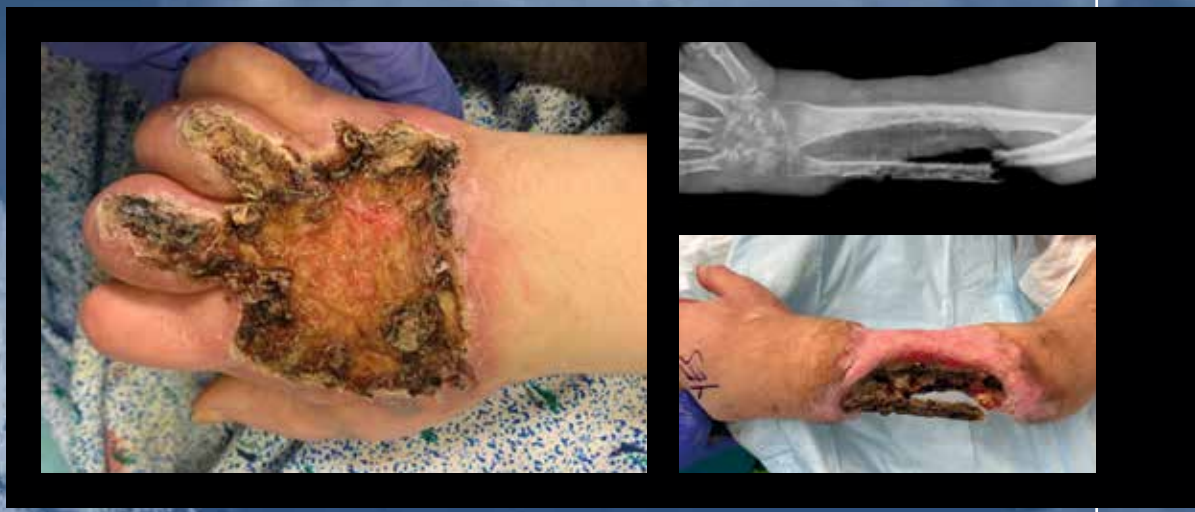
OCTOBER 2025 / VOLUME 110 / NUMBER 9

ACS Bulletin

AMERICAN COLLEGE OF SURGEONS

Surgeons Handle New and Alarming Pathology



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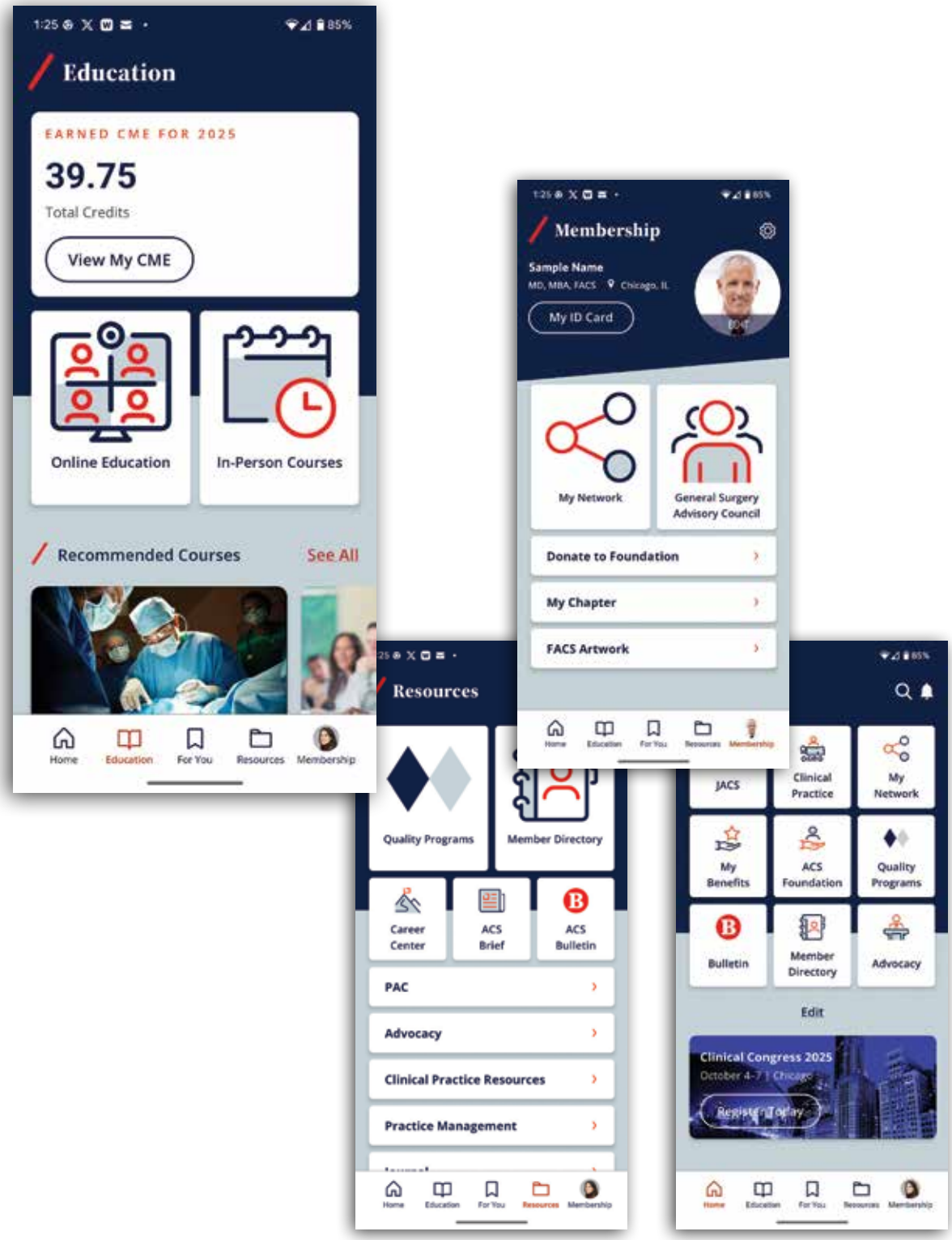

