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SEE PAGE 13



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Forensic Evaluation
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SEE PAGE 16



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RESIDENT VOICE

SPACE MEDICINE

EMERGENCY PHYSICIANS VOYAGE INTO THE FINAL FRONTIER

by SOPHIA GÖRGENS, MD

An astronaut steps onto the rust-red surface of Mars, above her the expanse of the galaxy, bright against the darkness of space. Her teammates are setting up basecamp—after a seven-month journey they intend to stay for at least the next year. She wants to help, but her right upper quadrant pain from the past two days is worsening, and she knows she's been running a low-grade fever. Suddenly, the pain intensifies, and she clutches her abdomen. Her teammates rush over and bring her back onboard their ship. An

CONTINUED on page 14

KIDS KORNER

Pediatric Fever and Illness Correlations

by LANDON JONES, MD, AND RICHARD M. CANTOR, MD, FAAP, FACEP

The best questions often stem from the inquisitive learner. As educators, we love—and are always humbled by—those moments when we get to say, “I don’t know.” For some of these questions, you may already know the answers. For others, you may never have thought to ask the question. For all, questions, comments, concerns, and critiques are encouraged. Welcome to the Kids Korner.

Question 1: Does the height of the fever in children predict the likelihood of serious or invasive bacterial illness?

The first *Haemophilus Influenza B* (Hib) conjugated vaccine was licensed for use in the U.S. in the late 1980s and the first conjugated vaccine for *Streptococcus pneumoniae* (Pneumococcus) was licensed in 2000. Prior to the incorporation of these routine immunizations, the height of fever in infants appeared to be proportionate to the likelihood of bacterial illness.^{1,2} But, is this still true now that we routinely immunize

CONTINUED on page 21

CASE REPORT: A Rare Complication PAGE 9

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NEWS FROM THE COLLEGE

UPDATES AND ALERTS FROM ACEP

Board, Council Election
Candidates Finalized

ACEP’s Nominating Committee has selected the slate of candidates for 2023. Elections will occur during the Council meeting on Sunday, October 8, in advance of ACEP23 in Philadelphia. During this election cycle, there are four Board of Directors positions to be filled, along with President-Elect, Council Speaker, and Council Vice Speaker.

President-Elect Candidates

- Jeffrey Goodloe, MD, FACEP (OK)
- Alison Haddock, MD, FACEP (TX)
- Ryan Stanton, MD FACEP (KY)

Council Speaker Candidate

- Melissa Costello, MD, FACEP (AL)

Vice Speaker Candidates

- Kurtis Mayz, MD, JD, FACEP (OK)
- Michael McCrea, MD, FACEP (OH)
- Larisa Traill, MD, FACEP (MI)

Board of Directors Candidates

- William Felegi, DO, FACEP (NJ)
- Robert Hancock, DO, FACEP (TX)
- Chadd Kraus, DO, CPE, FACEP (PA)
- Abhishek Mehrotra, MD, MA, FACEP (NC)
- Henry Pitzele, MD, FACEP (IL)
- James Shoemaker, MD, FACEP (incumbent - IN)

New Educational
Requirements for SUD: What
EM Physicians Need to Know

The Substance Abuse and Mental Health Services Administration (SAMHSA) released recommendations and the U.S. Drug Enforcement Administration (DEA) issued specific guidance on how practitioners can meet the required training every clinician will need to receive or renew their DEA license. The requirement stems from the same legislation that repealed the X-waiver requirement for prescribing medications for opioid use disorder; stakeholders convinced Congress that additional education was also necessary. ACEP did not support this mandatory educational requirement. Fortunately, it appears that the DEA and SAMHSA are making the requirement extremely flexible. Learn more by reading ACEP’s regulatory blog at acep.org/regsandeggs.

If you still need to meet this training requirement, ACEP has you covered with this education in the Online Learning Center (acep.org/olc).

- Emergency Medicine Medication for Addiction Treatment: Core Training
- Buprenorphine Initiation and Pain Man-

- agement Workshop
- EQUAL Opioid CME Collection
- ACEP Anesthesia & Analgesia Collection 2022

Award Honors Innovations in
Suicide Prevention

Every year, ACEP partners with the American Foundation for Suicide Prevention to bestow the Innovation in Suicide Prevention Award. This honor recognizes promising and innovative acute care activities in the area of suicide prevention, that improve patient outcomes and lives of patients and/or clinicians.

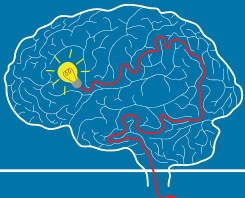
The 2022 winners were Michael P. Wilson, MD, PhD, Angie Waliski, PhD, and Ronald G. Thompson, Jr., PhD, LCSW, who led the first pilot of a peer-delivered suicide safety planning program in the emergency department. EDs are many patients’ first access point to care, and 31 percent of people who die by suicide visit an ED in the year prior to their death. A safety plan empowers the patient to design and utilize a personalized list of coping skills, activities and supports for patients to cope with suicidal thoughts.

The winning researchers tested the feasibility of safety planning initiated in the emergency department, led by peers, people in the community who provide support through compassion, empathy, and lived experience with suicidal thoughts or behaviors, but lack formal medical training. The results revealed that participants were equally likely to embrace peer-delivered safety plans, and more likely to complete the programs led by peers, than those led by professionals.

EM Physician Selected for
Mars Analog Mission

Nathan Jones, MD, FACEP, of Springfield, IL, Memorial Hospital, will be the medical director for NASA’s upcoming one-year analog mission known as the Crew Health and Performance Exploration Analog (CHAPEA). The goal is to simulate what crew members may experience in a mission to Mars before sending astronauts into space. They will simulate spacewalks, robotic operations, habitat maintenance, personal hygiene, exercise, and crop growth. Learn more about aerospace medicine in this month’s cover story (pgs. 1, 14–5). ➦

WHAT ARE
YOU THINKING?



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AND COMMENTS TO
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THE BREAK ROOM



Re: "Unpacking the 2023 Match Week"

Unless we organize as a whole and unionize and get the private hospitals out of residency training the state of emergency medicine will continue to decline, leading to more apathy, medical malpractice claims, longer wait times, lack of hospital support in all aspects of quality medicine. You can draw a direct line to the explosion of non-academic residency programs and the lack of interest in filling them.

You need doctors interested in teaching and the correct patient mix to train a new emergency department doctor. In the long run the only solution is to not betray the Hippocratic Oath.

Maybe we should get the hospital administrators to take the same oath instead of the oath to the almighty dollar/power/growth monster.

—Chris Hamann

Re: "Why Physicians Are Overconfident and How We Can Overcome It"

Dr. Koo, thank you for a concise and thoughtful essay. It is a needed check. I especially like the cognitive pause, to ask

WECIB (What Else Could It Be?). I am entering my fifth decade in emergency medicine; I would be interested in thoughts on the flip side. Once you or I have seen a lot of cases and, yes, caused a lot of harm, we're less certain.

For example, some emergency physicians are confident in tissue plasminogen activator (TPA) for stroke, not aware they are observing the natural history of many strokes as well as seeing stroke mimics. That confidence takes a hit when they injure a patient with a bleed that would not have otherwise occurred.

Confidence weakens further when, with follow-up (rare now that we use EBRs (electronic billing records) that have to be closed by end of shift), we discover the patient had a stroke mimic and could not possibly benefit from our therapy, but they could/did for sure suffer harm.

Thus, a thought: enjoy the over-confidence. It is a luxury that, should you survive long enough in EM, will be regarded in the rear-view mirror with fond indulgence.

—Tom Benzoni

Re: "Pros and Cons: Waiting Room Medicine"

You're both saying the same thing, one glass half full and the other half empty. I've done both clinical and [administrative work] over the years within different systems. Some systems are definitely more metric focused and do a better job than others. Bottom line is that waiting room medicine is terrible for us and the patients.

Fundamentally, hospital CEOs are convinced that a shift from inpatient to outpatient care is the future. I would argue that patients don't know that. We are the center of the medical universe. Physicians in the outpatient setting cannot keep increasingly complicated patients from the emergency department (ED), but actually encourage them to go if they are concerned.

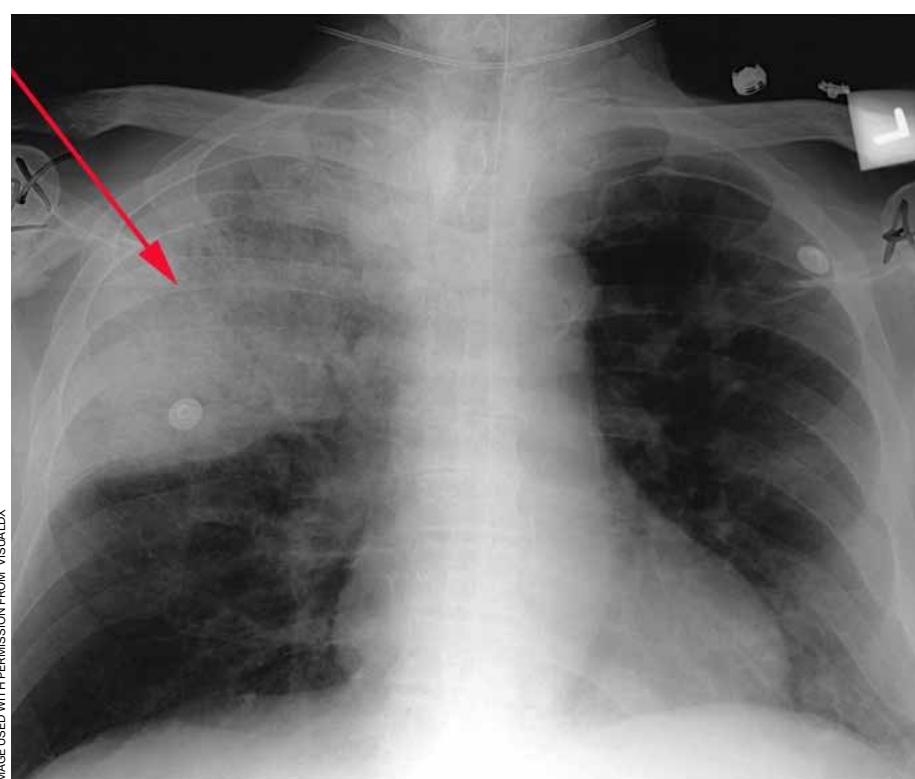
We need to focus more staff and money on EDs, observation/respite units, and social workers. Make specialty ED in-person consultations normal. Let telehealth and artificial intelligence (AI) be the mainstays of outpatient care. We're doing it wrong and those in charge are thinking about the future of medicine wrong.

—J. Benit

HAVE AN IDEA? SEND YOUR THOUGHTS, COMMENTS, OR IDEAS TO ACEP NOW BY VISITING ACEP NOW.COM.

EMERGENCY IMAGE QUIZ

with VISUAL DX



Question: A 22-year-old man presents with chest pain. He has a history of sickle cell anemia. Vital signs are: Temperature, 38.6 C; Heart rate, 118; BP 96.5; Respiratory rate, 36. What is the diagnosis?

- Acute chest syndrome
- Aspiration pneumonia
- Community acquired pneumonia
- Tuberculosis

ANSWER on page 10

ACEP HAS YOUR BACK



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Emergency Departments and the Growing Mental Health Crisis

MAY IS MENTAL HEALTH AWARENESS MONTH, A RECOGNITION THAT SHINES A MUCH-NEEDED SPOTLIGHT ON AN ISSUE CONFRONTED IN EMERGENCY DEPARTMENTS EVERY DAY OF THE YEAR.

by GREGG MILLER, MD, FACEP, AND
ENRIQUE ENGUIDANOS, MD, FACEP

While the COVID-19 pandemic certainly impacted Americans' mental health, ED visits for psychiatric needs had been steadily climbing for years beforehand. In 2007, mental health visits comprised 6.6 percent of all ED visits. By 2016, that number almost doubled to 11 percent.^{1,2} In a 2015 poll, 70 percent of emergency physicians reported that psychiatric patients were boarding on their last shift, with more than half reporting average boarding times of up to two days.³

During the pandemic, mental health issues played an even larger role in emergency medicine. Rates of anxiety and depression significantly increased, with 40 percent of U.S. adults reporting they struggled with mental health or substance abuse in June 2020, and 10.7 percent reporting they had seriously considered suicide.⁴ While overall ED visits declined because of the pandemic, mental health visits

remained disproportionately high.^{5,7}

Now that ED visits have stabilized closer to pre-pandemic volumes, it is too soon to have a precise understanding of the current state of ED visits for mental health issues. One large review suggests that population-level mental health has rebounded close to pre-pandemic baselines, with only a slight increase in depression.⁸ This is not necessarily good news; if we're right back where we started prior to the pandemic, we are still not in a good place.

