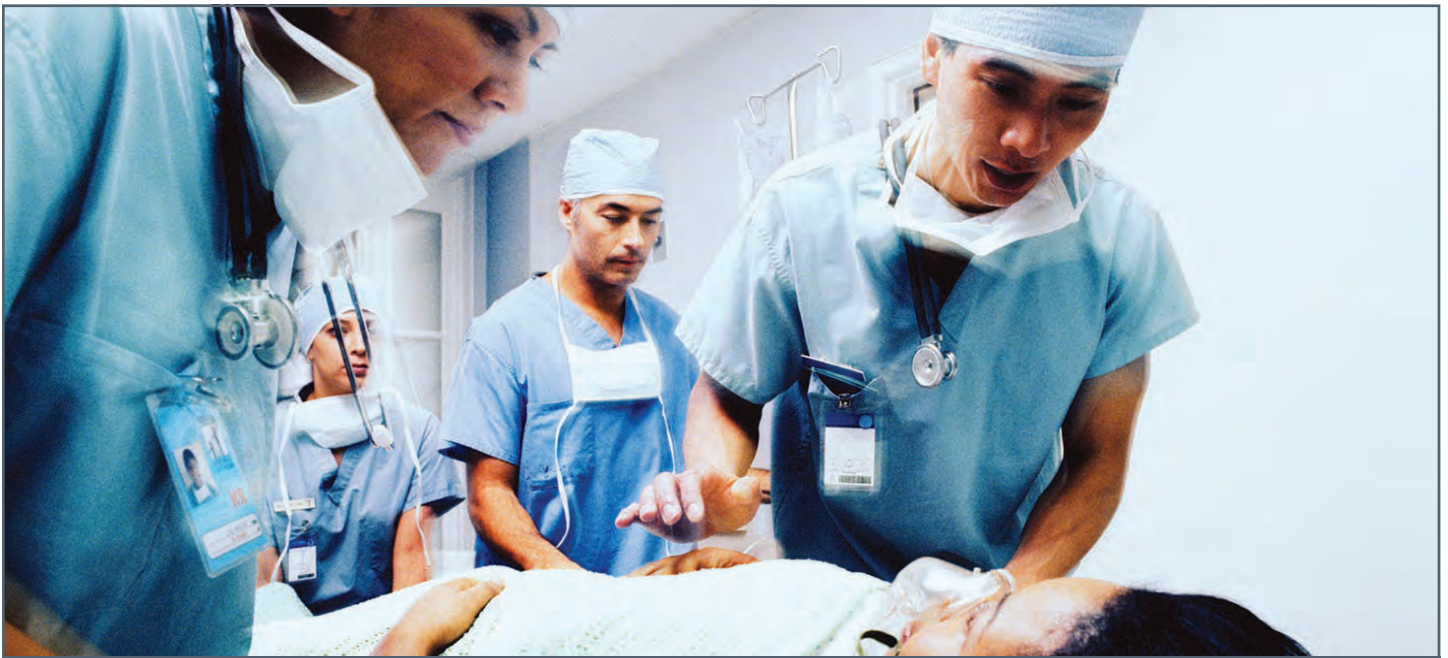
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Sharon: Sharon Regional Health System has an extremely supportive administration/medical staff, newer ED, and full service capabilities making this a great place to work with 37,000 patients treated annually. Small city setting offers beautiful housing and abundant recreation less than an hour from Pittsburgh and Cleveland. Outstanding partnership opportunity includes equal profit sharing, equity ownership, funded pension, open books, full benefits and more. Contact Ann Benson (careers@emp.com), Emergency Medicine Physicians, 4535 Dressler Rd. NW, Canton, OH 44718, 800-828-0898 or fax 330-493-8677.



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- Regional Medical Director

Our Department includes a well regarded EM Residency Program, Research and Fellowship programs. Our main site, Strong Memorial Hospital, is the regional referral and trauma center.

We are seeking BC/BP candidates with dynamic personalities who are interested in a diverse Emergency Medicine experience with great potential for career development, promotion, and career longevity within our department. With these sites, there is also ample opportunity to become involved in academics and administration.

Rochester, New York is located in upstate New York offers excellent schools, low cost of living, many opportunities both professionally and personally, and easy access to Canada, including metropolitan Toronto and the northeast United States.