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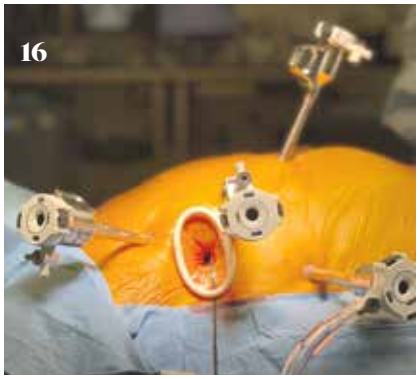

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Bulletin of the American College of Surgeons (ISSN 0002-8045) is published 10 times a year by the American College of Surgeons, 633 N. Saint Clair St., Chicago, IL 60611-3295. It is distributed electronically, without charge, to all ACS members. Dues-paying members can request a complimentary print subscription. Nondues-paying members and nonmembers can purchase an annual print subscription ($50 within the US and Canada; $75 for all others). Contact bulletin@facs.org.

Periodicals postage paid at Chicago, IL, and additional mailing offices. POSTMASTER: Send address changes to *Bulletin of the American College of Surgeons,* 633 N. Saint Clair St., Chicago, IL 60611-3295. The American College of Surgeons headquarters is located at 633 N. Saint Clair St., Suite 2400, Chicago, IL 60611-3295; tel. 312-202-5000; toll-free: 800-621-4111; email: postmaster@facs.org; website: facs.org. The Washington Office is located at 20 F Street NW, Suite 1000, Washington, DC 20001-6701; tel. 202-337-2701.

Printed in the USA.

Resources for ACS Members in Every Career Stage

Patricia L. Turner, MD, MBA, FACS
executivedirector@facs.org

THE ACS IS The House of Surgery®, and we work to unite and serve surgeons in every surgical discipline, practice type, and geographic location, as well as at every point in their professional lives. Many resources the ACS offers can help members develop and thrive at a specific stage of their surgical training and careers. This month, I'll provide an overview of our benefits for each career stage.

Fellows and Associate Fellows

The ACS has numerous resources for practicing surgeons, whether they are Fellows of the ACS or Associates (an early career surgeon not yet eligible for Fellowship). The practice management hub, for example, is designed for both employed and private practice surgeons, with support for compensation negotiation, contracts, billing and coding, and management.

The ACS also offers grants and scholarships of nearly $2 million per year to members, supporting conference attendance, Quality Programs engagement, mentorship, and research. For more information, please see my March 2024 column, "Scholarships for Every Type of Surgeon."

The ACS focuses on education (including CME-eligible courses) for practicing surgeons as well. Options include our online course on artificial intelligence and machine learning in surgery; simulation-based education; Current Trends in General Surgery, an online review course for general surgeons; and the newly revised Surgical Education and Self-Assessment Program (SESAP®) 19 and SESAP 19 Advanced, as well as the new 11th edition of Advanced Trauma Life Support.

Additional programs serve those interested in further developing leadership and teaching skills. These include the highly popular Surgeons as Leaders and Surgeons as Educators courses and the sought-after Committee on Trauma Future Trauma Leaders program.

Fellows, associate fellows, and residents can also access a Physician Business Training course offered in conjunction with another organization, specialty-specific compensation reports, and study resources at markedly discounted rates.

Of course, one of the most prominent features of the ACS is Fellowship, which confirms each Fellow's excellence in surgical practice. For those younger than 45 years, Fellowship comes with an additional benefit: membership in the Young Fellows Association, an ACS career-stage

group featuring career advice, networking, and camaraderie, as well as webinars on multiple topics, including healthcare quality and a mentorship program.

Senior Surgeons

Our most seasoned members have contributed significantly to how surgery is practiced today and have essential insights to impart to our profession.

We have begun to develop programming specifically for senior surgeons, including the recent creation of their own career-stage group, the Senior Fellows Society. The inaugural meeting of this group will occur at Clinical Congress 2025, on October 4 at 11:30 am in the Marriott Marquis Chicago. All senior and retired surgeons are invited to connect with this group.

Senior surgeons also enjoy membership dues waivers. Fellows who have maintained their membership may have their dues waived starting the membership year after their 70th birthday. Completely retired surgeons also may apply for a dues waiver.