It is clear to practicing EM physicians that caring for patients with mental health issues remains a pressing concern. Too many patients wait far too long in our EDs to receive necessary mental health care, causing needless suffering for both patients and caregivers. That's why ACEP is prioritizing mental health as a key focus for 2023, dedicating significant resources to the issue.

Behavioral Health Care Resources You Should Know About

One simple way you can mark Mental Health

Awareness Month is by making sure you know about the helpful tools and resources available to assist with emergent behavioral health:

- ACEP's Mental Health & Substance Abuse Information Papers web page is a very useful collection of articles offering insight into several pertinent ED practices, including:⁹
 - » Recent reviews of ED psychiatric care
 - » Advice on medication therapy during psychiatric emergencies
 - » Assessment of psychiatric safety in suicidal patients
 - » Practical solutions to boarding of psychiatric patients
- ACEP has relevant clinical policies and policy statements associated with ED Psychiatric Care:
 - » Critical Issues in the Diagnosis and Management of Adult Psychiatric Care in the ED¹⁰
 - » Adult Psychiatric Emergencies¹¹
 - » Pediatric Mental Health Emergencies in the ED¹²

- ACEP's advocacy efforts related to behavioral health care are documented on its website and will be recapped in person at the 2023 Leadership & Advocacy Conference.¹³

- The Coalition on Psychiatric Emergencies (CPE) is made up of a group of leaders in emergency medicine, psychiatry and patient advocacy who are focused on improving the treatment of psychiatric emergencies for patients and emergency providers.¹⁴

- ICAR2E is a point of care tool for managing suicidal patients in the ED.¹⁴

Behavioral Health is among the top priorities for ACEP President Chris Kang, MD, FACEP, and ACEP's Board of Directors. ACEP members who attended recent Council meetings can attest to the number of resolutions created around emergent behavioral health care. From these resolutions, several working groups were formed. Multiple objectives

CONTINUED on page 6

Creative CAREERS

Exploring unique career options
for emergency physicians

CHARLOTTE YEH, MD, FACEP

Chief Medical Officer for AARP Services, Inc.

Dr. Charlotte Yeh's day-to-day work as the CMO of the American Association of Retired Persons (AARP) Services, Inc., is a bit like emergency medicine, she says: "Every day is different with a different set of circumstances and range of problems to be solved." When she took the role in 2008, it was a newly created job tasked with expanding AARP's approach to making health products and services available to its members from third party companies. Because it was a new position, Dr. Yeh viewed it as an "incredible opportunity" to focus on the needs she felt were most pressing for adults aged 50 and older. AARP Services is a taxable subsidiary of AARP that manages relationships for a variety of products and services that carry the AARP name and are made available to AARP members by third party companies.

One of the primary areas of focus for Dr. Yeh is to lead the health care transformation initiative, which is a collaboration between AARP Services and third-party companies who make health-related products and services available to AARP members. When she took the job, Dr. Yeh was asked to work across AARP to examine what matters most to AARP members and how those learnings could inform a renewed perspective for health care innovation.

"We've learned a lot about people, about aging and the perception of aging. Some people do really, really well as they age, and other people don't," Dr. Yeh said. This observation has served as a catalyst for Dr. Yeh to work with organizations to analyze the "secret sauce of the 'thrivers'," and some key trends are emerging. "We are starting to understand the importance of what we now call personal determinants—having a sense of purpose, social connections, optimism, a positive view of aging—and how these personal determinants can help drive better health outcomes."

A big part of her role is to help support AARP's mission



CHARLOTTE YEH

to improve the quality of life for people as they age by identifying how the organization can be of value to over 50-aged population. "Almost all of my work is in this space of understanding what it is that the consumer needs and wants and how can that be delivered to them." It's easier said than

done, she said. It can be a challenge to build a business case around improving health care for older adults when many of the key contributors to geriatric health—loneliness, for example—are not easy fixes.

As a result of her work with AARP, Dr. Yeh says that she's also continued to think about age and ageism—and is passionate about aging as an equity imperative and a component of diversity, equity, and inclusion efforts. "Aging is one thing that we all have in common," noted Dr. Yeh.

Dr. Yeh's career has always been driven by her commitment and passion to affect change, and as Dr. Yeh moved on from the ED, she learned that being able to "go upstream" as part of her career path created a new vantage point for her to address health care challenges. Dr. Yeh's experience includes working as a carrier medical director for a Medicare payment contractor for five years. She then took a role with CMS during the stand-up for Medicare Part D, where she learned more about the regulatory, oversight, and audience pieces of the puzzle. As her career path unfolded, she also became involved with ACEP and the American Hospital Association. While her ED experience continues to serve as a catalyst for her work, all of these experiences have helped her embrace the art of consensus-building and how it can be put to work across an organization to create change.

Dr. Yeh believes emergency physicians have core skills that allow them to excel in careers outside the ED. "We are very systems-oriented, and we can hone problems. If you think about it, we know how to deal with people in their worst stage, under stress and fear, and we know how to create that calm." +

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- Emergency Medicine Myth-busting - Part 1
- Emergency Medicine Myth-busting - Part 2
- Getting Even Better at Pain Treatment
- Low Value Injury Care
- New Trends in Antibiotic Utilization
- Updates in the Care of Heart Failure

- OMI-NOMI: A New Paradigm for Coronary Ischemia
- OMI-NOMI: The OMI ECGs You Have to Know
- Racial and Ethnic Disparities in Emergency Care
- Pediatric Pearls
- ACEP Guidelines 2022: Acute Heart Failure Management
- Upping Your Game in Headache Care
- Sick Kids, New Ideas
- Strokes, Mini-Strokes, and TIAs
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- ED Staffing and Operations Forum*
- Diagnostic and Therapeutic Controversies*

Topics listed with an asterisk () are 90-minute faculty panel discussions; all other topics are 30 minutes.

Dates & Locations

Maui, Hawaii
March 4-8, 2023
Westin Maui Resort & Spa
Course Has Passed

Vail, Colorado
March 6-10, 2023
The Ritz-Carlton Vail
Course Has Passed

Las Vegas, Nevada
April 12-15, 2023
The Venetian
Course Has Passed

New Orleans, Louisiana
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The Roosevelt Hotel
Course Has Passed

Hilton Head, South Carolina
May 3-6, 2023
Hilton Head Island Marriott
Course Has Passed

Nashville, Tennessee
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Renaissance Nashville Hotel

San Diego, California
June 14-17, 2023
Coronado Island Marriott Resort & Spa

New York, New York
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Vancouver, BC, Canada
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The Westin Bayshore, Vancouver

Key West, Florida
Nov. 27 – Dec. 1, 2023
Casa Marina Key West, Curio Collection by Hilton



are being addressed by ACEP committees and will result in new and/or updated ACEP policies and publications over the next several months. A new clinical policy, “Critical Issues in the Evaluation and Management of Adult Prehospital or ED Patients Presenting with Severe Agitation,” is open for member comments until May 25, and the following resources are currently being updated:

- Pediatric Mental Health Emergencies in the ED
- Adult Psychiatric Emergencies policy statement
- ACEP Well-Being Resource Guide

ACEP is working closely with many partner organizations, including the American Psychiatric Association, the American Medical Association, the American Association for Emergency Psychiatry, the National Alliance on Mental Illness and more to assure that recommendations and solutions align with our on-going efforts in the area of emergent behavioral health care.

It’s also important to recognize the tools that exist in our communities of care; several are as close as a simple keystroke. Many EM clinicians across the country recognize the power of existing community information exchanges such as FindHelp and UniteUs that can provide lists of available community resources such as homeless shelters, behavioral health treatment centers, sobering centers and substance use disorder organizations, amongst other things. Access to relevant information on these platforms is often free of any charge, is easily available to the general public, is targeted by zip codes, and provides a wealth of information on available resources such as hours of operation, contact information, and resource website access.

Many of the individuals for whom we provide emergency mental health care have ongoing issues. In many cases, these individuals are connected with a number of additional practitioners within our communities of care, and if not, they probably should be. It’s easy to focus on the resources that we lack for ideal treatment, such as immediate psychiatric consultations or immediate housing placement. It’s worth the effort to recognize what resources of care exist within each of our communities and extend an outreach to understand them better and to proactively create plans of action together.

It’s likely you’ll be surprised at the amount of great work community-based organizations are conducting and the resources they can provide. These may help tremendously within the post-discharge world. There is a strong effort among most state and managed care organizations to increase outreach with high-risk individuals through the efforts of community health workers and others, often with a focus on lived experience within hired staff. Alternative options of care are growing rapidly within communities around the country, and it behooves us to connect with and be knowledgeable of the resources they can offer.

What’s Next?

Much work has already been done to address mental health emergencies, but much more remains. Our committee is working on additional articles related to behavioral health

concerns, including best practices in risk stratification, the initiation of medication, and more.

American EDs are responsible for managing millions of visits for mental health issues. Working together, EPs can and will continue to improve the care these patients receive, both inside and outside of the ED. 📌

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DR. ENGUIDANOS is the chair of ACEP’s Emergency Medicine Practice Committee (EMPC).



DR. MILLER is the Chief Medical Officer of Vituity. Dr. Miller leads an EMPC sub-committee focused on mental health issues in the ED. He is Founder/ CEO of Community Based Coordination Solutions.

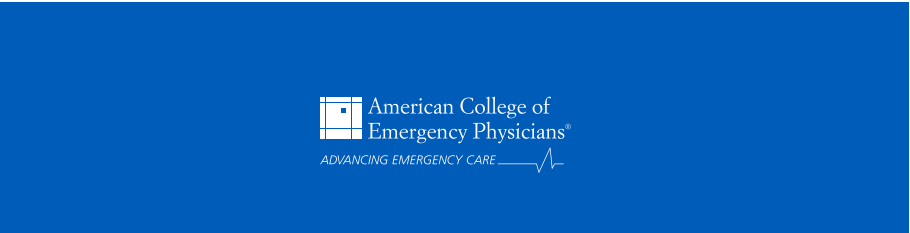


Thoughts from ACEP President Christopher S. Kang, MD, FACEP

The COVID-19 pandemic has indelibly disrupted our individual lives, local and national communities, and clinical practices. Throughout it all, emergency departments, staffed by you and your teams, remained open and steadfast. However, emergency medicine cannot continue to shoulder most of the health care system as various inadequacies persist and grow. Mental health patients have increasingly complex needs, fewer places for support, and board longer in the ED than medical patients. Left unaddressed, mental health care for patients and ourselves will challenge, even threaten, our security and humanity as well as the future wellbeing and trajectory of our workforce and specialty. Your individual and collective participation and collaboration are essential. And it starts with your willingness to learn and do more at the bedside and in your hospitals and sharing your stories, innovations, and successes.

Note: If you’re involved in significant innovations to address emergency mental health care, ACEP’s EM Practice Committee would love to learn more and highlight successful models. If you are willing to be featured, please send an email to ssahid@acep.org with a brief description.

Listen in: Dr. Kang will talk about behavioral health and physician mental health as our guest on the May episode of ACEP Nowcast. 📌



YOUR DUES DOLLARS AT WORK

Thanks to ACEP member dues, ACEP is the only EM organization with a seat on the RUC, the highly influential group that makes recommendations to the federal government on how physicians are paid.

This year alone, ACEP prevented proposed reductions in the relative value units (RVUs) assigned to the ED Evaluation and Management (E/M) codes.

So what does that mean? ACEP’s work prevented a **\$30 MILLION DOLLAR LOSS** for just Medicare patients treated with code 99284. When you factor in all patient visits using this code, the prevented loss is even greater!

Still unsure how that translates to your wallet? This alone keeps around **\$800** in every emergency physician’s pocket - more than the cost of national ACEP annual dues!

ACEP TELLS FEDS ABOUT EPS BILLING DISPUTE ISSUES

ACEP sat down with federal officials to discuss issues related to the federal dispute resolution process under the No Surprises Act and explained the unique aspects of emergency care and billing. We offered specific improvements to address issues ACEP members experience at every phase of the current IDR process.

FIGHT AGAINST NON-COMPETE CLAUSES

ACEP is amplifying concerns and opposition to non-compete clauses, which limit the right of emergency physicians to freely practice medicine in their communities. Join today to share your stories of how these predatory clauses have impacted you.