Interested applicants please contact:
Michael Kamali, MD, FACEP
Chair, Department of Emergency Medicine
Michael_kamali@urmc.rochester.edu
585-463-2970

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MINISTRY HEALTH CARE

Wausau/Weston Area: Ministry Health Care invites you to explore an Emergency Medicine opportunity in Northcentral Wisconsin. This is an ideal opportunity for a physician looking to practice in a rural setting while still treating a full range of trauma patients. You will join a dynamic team that boasts strong staff/physician relationships as well as low nurse turnover rates. The emergency department and walk-in clinic see a combined volume of 12-13,500, allowing for a high-level of personalized care. Multi-specialty group that promotes a healthy work/life balance; Full-time (13 twelve-hour shifts/month); 9-Bed Trauma Level IV with easy access to sub-specialty referrals off site; Easy one call transfers; Established relationship with the hospitalist team; Lucrative compensation and benefit package with loan repayment; Ideally located just 15 miles outside of the metropolitan Wausau/Weston area (pop. est. 75,000). Physicians who have recently joined Ministry Medical Group indicate that the excellent work/life balance combined with friendly, thriving communities was ultimately what drew them here. In Northcentral Wisconsin, you'll find the perfect balance of unspoiled natural beauty and convenient creature comforts. Merrill itself is a warm-hearted community ideally located just off the interstate, about 20 minutes north of Wausau. The community is home to about 10,000 residents and is an ideal location for outdoor enthusiasts with numerous lakes and parks with hiking, snowmobiling, biking and cross-country ski trails. Wausau is just an easy twenty minute commute to Merrill making it an ideal location for those seeking more of an urban lifestyle. The Wausau area offers a complete package of arts and culture, fine dining, shopping, cultural events and a wide assortment of entertainment. The community is also home to a downhill ski resort, a top whitewater kayak park, The Badger State Games and an assortment of urban amenities...without any of the hassles! Brad Beranek, 715-342-7998, mmgrecruitment@ministryhealth.org, ministryhealth.org.

Emergency Medicine Physicians Opportunities

Geisinger Health System (GHS) is seeking Emergency Medicine Physicians for multiple locations throughout its service area.

Geisinger Wyoming Valley Medical Center

Join a growing team of Emergency Medicine staff Physicians at Geisinger Wyoming Valley Medical Center (GWV) located in Wilkes-Barre, Pa. Practice state-of-the-art medicine with excellent sub-specialty backup and additional coverage through the department's Advanced Practice Providers, Pharmacists, and Scribes. With over 54,000 visits annually, Physicians at GWV enjoy its high acuity, hands-on environment.

The Emergency Department at GWV houses a total of 32 beds including: 24 acute, 3 trauma, and 5 acute/isolation. In addition, providers have access to 24 hour imaging services, point-of-care lab services, pharmacist coverage, and care management all within the department. The hospital is currently an accredited Level II Trauma Center and holds a Level I Heart Attack Program.

Geisinger-Shamokin Area Community Hospital*

Join a growing team of Emergency Medicine staff Physicians and Advanced Practice Providers at Geisinger-Shamokin Area Community Hospital (G-SACH), located in Coal Township, Pa.

Practice state-of-the-art medicine in a facility that handles over 18,000 visits annually. Teaching opportunities exist with 3rd year EM residents rotating through the department. G-SACH is a licensed 70-bed community hospital with 45 acute, 15 skilled and 10 gero-psychiatry beds. Enjoy the latest in surgical and health information technology.

**G-SACH is a campus of Geisinger Medical Center, Danville.*

Geisinger-Bloomsburg Hospital

Join a growing team of Emergency Medicine staff Physicians and Advanced Practice Providers at Geisinger-Bloomsburg Hospital (G-BH), located in Bloomsburg, Pa.

Geisinger-Bloomsburg Hospital's Emergency Department, which was recently renovated, houses 13 beds and handles approximately 16,500 visits annually. At the hospital, surgery, OB, hospitalists, a psych unit, and radiology with ultrasound, CT, x-ray, and MRI are available 24 hours a day. Geisinger Medical Center (GMC), located in Danville, Pa., is just miles down the road for complicated cases, trauma, STEMI, and pediatrics.

In 2015, Geisinger will celebrate 100 years of innovation and clinical excellence. There's never been a better time to join our team.

For more information visit geisinger.org/careers or contact: **Miranda Grace, Department of Professional Staffing, at 717-242-7109 or mlgrace@geisinger.edu.**

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