Surgical Residents

Residents of all surgical specialties are invited to enjoy free ACS membership as part of a pilot developed to enhance engagement for our trainees.

Residents are automatically part of their career-stage group, the Resident and Associate Society (RAS). RAS activities include career advice, networking, and leadership opportunities. This year, the group will host a RAS Lounge in the Exhibit Hall at Clinical Congress for relaxation and social connections, as well as share information about the new online RAS Curated Resource Library.

The ACS also has numerous educational resources for those in training, often at deep discounts, including the Residents as Teachers and Leaders and a 2-day Surgery Resident Program at Clinical Congress.

Additionally, there are new offerings developed for training programs. The Senior Resident Readiness Assessment (SRRA) complements our Entering Resident Readiness Assessment (ERRA), and Objective Assessment of Skills in Surgery (OASIS) adds an assessment for residents in postgraduate year 2.

Finally, we support emerging surgeon-scientists during their residency years. Our Clinical Scholars in Residence program and Resident Research Scholarship each provide 2 years of support to residents pursuing research careers.

Medical Students

To support interested students in their pursuit of a career in surgery, the ACS now offers a modestly priced 4-year ACS medical student membership.

We have numerous resources for students who are discerning their future path within surgery. These include our So You Want to Be a Surgeon web pages and a Guide to Choosing a Residency, as well as the National Professional Development Seminars for Medical Students, which includes informational videos by surgeon leaders in 13 separate surgical disciplines.

For those preparing for a surgical residency, we have educational materials, including Medical Student Educational Modules National Tutorial Seminars for Medical Students on essentials of surgical care, and Medical Minutiae, a *Jeopardy!*-style clinical game. Jointly with the Association for Surgical Education (ASE), we also have developed the Medical Student Core Curriculum and Simulation-Based Surgical Skills Curriculum, as well as a Resident Prep Curriculum (developed with the ASE and Association of Program Directors in Surgery).

Medical students are welcome at every ACS conference, including Clinical Congress, where they can join the 3-day Medical Student Program featuring insights from practicing surgeons, simulated interviews, and other professional skill-building sessions.

Finally, we have just formalized the Medical Student Society, a career-stage group that automatically includes all medical student members. This year, the first executive committee was selected and a webinar series initiated.

Mobile App

To help all members track the myriad resources offered, we've created a new, members-only mobile app that connects each surgeon to relevant resources. It is available for free download now. This initial iteration will continue to grow in functionality in future versions.

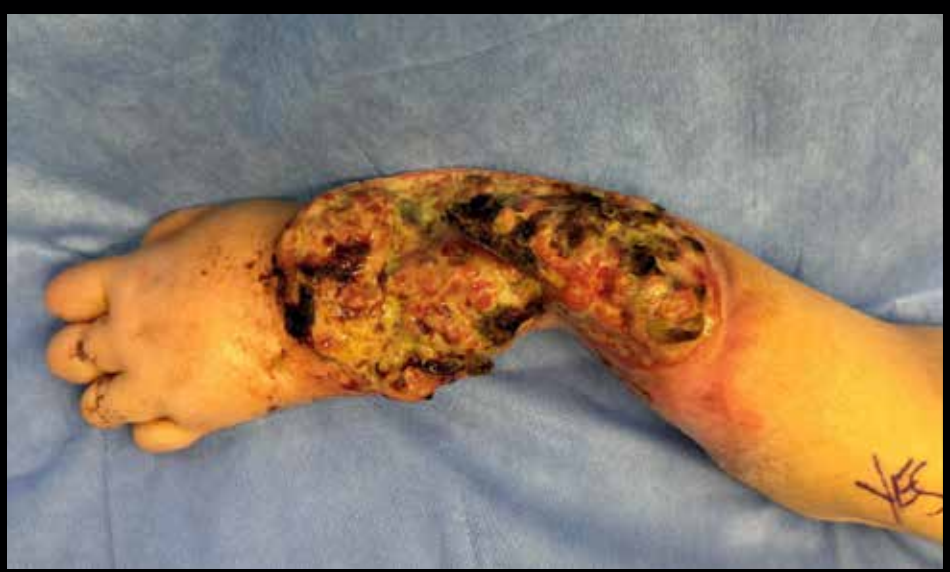
Clinical Congress 2025

Of course, many ACS offerings serve members in every career stage. Clinical Congress is a prime example. Join us this year, and please note: all registrants will receive on-demand access until February 23, 2026, to recorded sessions offering more than 150 CME credits. Learn more and register at *facs.org/clincon2025.*

Dr. Patricia Turner *is the Executive Director & CEO of the American College of Surgeons. Contact her at* executivedirector@facs.org.