Hidradenitis suppurativa

HS hides in the shadows

TOGETHER, WE CAN
CHANGE THAT

Under-recognized and undiagnosed, patients with HS may suffer an average of up to 10 years before accurate diagnosis.¹⁻³ Meanwhile, HS may wreak havoc, causing irreversible scarring, debilitating pain, and emotional burden.²⁻⁵ If your patient suffers from recurring or persistent abscesses at flexural sites, consider referring them to a dermatologist. This may be HS.



Learn more about recognizing
HS and referral options at
[HS-Awareness.com](https://www.hs-awareness.com)



 NOVARTIS

Patient portrayal.

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Thank You

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CASE REPORT: A RARE COMPLICATION

SCROTAL PYOCELE

by V. MORGAN LEADBETTER, OMS III; NORA RADER, MD; AND BRANDON FISHMAN, DO

Case

A 37-year-old white male with no past medical history presented to the emergency department (ED) for left testicular pain, redness, and swelling. He had presented to urgent care for the same complaint a week before, but did not seek follow-up at an ED despite their recommendation. The pain and swelling returned days later, which prompted the patient to present to the ED. He described the pain as sharp, throbbing and radiating to the groin. He denied any urinary symptoms such as pain with urination or increased frequency. He was found to have a fever of 101.2 degrees Fahrenheit and tachycardia at 101 beats per minute on arrival to the ED. On physical exam the left testicle was diffusely erythematous and enlarged compared to the right. There was also focal tenderness to palpation near the top of the testicle. There were no rashes, discharge, or palpable inguinal hernias. The testicle did not appear to be malpositioned. Images from the testicular ultrasound are shown below.

Diagnosis: Complex Hydrocele (Pyocele)

The testicular ultrasound revealed a small left complex hydrocele suspicious for pyocele. Laboratory examinations demonstrated leukocytosis with a WBC of 32.51 k/mcL. On admission the patient had 3 of 4 Systemic Inflammatory Response Syndrome criteria with leukocytosis, fever, and tachycardia. The patient was immediately started on intravenous clindamycin and acetaminophen and an emergent urology consult was sought. Blood, urine, and sexually-transmitted-disease cultures were negative. His treatment course was uncomplicated and he was eventually discharged home with a course of oral doxycycline.

Discussion

A scrotal pyocele is a collection of purulent fluid in the potential space between the visceral and parietal tunica vaginalis surrounding the testicle.¹ It is a rare complication of epididymo-orchitis and is considered a urologic emergency which requires urgent identification and treatment as it can lead to testicular damage or Fournier’s gangrene.¹ Infections associated with epididymo-orchitis are commonly caused by sexually transmitted *Neisseria gonorrhoeae* or *Chlamydia trachomatis* in men under 35 years old. Infections in men over 35 are often caused by *E. coli*.^{2,3} Management involves empiric broad-spectrum antibiotics and, occasionally, surgical drainage. Some patients will end up with orchiectomy.^{1,2}

Teaching points:

- Scrotal pyocele can mimic other testicular etiologies, but should always be included in the differential, as it is a urologic emergency.
- Early treatment with broad-spectrum antibiotics is essential to prevent sepsis and preserve testicular function.
- Serial scrotal examinations are required to monitor for testicular ischemia in order to prevent need for orchiectomy. +

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DR. RADER works at Ascension Macomb-Oakland Hospital.

DR. FISHMAN is an associate program director at Ascension Macomb-Oakland Hospital.



Left testicle trans upper-lower scan image.



Left epididymis sag scan image.

PHOTOS: XXXX

Answer

The correct answer is acute chest syndrome (a).

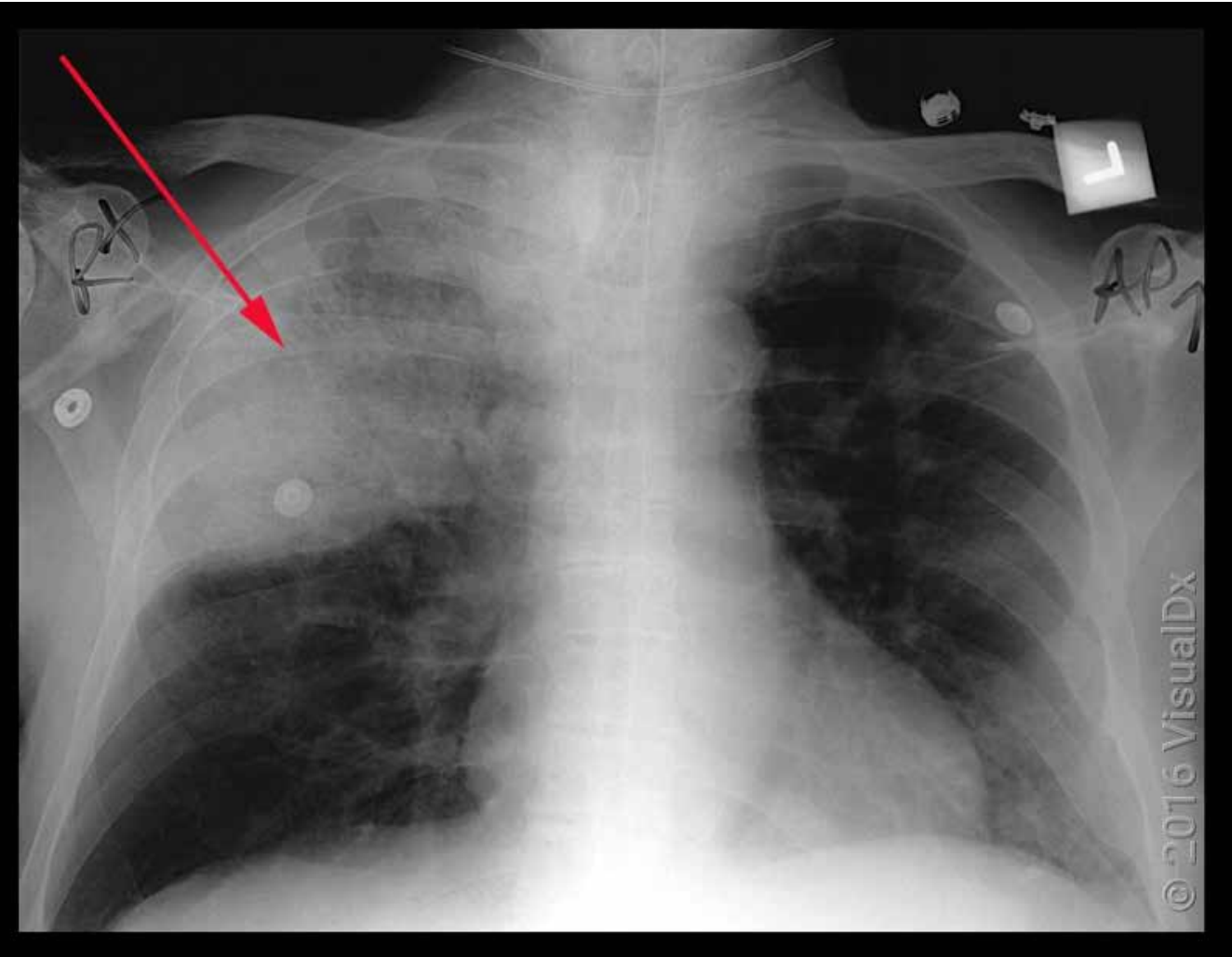
Acute chest syndrome (ACS) is a potentially life-threatening complication of sickle cell disease characterized by lung infiltrates, fever, and respiratory symptoms, including cough, tachypnea, wheeze, increased work of breathing or shortness of breath, and reduced oxygen saturation. ACS is the second most common reason for hospitalization in children and adults with sickle cell disease and is their leading cause of mortality. Management of ACS in children and adults is similar, although the disease is often more severe in adults, among whom it is associated with bone marrow and fat emboli. ACS can be triggered by an underlying infection or vaso-occlusive crisis, although in most cases, an identifiable trigger is not determined. Sickle cell disease is the primary risk factor for ACS. Within the population with sickle cell disease, the following are predictors for increased risk of developing ACS: young age, low fetal hemoglobin, leukocytosis, genotypes HbSS (sickle cell anemia) and HbSβo, asthma, tobacco exposure, recent surgery, or three or more severe veno-occlusive crises in the past year.

Management requires hospitalization for hydration, oxygenation, intravenous antibiotics, pain control, and blood transfusions and, in some cases, exchange transfusion.

Member Benefit: All ACEP members receive a 20 percent discount on VisualDX (acep.org/visualDX).

Reference:

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Acute chest syndrome (ACS) is a potentially life-threatening complication of sickle cell disease.

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FLAIL CHEST: NOT!

UNDERSTANDING THE NUANCES OF THIS OFTEN MISDIAGNOSED INJURY

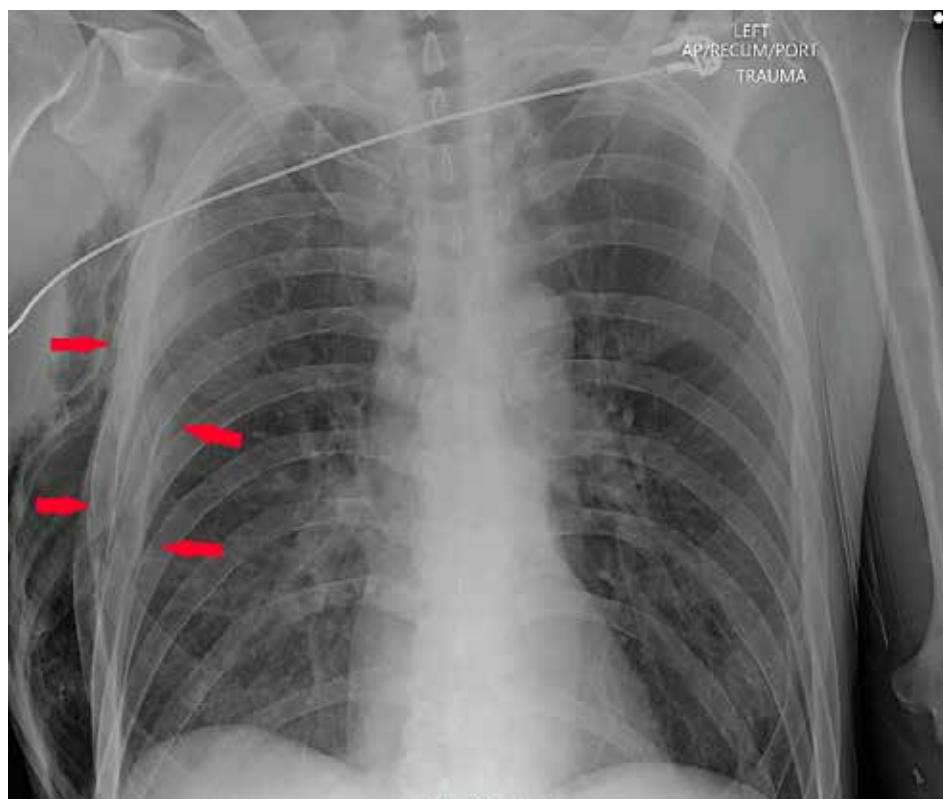


FIGURE 1: Chest X-ray of multiple rib fractures (arrows).

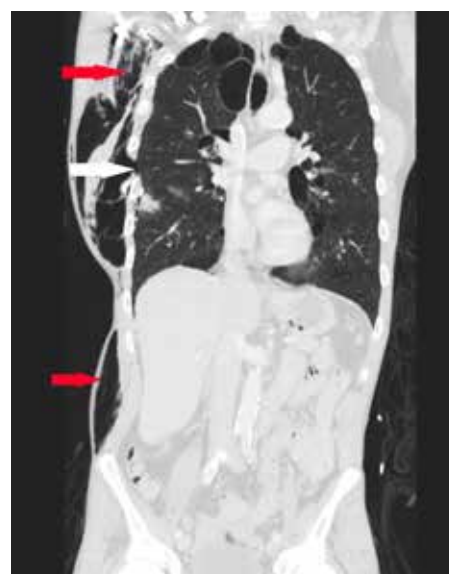


FIGURE 2 (LEFT): Axial chest CT of the chest wall defect (red arrow) and pneumothorax trauma (white arrows).

FIGURE 3 (ABOVE): Coronal CT lung window of subcutaneous air (red arrows), chest wall defect (white arrow).