Surgeons Handle New and Alarming Pathology—

Xylazine Wounds



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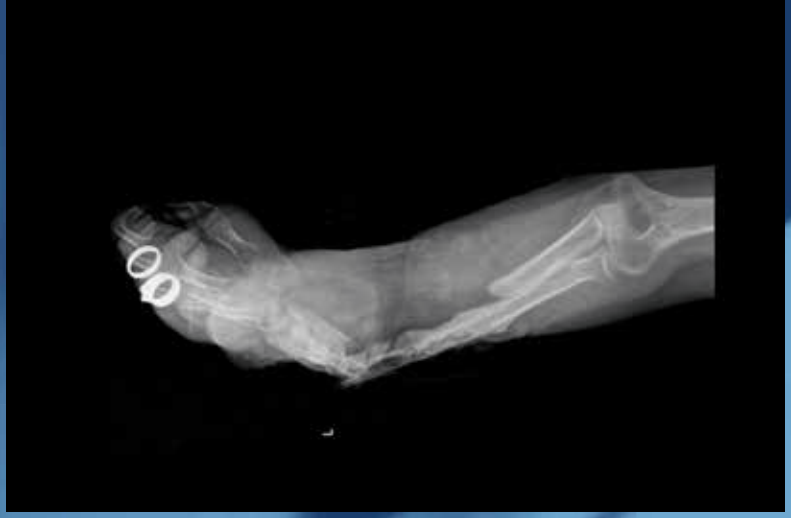


Over the past 2 decades, the US opioid epidemic has resulted in the deaths of 727,000 individuals by overdose alone[1]— and in recent years, a startling new complication of opioid use has emerged.

Overleaf:
This photograph and radiographic image show a forearm with severe xylazine wounds and related osteomyelitis and bone fracture.

INITIALLY FUELED by clinicians' overprescription of opioid medications, the epidemic has long since shifted into a three-pronged mix of prescription opioids, heroin, and hyper-potent synthetic opioids, most notably fentanyl. Synthetic opioids now constitute much of the illicit drug supply and cause the largest share of overdose deaths.[1]

Additionally, fentanyl and similar drugs are often contaminated with a range of other drugs. One particularly harmful contaminant, xylazine, presents a new medical issue that surgeons in many disciplines need to understand: severe, necrotic wounds that can cause amputations and even mimic necrotizing fasciitis.

As a result, numerous clinicians in hard-hit cities are engaged in efforts to understand, effectively treat, and educate surgeons and others on this new pathology.[2-4] Asif Ilyas, MD, MBA, FACS, an orthopaedic surgeon and opioid use researcher at Rothman Orthopaedics and Drexel University, both in Philadelphia, Pennsylvania, said, "I look at it as a new chapter of the opioid crisis."

Differential Diagnosis: Radiator Burns, Vasculitis, Necrotizing Fasciitis

For Lisa Rae, MD, FACS, chief of burn surgery at Lewis Katz School of Medicine at Temple University in Philadelphia, Pennsylvania, a patient arrived with an injury that looked like a radiator burn. This patient, who had active opioid use disorder, presented with deep, elongated wounds on his back—an impossible spot to inject drugs. She assumed the stripes came from a contact burn from a hot radiator, a cause the man denied. Only after the same man appeared again with similar wounds in late spring, followed by a second such patient, did she understand that the cause lay elsewhere. These wounds were a particular variation on the extreme problem that xylazine causes.

After the α2-adrenergic receptor agonist drug was first synthesized in 1962, research into human use was discontinued upon the discovery of its tendency to create severe necrotic wounds in users.

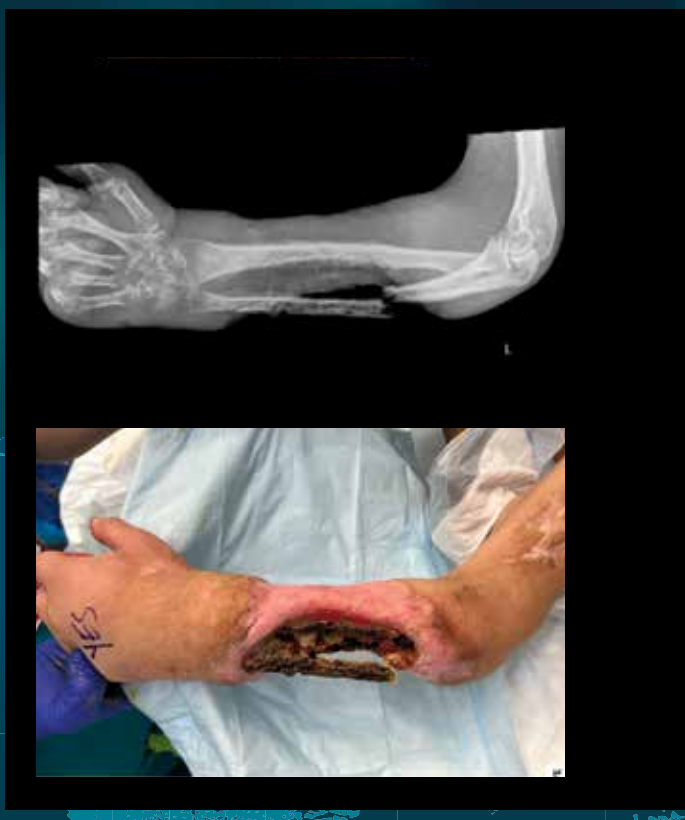
Because this result does not occur in nonhuman mammals, xylazine entered manufacture as a veterinary sedative only. Decades later, illicit use began in Puerto Rico, where some users sought the intense sedation the drug creates. Nicknamed "tranq," the drug spread, emerging around 2015 as a contaminant of the illicit fentanyl supply in the continental US.