PHOTOS: EFFRON

FIGURE 4: Chest X-ray OF post open reduction and interior fixation of rib fractures.



by ALIX MITCHELL, MD; WILLIAM BAUGHMAN, MD;
ROBERT JONES, DO FACEP; DAVID EFFRON, MD,
FACEP

Case

A 58-year-old male with a history of alcohol abuse presented to the emergency department (ED) as a category 2 trauma for a fall with a reported flail chest. The patient had been drinking with friends when he was witnessed to trip and fall a distance of one step. His right chest wall struck a protuberance, initially reported to be the edge of a stair and later noted to be tree stump. EMS recognized a chest wall deformity with movement of the chest wall, and a splint was devised and taped around his chest for what was suspected to be a flail chest. The splint consisted of a folded blanket placed over the mobile segment and held in place with tape. The patient complained of right chest wall pain and shortness of breath that improved once splinted. He denied syncope, head trauma, or any other complaints. His vital signs were within normal limits except for a respiratory rate of 23 with a room air pulse oxygen in the upper 90s. Exam was notable for bilateral breath sounds though diminished on the right, with a mobile segment on the right lateral chest wall. The patient experienced significantly more discomfort with the splint removed and it was reapplied during his trauma bay evaluation. There were no open wounds and the remainder of his exam was unremarkable.

Trauma imaging was performed including bedside X-rays of the chest and pelvis. The chest X-ray showed multiple displaced right rib fractures and chest wall subcutaneous emphysema without definitive evidence of a pneumothorax, as well as right lower lobe atelectasis versus contusion (Figure 1). The patient was placed on oxygen for his dyspnea, administered pain medication, and was taken for computed tomography (CT). CTs of his head, spine, chest, abdomen, and pelvis were performed. A chest CT demonstrated multiple displaced right lateral rib fractures with direct communication between the pleural space and the soft tissue. There was evidence of a decompressed pneumothorax into the soft tissues of the right lateral chest wall with evidence of developing tension within the soft tissues. Extensive subcutaneous emphysema was dissecting from the chest disruption superiorly into the neck and inferiorly into the lower chest and abdominal wall (Figures 2 and 3).

Trauma labs were notable for a lactate of 3.0 mmol/L and a serum ethanol level of 160 mg/dL.

On re-evaluation, the chest wall movement was noted not to be following the paradoxical movement typical of flail segments. Instead, the flail segment was bulging outward with both inspiration and expiration (see Figure 4 video). The trauma team placed a pigtail catheter in the right chest cavity to decompress the pneumothorax and the patient was admitted to the surgical intensive care unit.

The patient continued to have an oxygen requirement and significant pain. On hospital day 2, he was taken to the operating room for surgical rib fixation. A chest tube was placed at that time. On postoperative day 5, the chest tube was removed, and he was discharged the following day (Figure 5).

Discussion

Displaced rib fractures can injure lung tissue and cause a pneumothorax. In this case, the patient's pneumothorax was decompressed into a large soft tissue defect in his chest wall. The extensive chest-wall disruption resulted in soft tissue emphysema that was bulging with respirations mimicking a flail chest. A flail chest is defined by multiple fractures in three or more consecutive ribs with paradoxical movement of the resulting chest wall segment.

Flail chest can result in respiratory failure. Initial management includes analgesia and positive pressure ventilation to

CONTINUED on page 22



DR. MILNE is chief of emergency medicine and chief of staff at South Huron Hospital, Ontario, Canada. He is on the Best Evidence in Emergency Medicine faculty and is creator of the knowledge translation project the Skeptics' Guide to Emergency Medicine (www.TheSGEM.com).

When Emergency Physicians are Fatigued

How the data points to sleep deprivation in the emergency department

by KEN MILNE, MD

Case

It's 7 a.m. and your day shift relief finds you face-down, asleep, and drooling on the desk. They gently wake you up to get handover. You confess to your colleague that shift work is killing your circadian rhythm and worry that fatigue could impact your clinical judgement.

Clinical Question

Are emergency physicians spending a significant amount of time on shift in an impaired state of fatigue?

Background

All shift workers are likely aware of the negative impact shift work has on sleep quality. However, we may not appreciate how our interrupted sleep schedules can impact our overall health.

Shift work is associated with increased rates of cancer, cardiovascular disease, and accidents.¹ Many of us probably know of a colleague who has been in a motor vehicle collision when driving home from work.

While the personal risk is important, a big concern for physicians is that fatigue could impact the care we provide for our patients. Even moderate levels of fatigue can impact performance similarly to being intoxicated with alcohol.²

There are studies from other industries that show errors can increase by as much as 30–50 percent on night shifts. Most of the available evidence in medicine comes from studies on residents.³ It shows an association between fatigue and clinical errors, impaired cognition, reduced empathy, and increased interpersonal conflict. There is little to no evidence of the clinical impact of fatigue on practicing emergency physicians.

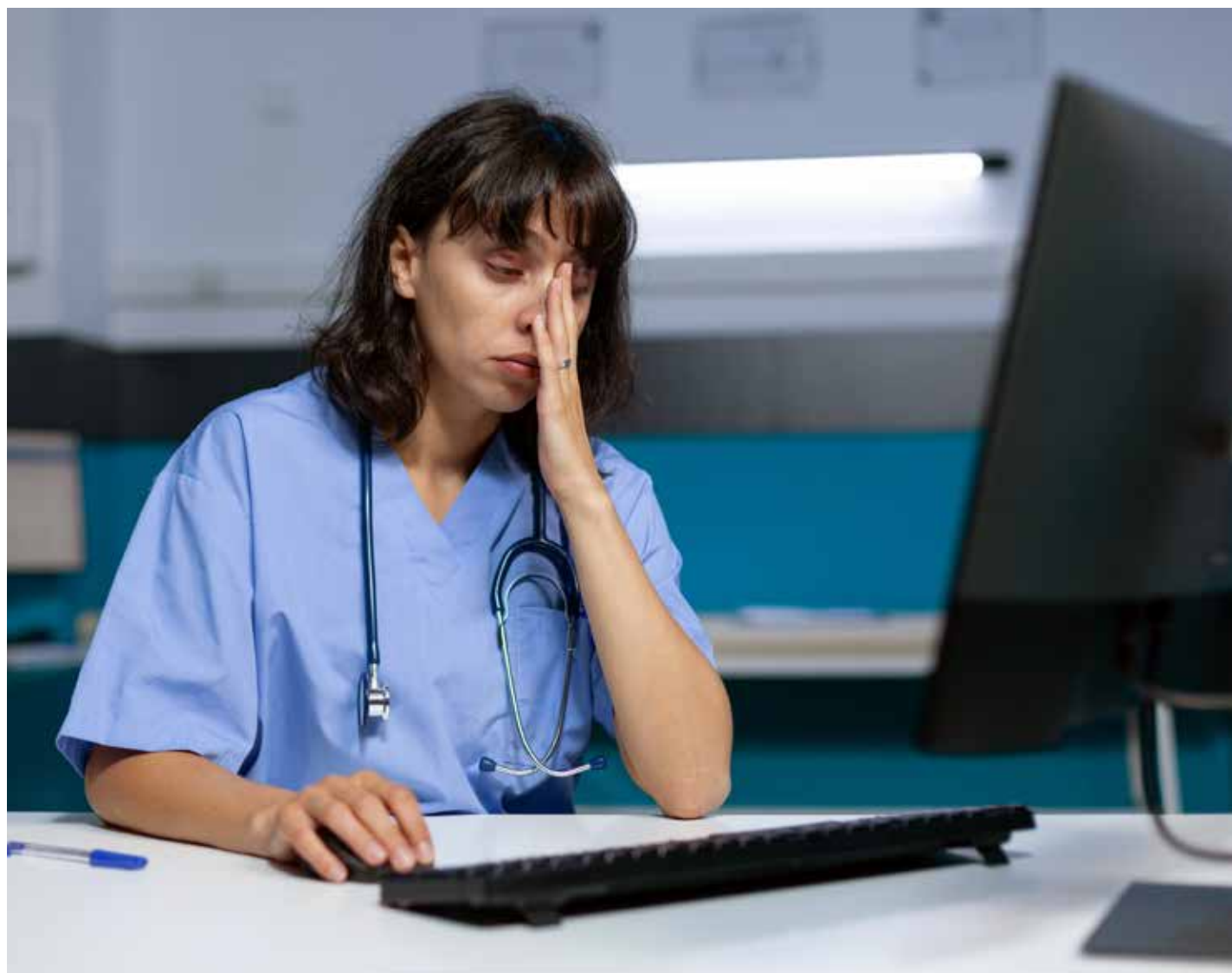
Reference: Observational study by Fowler, et al., seeking objective evidence for sleep and fatigue risk in emergency medicine physicians⁴

Participants: A convenience sample was used of emergency physicians from a single academic emergency department.

Data sources and measurement: Sleep periods recorded with actigraphy, using a commercially available device that measures wrist movement

Authors' Conclusions

"Fatigue is an issue for many emergency physicians. The present study addressed the percentage of time emergency physicians are in a fatigued state when on shift over an extended duration of time. More research is needed to examine system-level interventions for reducing fatigue in emergency physicians."



Results: Seventeen emergency physicians in a department of 131 volunteered to participate in the study. Nine were female and two were full-time nocturnists.

A "Readiscore" fatigue score was measured before and during clinical shifts. This score consists of three factors: sleep quality, sleep duration, and sleep efficiency (total sleep time divided by total time in bed).

Over a two-month period they collected data on 392 shifts (23 shifts per participant).

Key Result: Almost 25 percent of the time on shift the emergency physicians had fatigue scores indicating significant impairment.

Primary Outcome: Readiscore fatigue score (sleep quality, duration, and efficiency)

- **Sleep Quality:** Average, 7.7 out of 10 (Standard Deviation [SD], 1.84), indicative of poor sleep quality
- **Sleep Duration:** Mean number of hours slept per night was 6.77 (SD, 1.84)
- **Sleep Efficiency:** Mean 87 (SD, 9)
 - » Participants spent 725 hours (23.52 percent) on shifts with fatigue scores indicative of significant impairment

EBM Commentary

1. Selection Bias: Only 13 percent (17 out of 131) of the emergency physicians volunteered to participate. Perhaps those who participated were suffering from sleep issues or those who decided not to volunteer were too tired to be involved.

2. Hawthorne Effect: Participants knew they were in a study focused on sleep. It is possible that simply by being observed they changed their usual sleep habits. This could have impacted the results of the study.

3. Lack of a Comparison: How do these scores compare to other medical specialties or health care workers (nurses, physician assistants, diagnostic imaging, laboratory technologists, etc.)? Are emergency physicians sleep-deprived more, less, or at the same level as others?

4. The Readiscore and Clinical Significance: We do not know from this data whether a poor Readiscore, which indicates significant impairment, results in a clinically important poor patient outcome.

SGEM Bottom Line

Fatigue is a serious issue for emergency physicians' health, and we need to find ways to mitigate the negative personal impact and any potential negative impact on patient care.

sicians' health, and we need to find ways to mitigate the negative personal impact and any potential negative impact on patient care.

Case Resolution

You decide that, after going home and getting some much-needed rest, you are going to email the chief of the department, asking that the issue of sleep and fatigue be discussed at the next department meeting.

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

Thank you to Dr. Justin Morgenstern, an emergency physician and the creator of the #FOAMed project called www.First10EM.com for his help on this review. 🍕

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DR. MARCO is associate editor of *ACEP Now*.

Law Enforcement Information Gathering in the ED

Should patients talk to the police?

by CATHERINE A. MARCO, MD, FACEP;
EILEEN F. BAKER, MD, PHD, FACEP

Case

A 32-year-old man presents in police custody for bizarre behavior. He was the driver of a vehicle which struck a telephone pole. He was reportedly singing and dancing naked in the street following the motor vehicle collision. The police would like to ask him some questions about what happened. Should the patient talk with the police? What is your role as the emergency physician?

Introduction

Law enforcement officers frequently accompany emergency department (ED) trauma patients or patients who are under arrest or require assistance. At times, law enforcement officers may request assistance from ED staff to gather information or evidence. Ethical dilemmas may arise when balancing the physician's moral duty to act in their patients' interests and protect patient confidentiality with the physician's legal obligations.¹ ACEP's Policy Statement, "Law Enforcement Information Gathering in the Emergency Department," provides guidance for these situations. The policy states that physicians can release patient information to law enforcement in three situations:

1. The patient consents to the release of the information
2. The law mandates that physicians report such information
3. Law enforcement officers provide a subpoena or court order²

Confidentiality

Protecting patient confidentiality is an important duty.³ One of the clauses of the Hippocratic Oath states: "Whatever I see or hear in the lives of my patients, whether in connection with my professional practice or not, which ought not to be spoken of outside, I will keep secret, as considering all such things to be private."⁴ This obligation to protect patient privacy is also iterated in federal and state laws, including the Health Insurance Portability and Accountability Act of 1996 (HIPAA).⁵ Any identifiable information is considered PHI (Protected Health Information). Specific elements considered PHI include:

- Names
- Dates, except year
- Telephone numbers
- Geographic data
- Fax numbers
- Social Security numbers
- Email addresses
- Medical record numbers
- Account numbers
- Health plan beneficiary numbers
- Certificate/license numbers



- Vehicle identifiers and serial numbers including license plates
- Web URLs
- Device identifiers and serial numbers
- Internet protocol addresses
- Full face photos and comparable images
- Biometric identifiers (i.e., retinal scan, fingerprints)
- Any unique identifying number or code

There are important exceptions to confidentiality, to protect the patient and/or the public.⁶ All states have mandatory reporting laws that establish a duty to report certain types of abuse or mistreatment to state and local authorities. Report of other conditions of public health concern also may be required (for example, tuberculosis, gonorrhea, etc.). Most states also have requirements to report specific injuries, such as gunshot wounds and knife wounds.

Evidence Collection

In some cases, the law or subpoena may direct law enforcement to ask the physician to physically obtain evidence from the patient, such as via blood draw or invasive examination. If a procedure or examination is not medically indicated, and the patient does not consent, it is not appropriate for it to be performed against the patient's will in the ED. If a law enforcement request is in conflict with the patient's wishes, the institution's legal counsel should be sought. Further, emergency physicians may conscientiously refuse to carry out or comply with legal orders that violate the rights or jeopardize the welfare of their patients, recognizing that there may be legal repercussions for these decisions.

Conclusion

Emergency physicians may encounter requests for law enforcement information gathering in the ED. Patient confidentiality and patient autonomy should be prioritized.

In this case, the patient's decisional capacity

should be examined. The patient who possesses appropriate decisional capacity has the right to refuse to speak with the police. If the patient lacks decisional capacity, it is appropriate for the emergency physician to advocate for the patient by requesting information gathering at an appropriate time when the patient can consent.

ACEP Policy

Law Enforcement Information Gathering in the Emergency Department

Revised June 2017 and April 2010 and originally approved September 2003

The American College of Emergency Physicians (ACEP) believes that emergency physicians have a fundamental professional responsibility to protect the confidentiality of their patients' personal health information. Federal and state laws, including the federal health information privacy regulations implemented under the Health Insurance Portability and Accountability Act (HIPAA), articulate and reinforce this responsibility.

ACEP recognizes that law enforcement officials perform valuable functions in the emergency department (ED), and that one of these functions is investigation of criminal acts. As part of these investigations, law enforcement officials may request personal health information gathered in the ED. Emergency physicians may honor these requests only under the following circumstances:

1. The patient consents to release of the requested personal health information to law enforcement officers, or
 2. Applicable laws or regulations mandate the reporting of the requested personal health information to law enforcement officers, or
 3. Law enforcement officers produce a subpoena or other court order requiring release of the requested information to them.
- Law enforcement officers may, in some situations, present search warrants or other

court orders as grounds for requesting or directing that emergency physicians perform physical examinations, collect physical evidence, perform diagnostic tests, or conduct body cavity searches on ED patients who refuse these interventions. These situations present emergency physicians with difficult conflicts between obligations to respect patients' refusals of treatment, to promote trust in the therapeutic relationship, and to protect patients from harm, on the one hand, and obligations to obey legal authorities and to carry out socially imposed mandates to promote public health and public safety, on the other hand. ACEP believes that emergency physicians must make considered judgments regarding which set of obligations is more compelling in these specific situations. Emergency physicians may conscientiously refuse to carry out or comply with legal orders that violate the rights or jeopardize the welfare of their patients, recognizing that there may be legal repercussions for these decisions. These repercussions may include contempt of court or malpractice claims.

In their interactions with ED patients, law enforcement officers may use video or audio recording devices. These recordings may include interaction or communication between ED patients and physicians or other ED staff only with the consent of all parties.

Law enforcement information gathering activities in the ED should not interfere with essential patient care. ➔

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NASA

NASA's international astronaut corps awaits the announcement of the four crewmembers of the Artemis II crew that will travel around the Moon during a Monday, April 3, 2023, crew announcement news conference at Ellington Field near NASA's Johnson Space Center.



KRIS LEHNHARDT

Dr. Kris Lehnhardt



NICHOLAS HEFT

Dr. Nicholas Heft



HAIG AINTLABIAN

Dr. Haig Aintlabian

RESIDENT VOICE | CONTINUED FROM PAGE 1

emergency-physician astronaut rapidly uses a hand-held ultrasound (US) machine to diagnose her with acute cholecystitis. Earth is seven months away, but the physician has trained for this. She takes the astronaut to the medical bay, and with the assistance of her teammates, runs labs, starts intravenous fluids and medications, and prepares to place an US-guided drain.

The Future of Space Medicine

Aviation medicine—the predecessor of today's space medicine—has been around since the early 1900s, when aviation first took flight. Only a few decades later, President John F. Kennedy launched the nation's space dreams. Though the technological difficulties seemed insurmountable to some, by 1969, the United States had achieved that dream of going to the Moon and returning safely to Earth. By 1998, the first element of the International Space Station was launched, and today, space tourism is a commercial enterprise, academic and commercial endeavors are eyeing low Earth orbit, and a return to the Moon and voyaging beyond to Mars are the next steps in space travel.

But how does the human body cope with the extreme environments of space? Our understanding of the effects of space on human anatomy and physiology is ever-expanding, and space medicine has grown to fill that niche. As Kris Lehnhardt, MD, the element scientist for exploration medical capability at the NASA Johnson Space Center and an emergency physician at Baylor College of Medicine, both in Houston, notes, "Some physiologic changes that occur in space are good—for example, less muscle mass in the

legs is helpful in zero-gravity. The problems often occur when you return home—or to any celestial body. If you haven't used effective countermeasures to maintain your body in an Earth-like state, the stresses of gravity become problematic. One of our jobs is to figure out what those changes are, especially in the long term when you're thinking about three-year missions to Mars, and to come up with appropriate countermeasures."

While the National Aeronautics and Space Administration (NASA) has long provided cutting-edge research and medical advancements in space, the field is now expanding into the commercial sector and the need for more expertise is high. New space-medicine fellowship programs are coming to fruition to meet these demands of the space industry, with emergency medicine (EM), a pioneer and trailblazer among medical specialties, playing a role. In 2022, both the University of California Los Angeles (UCLA) and the University of Texas Health Science Center at Houston (UTHealth Houston) inaugurated their space medicine fellowship programs with Haig Aintlabian, MD and Nicolas Heft, MD, respectively, as their fellows. Both are EM physicians.

Other aerospace medicine programs, such as the residency through the University of Texas Medical Branch, focus on public health and preventive medicine and are certified through the American Board of Preventive Medicine. These new programs at UCLA and UTHealth Houston distinguish themselves by concentrating on acute medicine rather than preventive medicine. As Dr. Heft puts it, "One day in the near future, we will need physicians who are trained and equipped to provide acute care on missions that take you beyond the imme-

diate reach of Earth. From low Earth orbit, it only takes several hours to return to Earth and receive top-tier medical assistance, but what about from the Moon? From Mars? Or even further?"

Although physicians will always be needed for ground support, EM physicians are particularly well prepared for this evolution into a mission-integrated role. "We're the Swiss army knife of specialties," Dr. Aintablian notes. "If you're a great terrestrial doctor, you'd likely make a great space doctor. We have 80–85 percent of the skills already. The space medicine fellowship focuses on closing those knowledge gaps: how to perform regional blocks, advanced dental procedures and extractions, US-guided nephrostomy and cholecystostomy tube placements, appendectomies, and long-term management of medical problems and psychiatric illnesses." This last skill, they all agree, is likely the most important of all. On a months- or years-long journey with no escape and no quick way back to Earth, psychological stress builds up. Professional therapy and medication management en route can be both preventative and therapeutic. As such, in addition to rotations with surgery, orthopedics, ophthalmology, dentistry, and anesthesia, the space fellowships include psychiatry components. All this while maintaining EM clinical competency and learning the key tenets of aerospace medicine and biomedical engineering.

"The engineering aspect to our training teaches us how to integrate medicine into the design of the spacecraft, from spacesuits to medical devices," Dr. Aintablian explains. "Given the mass and physical space restrictions, we need to learn how to make things smaller, lighter, and smarter, and we need to learn how to communicate and interface with our engineers in that regard." A space physician, then, must be trained in the foundations of engineering design but must also improvise with limited resources. Perhaps this is why EM physicians can be such a natural fit for the role—we are an inventive field that thrives in critical thinking and innovation.

Although both new space-medicine fellowship programs are currently for EM-trained physicians only, all three space physicians are hopeful that this will change. "EM doctors are certainly not the only ones who should be training to fill this gap," Dr. Heft states. "We are currently diving into this field of providing acute care in space, but we are only one component of the cadre of doctors that will be needed to make humans a multi-planetary species. It's a team effort and doesn't belong to just one medical specialty. Of course, the ultimate priority is the safety of the crew and the combination of both preventative *and* acute care to ensure their safe return." Their views on diversity extend to space travel as well, and they embrace the expansion of space travel to non-NASA astronauts as a natural next step in the development and evolution of space flight. As Dr. Aintablian puts it, "If space isn't accessible to everyone, even to people with chronic medical problems, then it's really not as exciting."

Job opportunities for well-trained space-medicine doctors continue to grow, from NASA to the private space industry. The applications of their innovations, however, are not just limited to space. The technologies from space adapt to extreme environments or resource-limited settings on Earth. As Dr. Lehnhardt explains, "Some of our biggest obstacles in space include communication delays, limited diagnostic capability, and resource efficiency. We are at the forefront of developing new tech-



The crew of NASA's Artemis II mission (left to right): NASA astronauts Christina Hammock Koch, Reid Wiseman (seated), Victor Glover, and Canadian Space Agency astronaut Jeremy Hansen.

WANT TO LEARN MORE ABOUT SPACE MEDICINE? CHECK OUT THESE RESOURCES:

- UTMB Principles of Space Medicine Course (July) (www.utmb.edu/spph/aerospace-medicine/principles-of-ASM)
- NASA Aerospace Medicine Clerkship (October and April) (www.nasa.gov/feature/aerospace-medicine-clerkship/)
- Principles of Clinical Medicine for Space Flight (textbook) by Michael Barratt, Ellen Baker, Sam Pool. (<https://link.springer.com/book/10.1007/978-1-4939-9889-0>)
- Fundamentals of Aerospace Medicine (textbook) by Jeffrey Davis, Jan Stepanek, Jennifer Fogarty, Rebecca Blue. (<https://mayoclinic.pureelsevier.com/en/publications/fundamentals-of-aerospace-medicine-fourth-edition>)
- Space Physiology and Medicine (textbook) by Arnauld Nicogossian, Richard Williams, Carolyn Huntoon, Charles Doarn, James Polk, Victor Schneider. (<https://books.google.com/books?id=-NG4DQAAQBAJ>)
- UTMB Aerospace Medicine Residency (<https://www.utmb.edu/spph/aerospace-medicine/residency-program>)
- Mayo Clinic Aerospace Medicine Fellowship (<https://college.mayo.edu/academics/residencies-and-fellowships/aerospace-medicine-fellowship-minnesota/>)
- UCLA Space Medicine Fellowship (www.emergencymedicine.ucla.edu/education/fellowships/space_medicine)
- UTHealth Houston Space Medicine Fellowship (med.uth.edu/emergencymedicine/sections/space-medicine-fellowship/)

nologies for these austere settings." One example Dr. Lehnhardt gives is a current NASA project to create intravenous fluids from potable water. This strategy avoids wasting expired intravenous fluids in space; on Earth the process could see use in disaster zones or remote rural hospitals.

Space medicine may not really be the final frontier—after all, we are always learning to push the boundaries of medicine and human

capability—but it does provide a whole new field of study, a subspecialty whose intricacies and innovations will have ramifications on Earth as well as among the stars.

"We're at an inflection point in space medicine with our needs and demands changing," Dr. Lehnhardt muses. "The next 10 to 20 years will see a rapid growth in space travel, which makes this an exciting time to be in space medicine." ➕

By the Numbers

Emergency Medical Technician (EMT) Shortages

2022

36%
TURNOVER

50%
EARN \$21–\$30/hour

40,000
PROJECTED EMT NEED
2016–2030

6 STATES LOWERED AGE
REQUIREMENT TO 16

LOUISIANA EMS TRAINING IN HIGH SCHOOL

2,000

EMERGENCY MEDICAL
"RESPONDERS"

TEXAS

70%
EMTS NOT WORKING IN
AMBULANCES

SOURCE

Mercer M. States strive to reverse shortage of paramedics, EMTs. PEW Charitable Trust website. <https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2023/02/06/states-strive-to-reverse-shortage-of-paramedics-emts>. Published and updated February 6, 2023. Accessed April 26, 2023.