In Philadelphia, a city known for the intensity of its opioid crisis, street-sold opioids began showing high rates of contamination several years ago; from January through May 2024, for instance, virtually all tested samples in the city included xylazine.[5] A substantial part of the fentanyl supply nationwide is now contaminated with this drug.[6]

The result is a population of patients with dramatic and often complicated wounds. Interestingly, the wounds can

These xylazine wounds on the forearms are of moderate intensity.

In other words, these wounds are so deep they expose tendons and bones, which then become so damaged by osteomyelitis that they sometimes spontaneously crumble.



occur at both injection sites and distant locations across the body—as with the patients Dr. Rae saw with wounds on their backs.

Although the full pathology is not yet clear, Dr. Ilyas noted early insights on local wounds: "The thought is that xylazine is likely causing these wounds by one of a couple potential mechanisms. One is, it's causing a local tissue toxicity—almost like a burn. The second is that it is causing some local vasoconstriction, reducing blood flow and oxygen to the area. The combination of these potential mechanisms is lending itself to these wounds that, with repetitive injecting, gets worse and worse and worse."

The result is a startling spectrum of severity. Dr. Ilyas explained, "We're seeing mild cases with early wounds forming, and we're seeing other folks who have been injecting for such a long time that their limbs have become mummified."

In other words, these wounds are so deep they expose tendons and bones, which then become so damaged by osteomyelitis that they sometimes spontaneously crumble.

Dr. Rae concurred that cases are often severe.

"We have people who have eroded tissue through their chest wall. Their lung is out. We've seen the innominate artery. One woman had fistulas and opened up her entire abdomen. Never mind the bones and the maggots and the smell," she said.

The range of presentations includes milder cases that involve areas of reddened and blackened tissue. Although wounds can occur on most body parts, many are on limbs, particularly forearms, the most frequent sites of injections.

Wounds may vary by location, according to Dr. Rae. At injection sites, they present first as small abscesses with blisters, then larger wounds that are purple and ischemic. In contrast, distant sites tend to involve deep, oblong wounds with areas of frank necrosis.

At times, Dr. Rae explained, both types may resemble vasculitis or even necrotizing soft tissue infection (NSTI), which is also known as necrotizing fasciitis.

For a wide range of surgeons, including those in general, trauma, and acute and critical care surgery, this may be how they first encounter xylazine wounds: during a consultation for possible NSTI, a situation that can call for a rapid trip to the OR for radical excision of diseased tissue and a high chance of amputation—with the alternative being nearly guaranteed, often rapid mortality.

This image shows severe wounds with exposed and crumbling bone.

While the mortality rate for untreated NSTI is extremely high, patients with xylazine wounds—even those who are totally noncompliant with care—almost always survive.

Avoidable Amputations, Unworkable Skin Grafts, and Delayed Osteomyelitis Care

But xylazine wounds are not necrotizing fasciitis. Indeed, in some ways they are quite far from it.

For consulting surgeons, the first thing to note is the differences in the symptom picture. Patients with xylazine wounds typically have pain proportionate to the severity of their wounds, low-grade or no fever, normal vital signs, normal blood counts, and a small abscess or unremarkable findings on computed tomography scans.

In contrast, a patient with NSTI will present with extreme pain, high fever, an elevated white blood cell level, a rapid heartbeat and respirations, hypotension, abscess and/or soft tissue gas on computed tomography, and a range of possible late signs, including sepsis. While both patient groups may present with nausea, vomiting, and diarrhea, patients with xylazine wounds will have those symptoms only because of drug withdrawal, while patients with NSTI experience them as part of the fulminating infection (see Table).

Perhaps most importantly, the urgency and potential outcomes of xylazine wounds are far milder than those of NSTI. "These aren't life-threatening. They're limb-threatening, but not life-threatening," Dr. Ilyas explained.

While the mortality rate for untreated NSTI is extremely high, patients with xylazine wounds—even those who are totally noncompliant with care—almost always survive.

About her own experience in clinic, Dr. Rae said: "We're seeing just this purple, horrible, necrotic tissue, and I'm just talking doctors off a ledge and going, 'No, no, we know what this is. They're okay, I promise. I'll monitor them closely. They don't need to be rushed to the OR and have a radical excision of all their skin. Let them demarcate and heal, and we'll do wound care and things like that.'"

The treatment process for xylazine patients is often surprisingly simple, involving nonaggressive wound debridement, a dermal substitute to cover the wound, and watchful waiting. By the accounts of Drs. Rae and Ilyas, as well as published accounts from other clinicians and patients, the affected people who manage to cease using xylazine-contaminated drugs often heal well with no further interventions.

In many cases, this can be enough to mitigate the threat to the limb. While some xylazine wounds do lead to amputation—an investigation by *The Philadelphia Inquirer*[7] found that, in that city, amputations among people addicted to opioids doubled between 2019 and 2024—clinicians now understand that xylazine wounds tend to heal better than most other wounds of similar size, depth, and severity. This is true even for injuries that could require an amputation if they arose via other causes.