Forensic Evaluation of Motor Vehicle Accidents

Assessing patients and informing police of possible outcomes

by RALPH J. RIVIELLO, MD, MS, FACEP; AND HEATHER V. ROZZI, MD, FACEP

Case

A 35-year-old male is brought to the emergency department (ED) following a single-motor-vehicle collision in which two people were ejected and pronounced dead at the scene. The patient was not ejected but was found sitting outside of the vehicle and seems to be intoxicated. He is completely amnesic to the events of the accident. EMS reports starring and significant damage to the windshield and show you a picture (Figure 1). Primary survey is intact and he is hemodynamically stable. Secondary survey reveals two forehead lacerations and contusions, a seatbelt sign (Figure 2), and right upper quadrant tenderness to palpation. Imaging and lab studies are ordered. The police officer is working with nursing staff to draw a legal blood alcohol when he asks you, “Hey doc, can you tell if the patient was the driver or not?”

Discussion

There were over 2.1 million ED visits for injuries from motor vehicle accidents (MVAs) in 2020.¹ The patient’s location within the vehicle, the speed and site of impact, and use of restraint systems such as seat belts and airbags determine the type, location, and severity of injuries sustained by a patient involved in an MVA. The emergency physician’s documentation of these injuries may prove to be crucial in law enforcement’s reconstruction of the crash and may have significant implications for subsequent legal proceedings.

In frontal collisions, the motion of the vehicle occupant continues in the direction of travel until it is stopped by the restraint system, the interior of the vehicle, or a surface outside the vehicle. In the case of an unrestrained driver, the most common locations of impact are the steering wheel, the instrument panel, and the windshield (most commonly resulting in head injury). Unrestrained passengers tend to strike the windshield and dashboard, often sustaining trauma to the head, thorax, and legs. Vehicle occupants wearing seatbelts may sustain injury to the cervical spine as a result of abrupt deceleration as well as blunt trauma to the chest, abdomen, and pelvis.

Other patterned injuries may be seen on the thorax from the seatbelt, steering wheel, airbag, or airbag cover, or to the lower extremities from the pedals. Additionally, the distribution of injuries on the patient’s body may, when considered along with the pattern of damage to the vehicle, help law enforcement determine the patient’s location in the vehicle. The classic “seat belt sign,” if present, may show in which side of the vehicle the patient was seated. Clavicular and humeral fractures are more common in passengers than in drivers. Drivers frequently sustain hand, wrist, and elbow injuries, while passengers rarely have hand fractures.²

Safety Innovations

One major safety innovation in motor vehicles is the type of glass used for car windows. Windshields are made of laminated safety glass. Laminated glass is two sheets of glass that are fused together with a thin, clear, vinyl layer in the middle, forming a very strong piece of glass. The vinyl layer is added to ensure that the windshield stays intact even when it is broken. Theoretically, this glass prevents ejection and minimizes injury. This causes the “spider web” pattern described when an occupant hits the windshield. Common injuries from windshield



FIGURE 1 (ABOVE): EMS Photo of damaged windshield showing star/spider web pattern from impact of occupant



FIGURE 2 (LEFT): Patient’s chest with seatbelt sign oriented from right shoulder to left lower chest

KEY POINTS

- Motor vehicle collisions are commonly seen in the ED.
- Vehicular safety innovations may contribute to unique injuries.
- Patterned injuries may help determine position within the vehicle and predict types of injuries.
- Emergency physicians should thoroughly document the injuries seen in these patients, including descriptions of patterned injuries and orientation of seatbelt signs. Photo documentation can be helpful.

impact include: multiple, irregularly shaped facial lacerations; corneal abrasions; and ocular injuries.^{3,4}

Door and rear windows are made of tempered glass. Tempered glass is specially treated so that when it breaks, it shatters into many small cube- or pebble-like pieces. These smaller pieces are typically not sharp and are designed to lessen injury to occupants during collisions. The injuries seen are mostly due to the blunt force, rather than sharp force. Injuries caused by this type of glass are referred to as dicing injuries. They are mostly superficial and described as multiple, small, irregular, L-shaped or angulated injuries to the side of head, face, and neck. Location of the injury may give a clue to the patient’s position in the vehicle. Left-sided injury usually indicates positioning on the driver’s side of the vehicle. These injuries may contain foreign bodies.

Legal Considerations

Labs such as an ethanol level and a urine drug screen may not necessarily change the management of the patient injured in an MVA. However, many hospitals include these labs within their trauma protocols. Law enforcement may also present with a subpoena for specific lab testing. It is important to know the protocols and regulations where you work.

Complete documentation of injuries in patients who have been involved in an MVA should include a narrative description with either body maps or photographs of the injuries. This documentation, along with examination of the vehicle, may assist law enforcement in determining the location of a patient in the vehicle and reconstructing the accident, and may assist in legal proceedings.

Case Resolution

Based on the directionality of the seatbelt sign from right to left, you inform the officer that the patient was most likely not the driver and was seated on the passenger side of the vehicle. ➔

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PROTECT YOUR
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THE END OF THE RAINBOW



DR. DAHLE blogs at whitecoatinvestor.com and is a best-selling author and podcaster. He is not a licensed financial adviser, accountant, or attorney, and he recommends you consult with your own advisers prior to acting on any information you read here.

Lessons Learned from the SVB Meltdown

How you can be
cautious with
your cash



by JAMES M. DAHLE, MD, FACEP

Question

I was shocked to see bank runs in March 2023. I thought those went away after regulatory changes in the Great Depression. What takeaway should there be from the troubles that Silicon Valley Bank (SVB) and other banks had during March 2023?

Answer

In March 2023, depositors of SVB engaged in a classic “bank run” that resulted in the Federal Deposit Insurance Corporation (FDIC) stepping in and putting the bank into receivership. There were a number of factors that made SVB particularly susceptible to this problem, but all banks are susceptible to a bank run. The reason for this is because the money you lend to a bank does not stay at the bank. The bank lends it out. Our banking system is also a “fractional banking” system, meaning that the bank can and does lend out even more money than it takes in in deposits. This all works just fine, unless all the depositors want all their money back all at once. Obviously, the more a bank lends out, the more money it can make in the good times, but the higher risk of a bank run. So regulations have been put in place over the years that limit how much a bank can lend out, and what kinds of assets and how much of them it must keep to pay the demands of depositors.

In the case of SVB and many other banks, the assets the bank holds are relatively safe

Treasury bonds (Treasuries). However, while Treasuries are guaranteed by the U.S. government, a holder of a Treasury must hold it until maturity to be guaranteed to receive their entire principal back. If they sell it prior to maturity, it will be sold for a gain if interest rates have fallen and for a loss if interest rates have risen. Since interest rates went up dramatically in 2022, Treasuries that must be sold early, especially long-term Treasuries, will be sold at a severe loss. This made it even more difficult for SVB to raise funds to meet depositor demands during a bank run.

Lessons Learned

There are number of lessons to learn from this situation. The first is to avoid buying long-term assets with short-term debt. Bank deposits are the ultimate in short-term debt, since they can be called at any time. A bank has to do this to a certain extent, of course, but in your personal life it should be avoided. Homeowners doing this en masse with adjustable-rate mortgages contributed to the Global Financial Crisis of 2008. If SVB had not “reached for yield” by buying long-term Treasuries and had stuck with short-term Treasuries instead, it would not have been in such a mess.

The second lesson is to understand and take advantage of FDIC (and National Credit Union Administration (NCUA), the credit-union equivalent) limits. Essentially, the federal government insures bank deposits up to \$250,000 per depositor per bank. So, if you have more than \$250,000 in cash, it would be

wise to split it up between different banks so it is all insured. While this is not always possible, it is generally a good practice.

The third lesson is that the government will often do more than it is required to do. The FDIC was only required to back up \$250,000 of depositor money, but it essentially stepped in and insured all SVB deposits to prevent systemic risk to the financial system. While concerned about the moral hazard of “bailing out” businesses, the government felt that letting the bank—and its investors—fail without hurting depositors was the proper place to draw the line in these circumstances. The government has done similarly unexpected things in the past, such as the recent three-plus-year student-loan holiday. While you cannot count on these sorts of interventions, you can take advantage of them when they do occur. This particular action should make you a little more comfortable to keep more than FDIC limits in a single bank. It would not be surprising to see future Congressional bills and regulatory action directed at raising FDIC limits, either with or without requiring an insurance premium to be paid by the depositor.

The fourth lesson is that even successful businesses need back-up banking plans. The problem with the SVB crisis that required the government to step in was that it was about to affect the lives of everyday people. Their employers banking at SVB were profitable businesses with plenty of cash. However, through no fault of their own, they could not access that cash to make payroll and were facing

possible loss of that cash. If they had some of their money elsewhere, even at a second bank, this would not have been nearly as much of a problem.

Cautious with Cash

The fifth lesson is that banks are not great places for you to invest large amounts of cash. While there have been times the last few years when a high-yield savings account paid more than money-market funds, that is no longer the case. As of this writing (in March 2023), the best money-market funds are paying over 4.5 percent while most high-yield savings accounts are only paying around 3.6 percent and the average savings account yield is 0.35 percent. If you have a need to hold large amounts of cash for any length of time longer than a few days, you are far better off linking your bank account to a high-quality money-market fund at one of the big mutual fund companies and moving money back and forth as needed. Not only will you earn a higher yield, but there is no risk of a bank run on a money-market fund. Money-market funds do not engage in fractional banking.

Banking is an important part of all our financial lives. However just like our currency, the fractional-banking system requires a certain amount of trust. When that trust is eroded, severe economic disruption can occur for society as a whole. To minimize risk, be careful how you and your businesses interact with that banking system. ☕



8 Pitfalls in Recognition and Management of Acetaminophen Toxicity

How to be better equipped to take care of your next acetaminophen toxicity patient

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

About one billion doses of acetaminophen are taken safely per annum, and 60 million people in the U.S. take acetaminophen on a weekly basis.^{1,2} With such enormous popularity it is no surprise that each year there are 56,000 emergency department (ED) visits, 2,600 hospitalizations, and 500 deaths in the U.S. related to acetaminophen toxicity.² Some cases of acetaminophen toxicity are simple



to recognize and manage, such as an intentional single recent ingestion of a large number of regular-release acetaminophen with no co-ingestions in an otherwise healthy patient. Unfortunately, most cases are not so simple, with half of them being unintentional

overdoses, many with a delayed presentation; some with delayed-release formulations, combined formulations, or co-ingestions, and some in patients with co-morbidities—all factors that make recognition and management more challenging.³ In this EM Cases column, I endeavour to outline the top 10 clinical pitfalls in the recognition and management of acetaminophen toxicity.

Current recognition and management of acetaminophen toxicity involves eliciting the time of ingestion, amount of acetaminophen ingested, type of acetaminophen preparation, co-ingestions, and co-morbidities; it involves understanding how the typical symptoms of nausea, vomiting, diaphoresis, pallor, lethargy, and malaise in the first stage often become quiescent, only to be replaced by right upper quadrant (RUQ) pain and elevated liver transaminases in the second and third stages; and it involves timely administration of activated charcoal and N-acetylcysteine. In the massive overdose, it involves the additional consideration of 4-methylpyrazole (Fomepizole) and dialysis.

PITFALL 1 Failing to recognize the seriousness of an unintentional acetaminophen overdose in patients with pain syndromes or those taking cold preparations that contain acetaminophen

Most fatalities, which comprise one to two percent of overdoses, result from either a delayed presentation after deliberate overdose, or from excessive dosing for fever or pain over several days.⁴ It is incumbent upon the emergency physician to ask patients about specific analgesics and their quantities and dosages, and when in doubt, obtain an acetaminophen level. With half of cases being inadvertent there may be no obvious history of ingestion. Consider acetaminophen toxicity in patients presenting with unexplained hepatic injury or failure, hypoglycemia, lactic acidosis, or altered mental status.

PITFALL 2 Failing to recognize patient factors that may potentiate or augment acetaminophen toxicity including other medications, co-ingestions, chronic alcohol use, and malnutrition

All of these factors may increase the risk of liver damage after acetaminophen overdose and should be taken into account when interpreting the Rumack-Matthew nomogram and in deciding on N-acetylcysteine (NAC) antidote dosing.