In fact, a similar wound from a non-NSTI cause might require a skin graft, with patients unable to epithelialize the wound and heal fully without one.

Although the underlying biology is not yet determined, Dr. Rae posited that the very method by which drug users accumulate harm also marshals resources for faster and more complete healing.

"They have a chronic wound cycle where they keep injecting and their body's trying to heal, so they actually have all the healing mechanisms in that wound when we take out the dead tissue, and we try to take out as little as possible. They grow new tissue and heal into it very, very quickly, much more quickly than I see in a healthy burn patient who has tissue necrosis, because all those elements need to make their way into the wound," she said.

For patients with xylazine wounds, she advised against skin grafting. She noted that ongoing

Table. Xylazine Wounds Versus Necrotizing Fasciitis

Element	Xylazine wounds	Necrotizing fasciitis
Cause	Xylazine contamination of injected or smoked illicit fentanyl	Often group A Streptococcus or Staphylococcus aureus, if monomicrobial (type II); a mix of aerobic and anaerobic bacteria, if polymicrobial (type I)
Threatened outcome	Loss of limb	Loss of life
Local signs	Painful wound, often deep and elongated; may be distant from the site(s) of drug injection	Highly painful wound
Systemic signs	Normal vital signs, normal white blood cell count, low-grade or absent fever, and absence of sepsis; nausea, vomiting, and diarrhea, if present, may be attributable to drug withdrawal syndrome	Indications of infection, such as high white blood cell count, fever, high heart rate, nausea, vomiting, and diarrhea, plus extreme pain; range of possible late signs, including sepsis
Evidence on computed tomographic imaging	May include abscess; a small pocket of air may reflect a recent injection	Often includes soft tissue gas and abscess
Treatment approach	Debridement, closure with dermal substitutes, and watchful waiting; in severe cases, care for bone infection and/or amputation of limb	Radical excision of diseased tissue, with possible skin grafts, limb salvage, and/or amputation
Likelihood of limb loss	Low	Higher
Mortality rate	Very low, even if untreated	Very high if untreated

injections of street drugs at or near the site can destroy a graft. Additionally, creating a tissue donor site introduces both a site for xylazine wound recidivism and additional care needs—a challenge to a patient population who are often unhoused and/or lacking access to appropriate sanitation and hygiene supplies.

"I employ a harm reduction strategy rather than a curative one. Dermal substitutes can help patients heal or grow tissue to protect exposed bone and tendon without definitive wound closure while they are still injecting. Graft and donor sites are high risk at this stage, and we find many patients heal without needing a skin graft over the dermal substitute," Dr. Rae explained.

For patients with tissue damage that is exposing bone, the lack of skin coverage can lead to chronic osteomyelitis. Although consensus is not universal, the general wisdom is that treating these bone infections is best delayed until wound closure has been attained.

"You can manage both the skin wounds and the osteomyelitis simultaneously," Dr. Ilyas said.

He also noted that treating these infections is often delayed until closure of open skin, which can help ensure maximal benefit. "We're not being as aggressive with the osteomyelitis because we need soft tissue coverage if the bone infection is to resolve."

Patient-Centered Care

Dr. Rae acknowledged that this careful, slow-moving strategy can feel inconsistent with the decisive, curative approach to which many surgeons are accustomed. What she and others have raised is the strong need for patient-centered care,[8] including a willingness to engage with patients who do not fully cease drug use.

"We've changed our paradigm to be less aggressive surgically for these wounds and really base our surgical intervention on the stage of the wound and then the patient's compliance with substance abuse treatment," Dr. Ilyas said, because the level of healing is so often contingent on drug cessation.

To that end, physicians also are increasingly engaged in ensuring that patients have adequate access to both addiction medicine and pain management specialists while undergoing wound care. This approach helps reduce a common problem among affected patients: the combined withdrawal of xylazine and opioids can be so challenging to tolerate that the rate of xylazine-affected patients leaving the hospital against medical advice has increased to roughly half of all inpatients.[7]

As a result, treatment can include opioid drugs—an often-

Access related video content online.

> "We don't see a lot of new pathology come our way in medical science. To have something new to figure out from a surgical standpoint is a very interesting moment."
>
> Dr. Lisa Rae

Philadelphia Classification for Xylazine Wounds

Stage 1: Mild wounds with partial- or full-thickness skin violation only, without muscle involvement and with preserved function of the extremity

Stage 2: Moderate wounds with full-thickness skin violation, minor muscle necrosis, and preserved function of the extremity

Stage 3: Severe wounds with extensive soft tissue violation, muscle and tendon necrosis, exposure of bone, osteomyelitis, and possibly pathologic fracture due to osteomyelitis

Stage 3A: Stage 3 wounds with preserved hand function

Stage 3B: Stage 3 wounds without hand function

uncomfortable experience for surgeons who are reluctant to prescribe the large doses these patients have come to tolerate—as well as methadone, buprenorphine, clonazepam, and other drugs meant to assuage withdrawal symptoms and the pain associated with xylazine wounds.