PITFALL 3 Assuming that a patient with normal or near-normal transaminases has not taken a life-threatening overdose

It is important to understand that AST and ALT are typically unaffected and normal or near-normal in the first 12 hours after a supratherapeutic ingestion. Normal serum AST and ALT levels alone are not predictors of outcome. That being said, AST levels greater than 1,000 IU/L are more likely to result from acetaminophen poisoning than from chronic hepatitis or alcoholic liver disease, and evidence suggests that the acetaminophen level multiplied by the aminotransferase level (calculated at the time of presentation and after several hours of NAC) holds promise as a risk predictor following acetaminophen overdose.⁵ This calculation may be especially useful when the time of ingestion is unknown.

PITFALL 4 Failure to recognize the potential value of hyperphosphatemia and elevated arterial lactate in predicting death and the need for liver transplant^{6,7}

A prospective study looking at serum phosphate levels in patients with acetaminophen toxicity found that hyperphosphatemia was seen only in non-survivors, suggesting that it is a highly accurate predictor of death following acetaminophen overdose.⁸ A retrospective study of acetaminophen-poisoned patients found that when using a threshold of 3.5 mmol/L, arterial lactate drawn early had a positive likelihood ratio of 13, and negative likelihood ratio of 0.35 for death.⁹

PITFALL 5 Using the Rumack-Matthew nomogram to inform treatment with NAC in patients with delayed presentations, chronic overdoses, extended-release preparation overdose, or co-ingestions with drugs known to alter the metabolism of acetaminophen (e.g., opioids, phenytoin, carbamazepine, trimethoprim-sulfamethoxazole)

The Rumack-Matthew nomogram should only be used in iso-

lated, single, acute overdoses of regular-release acetaminophen within 24 hours of ingestion, which is the minority of patients. Use of the nomogram in other clinical scenarios may be misleading. In one study that looked at patients with significant liver injury as a result of acetaminophen overdose, only 17 percent could be appropriately risk stratified using the nomogram.¹⁰

PITFALL 6 Neglecting to administer NAC for late presentations in a timely manner

While it is true that NAC is most effective when given within eight hours of ingestion, a common pitfall is to assume more delayed ingestions do not benefit from administration of NAC.¹¹ There are often significant delays from the time of ordering NAC to the time that the infusion is started. NAC should be given immediately. Indications for NAC include “line crossers” on the Rumack-Matthew nomogram (after an isolated acute ingestion of regular-release acetaminophen within 24 hours) and those patients with elevated transaminases (even in the absence of elevated acetaminophen level) deemed to be as a result of acetaminophen toxicity. If the initial level is not above the nomogram line at the four-hour mark, then an eight-hour and 12-hour level should be drawn.

PITFALL 7 Using the same dosing protocol of NAC for all acetaminophen-toxic patients

In my opinion a toxicologist should be consulted for recommendations on NAC dosing as dosing adjustments should be made depending on a variety of complex factors including timing of ingestion, amount of acetaminophen, type of preparation, co-ingestions, and comorbidities.¹² Dose adjustments are also recommended for patients with massive overdose and those requiring dialysis.¹³

PITFALL 8 Failure to recognize massive acetaminophen overdose in patients with altered level of awareness who have normal transaminases

Massive acetaminophen overdose is defined as greater than 500 mg/kg.¹⁴ It typically presents with a very different toxidrome, characterized by early presentation, exceedingly high acetaminophen levels, coma and lactic acidosis, but with preservation of normal transaminases in this early stage. The reason that massive overdose is important to identify is because management of these patients requires consideration of fomepizole and dialysis in addition to a higher-than-usual dose of NAC. In addition, charcoal is indicated up to 4 hours in mas-

Part 1: Ethical Considerations in Treating Adolescent Psychiatric Emergencies

by EILEEN F. BAKER, MD, PHD; V. RAMANA FEESER, MD; MONISHA DILLIP, MD; JOEL M. GEIDERMAN, MD; CATHERINE A. MARCO, MD

Case Presentation

A 15-year-old boy presents to the emergency department (ED) via EMS for evaluation after getting into a fight at school. He had reportedly threatened another student with a knife and was brought in by law enforcement. He has a history of oppositional defiant disorder. Upon arrival, he is refusing care. He says he is uninjured and does not feel suicidal. He does not wish to undergo any laboratory testing. The patient has been staying with a friend and does not want anyone to contact his grandmother, who is his legal guardian.

Overview of Adolescent Mental Health Emergencies

Pediatric mental health emergencies (MHE) constitute a large and growing segment of pediatric emergency medical care. Depression, anxiety, and behavioral disorders are the leading causes of illness and disability among adolescents. EDs, therefore, play a critical role in evaluating and managing child and adolescent patients with MHE. In 2020, compared to 2019, the proportion of MHE-related ED visits increased from 3.8 percent to 7.5 percent, primarily affecting older adolescents. This was also associated with an increase in the proportion of visits that required psychiatric admission or transfer.¹ According to the World Health Organization, globally, one in seven (14 percent) of 10 to 19-year-olds experience a mental disorder.

Depression, substance use and suicide are foremost.² Suicide is the fourth leading cause of death among 15-to-29 year-olds.³ Pediatric ED visits for suicidal ideation in the U.S. increased from 580,000 in 2007 to 1.12 million in 2015.⁴ On October 19, 2021, the American Academy of Pediatrics (AAP), American Academy of Child and Adolescent Psychiatry, and Children's Hospital Association declared a national emergency in children's mental health, noting the effect of the COVID-19 pandemic in addition to existing challenges.⁵

Mental-Health Determinants and Adolescent Triggers

Multiple factors affect mental health. In addition to biological and hormonal factors and changing brain chemistry of adolescents, mental health can be shaped by environmental factors, including life experiences. Heavy episodic drinking among 15-to-19-year-olds was 13.6 percent in 2016, and cannabis was the most commonly used drug.³ The pandemic exacerbated pre-existing challenges to America's youth, including in-person schooling, in-person social opportunities with mentors and peers, access to health care and social services, food, housing, and health of parents or caregivers. More than 140,000 children in the U.S. experienced the death of a parent or grandparent caregiver.⁶ More heavily affected youth groups include those with disabilities, the LGBTQ+ population, racial and ethnic minorities, those from low-income families, rural areas, those in child-welfare and juvenile-justice systems, immigrants, and the un-

housed.⁷ In recent years, black children aged five to 12 are nearly twice as likely to die by suicide than white children,⁸ and in socioeconomically disadvantaged children and adolescents, those growing up in poverty are two to three times more likely to develop mental health conditions than peers with higher socioeconomic status.⁹ These factors are often referred to as social determinants of health.

Assessment

A critical part of mental health emergency evaluation is the determination that the patient is "medically cleared," a phrase indicating that there is no acute medical or traumatic injury. The APA recommends that "universal requirements for routine testing...be abandoned" as part of the psychiatric evaluation, unless clinically indicated. Prompt recognition, treatment, and referral of adolescent mental-health problems can significantly affect emergency outcomes and contribute to these patients' long-term prognosis.¹⁰ Targeting efforts to enhance MHE care includes expanding access to mental-health specialty consultation, dedicated mental-health policies, and establishing transfer agreements for children with MHE.

Adolescent Rights

Some aspects of the medical rights of minors can vary by state. However, there are some constant elements of which an emergency physician should be aware. EMTALA requires that a medical screening exam to assess for and stabilize life- or limb-threatening disease should be completed first, regardless of whether the patient is a minor or whether their parent or guardian is present. Once the patient is deemed medically stable, their autonomy with and without their guardian may be addressed.¹¹

First, the provider must assess whether the patient has decisional capacity.¹² Second, the patient must have the legal ability and capacity to consent or refuse. This element can vary by state for patients under the age of 18. In most cases, a minor may seek care for a protected health issue related to substance use or reproductive or mental health. Emancipated minors are typically deemed so by the courts but typically include minors who are financially independent, married, on active military duty, or live independently with their own child(ren).¹¹ Some states have a "mature minor" doctrine. This common law definition allows minors to be seen independently if older than age of 14 and "emotionally mature" as judged by the provider. The physician, in this instance, must meticulously document their judgment of the patient's capacity to make decisions. ➕

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A special thanks to Drs. Emily Austin and Margaret Thompson for their expertise on the EM Cases podcast that inspired this column. ➕

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sive overdose (compared to 2 hours in non-massive overdose).¹⁵ Fomepizole 15 mg/kg given once can be considered as an adjunct to NAC.¹⁶ It is thought to halt the formation of N-acetyl-p-benzoquinone imine, and to inhibit cellular necrosis. The indications for fomepizole based on current evidence are unclear, as there have yet to be robust RCTs published. It is reasonable to consider fomepizole in the massive-overdose patient, those requiring hemodialysis, and those with evidence of significant hepatic injury. Typical indications for dialysis include altered mental status, metabolic acidosis, elevated lactate plus serum acetaminophen greater than 900 mg/L (5,960 mmol/L).¹⁶

Conclusions

Some patients with acetaminophen overdose are relatively straightforward to recognize and manage in the ED. But many present challenges, i.e., in recognition of the condition in unintentional ingestions or in the altered patient, in management due to factors that make the Rumack nomogram useless or misleading, or in dosing of NAC. Massive overdose patients require recognition of an entirely different toxidrome and specific management. Although common, acetaminophen toxicity is no simple matter.



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Bit by BHT (Behavioral Health in Triage)

Redesigning the hospital to fit changing needs

by SHARI WELCH MD, FACEP, FACHE

Lancaster General Hospital (LGH), in Lancaster, Pa., has long had a reputation for an efficient, busy, community-hospital emergency department (ED). Now part of Penn Medicine Health System, it is a 525-bed, nonprofit, level I trauma center, and offers both Percutaneous Coronary Intervention (PCI) and stroke thrombectomy. It has American Nurses Credentialing Center magnet designation. Its ED sees 113,000 visits a year and a high volume of geriatric patients (28.5 percent). Prior to 2021, the ED boasted some of the best operational metrics reported in an ED of its size and could be considered a “best of breed.” Its door-to-doctor time was 25 minutes and its walkaway rate only 1.7 percent. After COVID-19, however, with increasing behavioral health (BH) volumes and increasing boarding, the department began to falter. In 2021 those metrics were 40 minutes and 9.2 percent, respectively.

While the community presented with as many BH complaints as chest pain chief complaints, there was no comprehensive service line dedicated to mental health issues. In addition, the community resources for such patients were limited. Historically, the ED had operated under a traditional flow model, beginning with nurse triage, and with further health care interactions operating in series in the main department. They had not begun a flow model involving a physician in triage (PIT), which is now considered a best practice for high-volume EDs.

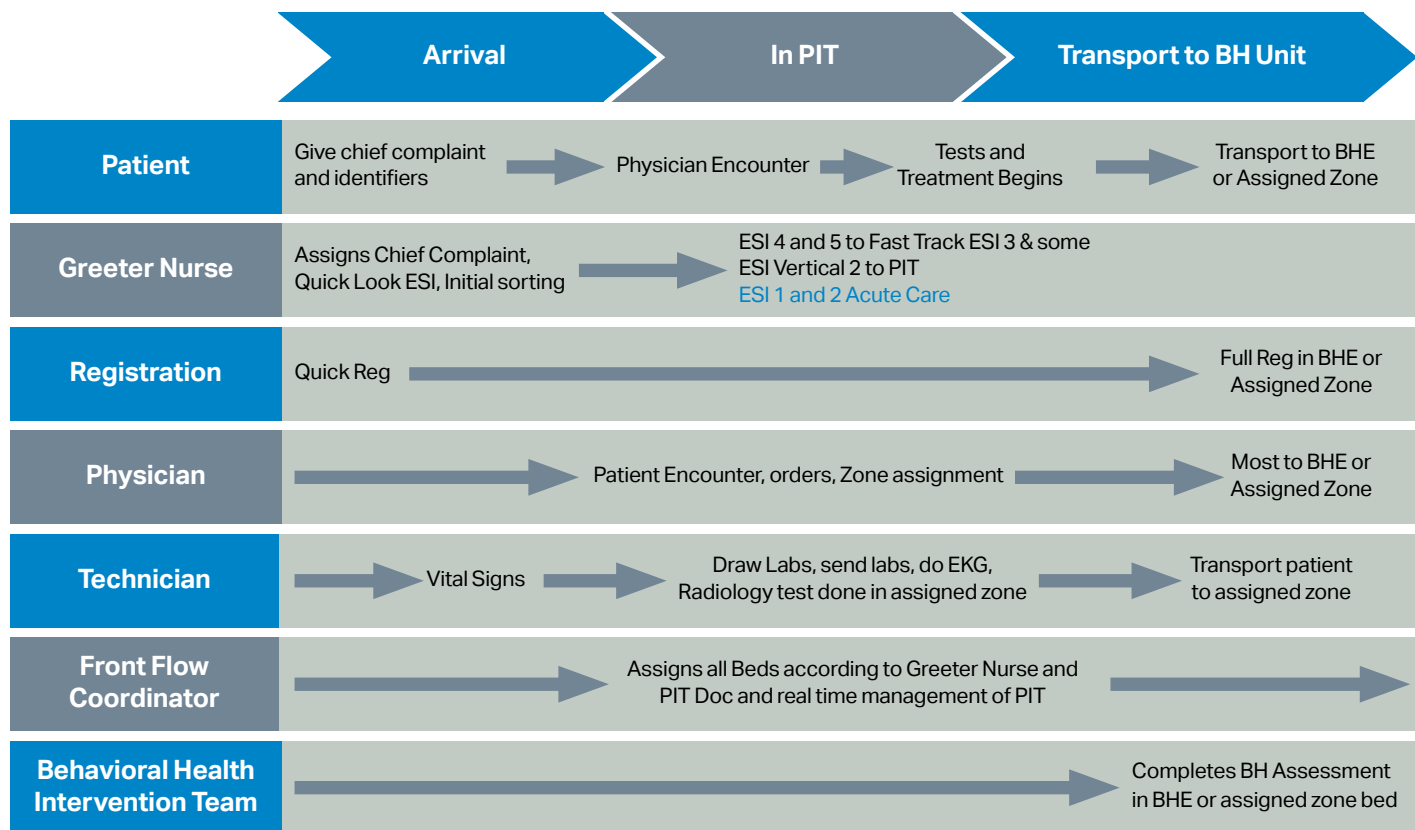
Thinking Differently

LGH decided that their current structure was not functioning and that a new flow model was required, particularly for the BH patients. Because they had a vast waiting room with more than 70 plexiglass-enclosed chairs, but treatment spaces with beds were limited in the main part of the ED, LGH began thinking about ways to use existing resources differently.