For Dr. Rae, prescribing large doses of opioid drugs has been a learning experience for herself and other hospital staff members.

"There's a lot of misunderstanding that they're just, you know, having fun and using it," she said. "But there is nothing you could give them that causes euphoria anymore. That chase is over. They're just stuck in a cycle of not feeling well."

The result of clinician misperception can be the unwitting withholding of necessary medications and an experience of rapid withdrawal that intensely sickens and distresses the patient. After appropriate treatment for withdrawal upon admission and a few days of titration of medication for ongoing symptoms, a healthier and calmer patient can emerge.

"Patients are simply sick from withdrawal," Dr. Rae said. "When we fail to treat the withdrawal symptoms so that they cannot stay in the hospital to receive the care they came for, it's our fault as doctors."

Consensus Statements and Standards

A decade after xylazine began contaminating illicit opioids, physicians are attaining consensus on how to best treat the resulting wounds.

In November 2024, Dr. Ilyas's nonprofit research organization, the Rothman Institute Foundation for Opioid Research & Education, held a symposium on the xylazine crisis in Pennsylvania at the Sidney Kimmel Medical College in Philadelphia. The event generated a consensus statement[2] that offers a classification system for xylazine wounds (see sidebar), an algorithm for understanding when amputation may be necessary, and extensive insight into wound care, pain management, social services, ethical considerations, and policy goals.

In April 2025, the University of Pittsburgh Medical Center (UPMC) in Pennsylvania announced it was among the first health systems to implement standards procedures for treating xylazine wounds. As with the Philadelphia group, they convened clinicians from numerous specialties to understand how to balance wound care with withdrawal management strategies and addiction medicine.[4]

Temple University, Dr. Rae's institution, also is working on a publication on treatment protocols

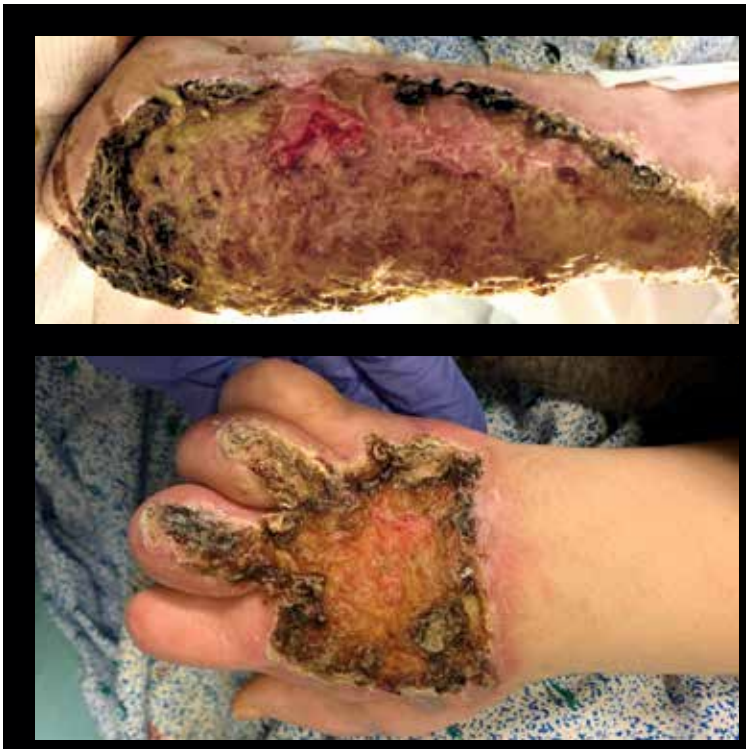
that similarly engages a wide range of clinicians into helping ensure optimal care to patients.

Vision of Hope

Amid the ongoing crisis, there is good news: the presence of xylazine in illicit fentanyl appears to be dropping, per the Philadelphia Department of Public Health. Although virtually all fentanyl tested contained xylazine in May 2024, by December, that rate was 42%.[5]

Additional opioid additives, including medetomidine and nitazines, are now contaminants of concern. But to date, none of these appears to be associated with the severe tissue injuries that xylazine causes. (Medetomidine, which is among the most frequently encountered additives, causes somewhat alarming but largely nonharmful bradycardia.)

Researchers and clinicians have identified many steps that are helpful for the optimization of care, including a xylazine wound-specific code for hospital records, to help facilitate research and follow-up; state and federal policies, particularly ones making xylazine a controlled substance; and ongoing clinician education. For now, progress toward care protocols can help raise hope among drug users, the healthcare personnel who serve them, and the communities impacted by the opioid crisis.



The forearm and hand exhibit moderate xylazine wounds.

It also may engage surgeons and other clinicians in what may be a once-in-a-lifetime clinical experience. As Dr. Rae noted, "We don't see a lot of new pathology come our way in medical science. To have something new to figure out from a surgical standpoint is a very interesting moment." B

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Robotics Integration Ushers in New Era of Cardiac Surgery

Tony Peregrin

Cardiac surgery is undergoing a transformative shift as advanced technologies—most notably robotic-assisted systems—reshape how procedures are performed.