A task force set out to manage BH patients differently. The ED clinical team—in conjunction with the dedicated BH team—worked collaboratively together to determine best flow for patients arriving with a BH complaint. When the PIT doc is present, patients are seen and assessed in tandem by a triage nurse and a physician. The PIT team can initiate a BH consult while the patient remains in triage; when possible, patients are discharged directly from the triage area after the medical screening exam and the BH team assessment (backed by a psychiatrist). This has resulted in a reduction in one-to-one sitter usage for discharged patients, and expedites bed search for patients requiring psychiatric admission.

The swim lane diagram (see Figure 1) shows

Lancaster General's ED Behavioral Health Intake Process—Swim Lanes for BHE/MAIN



the process they developed.

Meanwhile, the LGH Hospital leadership team re-conceptualized the BH space altogether. Rather than serving as a holding area for acutely psychotic or suicidal patients waiting for placement, they created a small unit that follows the psychiatric assessment, treatment and healing (PATH) model. The following images display the newly conceptualized PATH model (see figure on right):

Some of the features of this unit include:

- Ligature-free rooms and common hallway spaces
- Lockers to store patient belongings safely and privately
- Medication-reconciliation specialist in ED
- Security stationed in unit
- Duress buttons provided for every staff member
- Care team: ED registered nurse, BH intervention team (BHIT) member, psychiatry consults when applicable
- Laundry area in unit, overflow rooms with garage doors

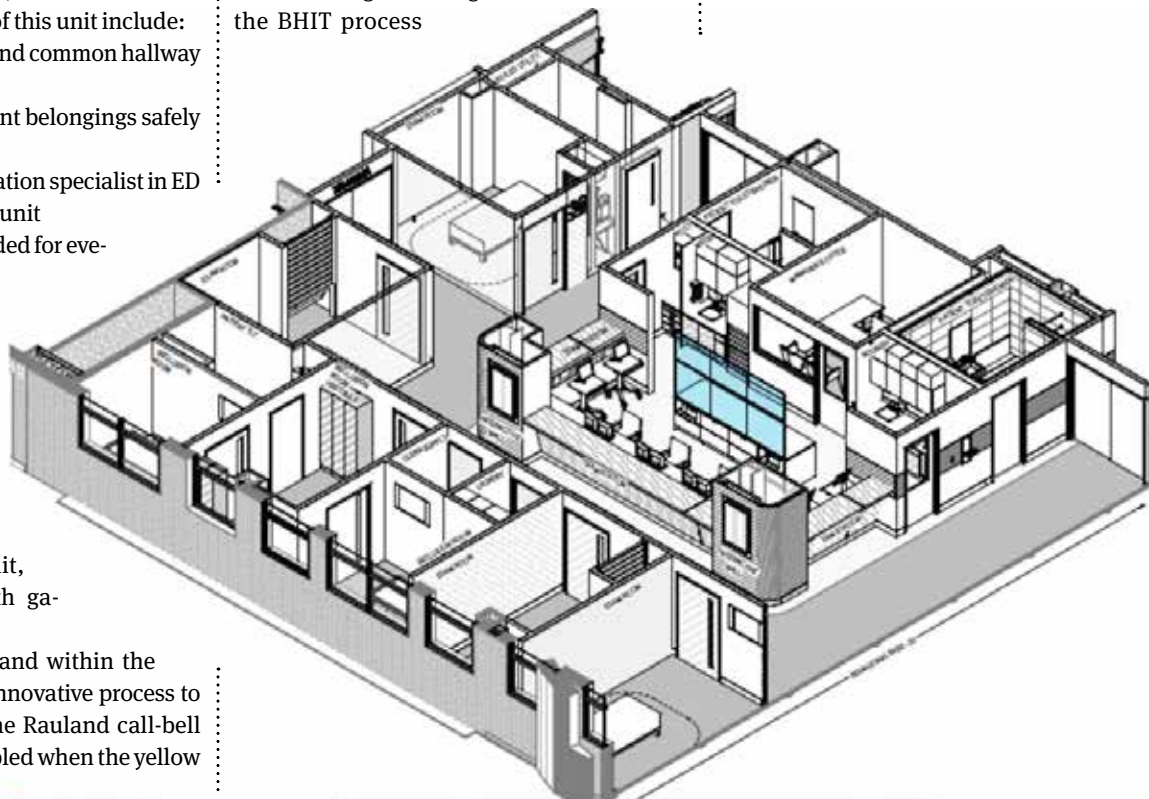
The LGH ED overall and within the PATH unit has another innovative process to mitigate elopements. The Rauland call-bell system in the unit is enabled when the yellow E button is depressed.

When activated the PATH area becomes a locked unit. Patients who pose suicide or elopement risk wear bright yellow gowns for easy identification. The yellow E technology has proven to reduce and prevent patient elopements.

PIT has improved overall median length of stay (LOS) and earlier BH assessment. The data show that BH patients managed through the BHIT process

in triage consistently have shorter LOS than BH patients managed using a traditional flow model.

The LGH leadership team invented a model for BH patients using available resources that could be replicated elsewhere. The Lancaster General Hospital ED is proud of its success in managing their BH burden; Bit by BHIT they know they have found the right PATH to do so! ➕



against these common invasive pathogens? Does it matter if a child has a fever greater than 39 degrees Celsius (102.2 degrees Fahrenheit) or greater than 40 degrees Celsius (104 degrees Fahrenheit)? The American Academy of Pediatrics recently published a clinical practice guideline for well-appearing febrile infants less than 60 days of age and risk-stratified these infants for bacterial illness using serum and urine labs.³ This discussion focuses on children who are over 60 days of age.

A 2006 prospective observational study in the post-pneumococcal vaccine era—meaning after both the Hib and Pneumococcus vaccines—evaluated 429 infants ages 57–180 days old (two to six months of age).⁴ Overall, 44 infants (10.3 percent) were positive for serious bacterial illness (SBI), which included 41 with positive bacterial urine cultures and 4 with positive blood cultures. One child had both urine and blood cultures positive. Cerebrospinal fluid was obtained from 58 infants and there were zero cases of bacterial meningitis. Respiratory screening tests were performed on 413 of the 429 infants and were positive in 163 cases (39.5 percent). There were five cases of viral meningitis. Height of fever comparing SBI and non-SBI groups was not significantly different ($P=0.18$).

A 2006 cross-sectional observational study evaluated 103 children less than 18 years of age over a two-year period who presented with “hyperpyrexia.”⁵ Hyperpyrexia was de-

fined as greater than or equal to 106 degrees Fahrenheit (41.1 degrees Celsius). Complete blood count, blood culture, and viral respiratory culture were obtained on each patient. Additional lab work and imaging was at the discretion of the attending physician. Of these 103 children, 20 (18.4 percent) had a culture-proven SBI, including urine, blood, and CSF. Twenty-two (21.4 percent) had a positive viral culture. Temperature itself was not predictive of either a bacterial or viral illness. Of note,

though, this study did not evaluate and compare children with temperatures less than 41.1 degrees Celsius versus greater than or equal to 41.1 degrees Celsius, therefore it cannot address whether hyperpyrexia was associated with a higher prevalence of bacterial illness.

The study that currently best answers this clinical question is a 2015 prospective observational study that evaluated 15,781 children less than five years old and identified 1,120 (7.1 percent) SBIs.⁶ The authors noted the maximum

axillary temperature at presentation and the maximum temperature (any location) reported by family within the previous 24 hours. SBI included bacteremia, urinary tract infection, pneumonia, osteomyelitis, meningitis, and septic arthritis. 42 percent of children had a fever greater than or equal to 39 degrees Celsius (102.2 degrees Fahrenheit) at presentation or reported by family. Overall, SBIs were pre-

CONTINUED on page 23



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- ▶ EM career success

help stabilize the chest wall.¹ Unlike the typical paradoxical chest wall movement seen with flail chest, the subcutaneous tissues in this case were inflating with both inspiration and expiration although this was not fully appreciated due to the significant discomfort the patient experienced when the splint was removed. The direct movement of air into the chest wall was improved with the placement of a pigtail catheter and ultimately treated with operative repair.

Traditionally, treatment of flail chest was aimed at associated injuries, especially pul-

monary contusions, and supportive care. Definitive treatment with surgical stabilization has been gaining favor, with current literature suggesting decreased ICU stays and fewer complications, especially with patients under 60 years old when taken to the operating room within 72 hours of injury.² ➔

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sent in 3.6 percent of children with a fever greater than or equal to 39 degrees Celsius and duration of illness less than or equal to 24 hours, while the prevalence of SBI in children with fever greater than or equal to 39 degrees Celsius and illness duration greater than 96 hours was 20 percent. Duration of fever, rather than height of fever, appeared to play a role. The authors do mention that 45 of 137 (32.8 percent) children less than six months of age with a fever greater than or equal to 39 degrees Celsius had an SBI, but using a cut-off of 39 degrees Celsius missed 82 percent of cases of SBI in this same age group. The authors conclude that “temperature is an inaccurate marker of serious bacterial infection in children presenting to the emergency department with fever and reliance on magnitude of fever to guide further evaluation will result in misclassification of both serious bacterial infections and self-limiting illnesses.”

A 2018 systematic review and meta-analysis attempted to evaluate specifically this clinical question, but included studies that were both pre- and post-pneumococcal-vaccine time periods.⁷ The results were heterogenous and don’t apply to our current pediatric population in the post-pneumococcal-vaccine era.

Summary

In the post-pneumococcal vaccine era, the height of a child’s fever does not definitively predict a serious bacterial infection. While higher fevers do appear to have a higher association with bacterial illness, the actual temperature does not seem to predict whether a child has a bacterial versus a viral infection. ➕

Meningitis/Encephalitis PCR Panel for Testing

Question 2: After the administration of antibiotics, how long will the meningitis/encephalitis PCR panel remain positive for bacterial pathogens after lumbar puncture?

Many emergency department settings now have access to the FilmArray Meningitis/encephalitis Panel for testing on CSF after lumbar puncture. This polymerase chain reaction (PCR) panel was approved in 2016 and we do not endorse or oppose it—we simply have access to this test at our hospital, like many other hospitals. It tests for six bacteria, seven viruses, and one fungus. Studies have evaluated and continue to evaluate its effects on duration of antibiotic therapy, length of stay, etc. We sought to explore the duration of time that it remains positive for tested cerebrospinal fluid bacterial pathogens after antibiotic administration. According to a 2020 meta-analysis that included eight studies with 3,059 total patients (1,085 pediatric), the pooled sensitivity and specificity of this PCR test is 90 percent (95 percent CI, 86–93 percent) and 97 percent (95 percent CI, 94–99 percent), respectively.⁸ Regarding the duration of a positive bacterial PCR result after administration of antibiotics, we were unable to find any studies that answered this question, so the answer appears to remain unknown at this time.

Summary

We are unable to find any studies that address the length of time that the CSF meningitis/encephalitis PCR panel remains positive after antibiotic administration. ➕

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