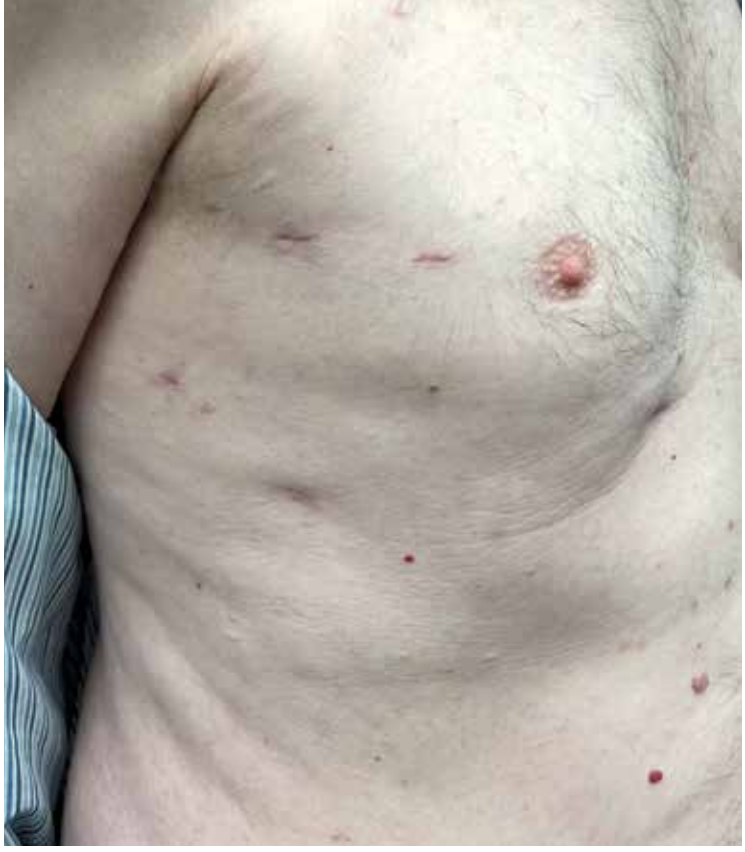
Opposite: Partnering with a skilled bedside surgeon helps ensure safety and success in these complicated operations. Here, Dr. Pedro Catarino assists with a robotic lung transplantation, performed with the robot using a 6-cm incision.

FROM HIGH-DEFINITION 3D visualization and enhanced instrument precision to smaller incisions and fewer procedures requiring open sternotomy, these innovations are reducing patient risk and expanding what's possible in the OR. Surgeons now have a different type of control and clarity, enabling complex interventions that may have been once considered too invasive or high risk.

"I think that for a long time, cardiac surgery was impervious to the adaption of minimally invasive operations, and that has to do with the inherent complexity of cardiac surgery, the need for good access, the rigid chest wall—all of which made it really hard to apply less-invasive approaches," explained Dominic Emerson, MD, FACS, director of robotic cardiac surgery at Cedars-Sinai Medical Center in Los Angeles, California. "The robot has really changed that. The wristed instruments give you an amazing amount of dexterity. For the most common kinds of mitral pathology—which are degenerative mitral pathologies isolated to the posterior leaflet—our repair rates are greater than 99% in those patients with excellent durability.[1] And it's not just us—several other centers also have demonstrated those kinds of results."

While robotic systems feature instruments that can mirror human hands and fingers, optimized visual display is another key benefit of this approach to cardiac surgery.

"The 3D visualization of robotics offers 10 to 12 times the magnification with very crisp images," said Husam H. Balkhy, MD, FACS, FACC, professor



These scars are 4 weeks post-op following a robotic endoscopic mitral valve repair at UChicago Medicine.

of surgery and director of robotic and minimally invasive cardiac surgery at The University of Chicago (UChicago) Medicine in Illinois. "These kinds of images are also available in nonrobotic systems, but it is the integration of dexterity and visualization in the current robots that is very unique."

With incisions measuring three-fourths of an inch or smaller, robotic-assisted cardiac surgery typically results in reduced blood loss and pain, as well as faster recovery times and return to daily activities compared to traditional open-heart surgery. However, despite these benefits, the adoption of this treatment modality in cardiac surgery has lagged behind other specialties.

"The history of surgical robotics began clinically in the late 1990s, and it was directed toward cardiac surgery," said Dr. Balkhy. "It never matured or materialized because, at the time, I think the systems were a little bit primitive, relatively speaking, and the surgeons were not ready."

In 1998, surgeons at Hôpital Broussais in Paris, France, and Heart Center Leipzig in Germany were the first to use an early iteration of a surgical robot for coronary artery bypass grafting (CABG) procedures, which were the first robotic surgeries of any kind performed.[1]

"Where other specialties have kind of jumped in and started to use robotics in a very common way, cardiac surgeons have been a little bit late to the party, if you will," said Dr. Balkhy. "And so now, with these more refined systems and more training, we're able to realize that this approach is revolutionizing cardiac surgery and will continue to do so based on what I see after having been doing this now for almost 20 years."

According to Dr. Balkhy, many cardiac surgeons today are working with a fourth-generation robot, with enhancements that include enhanced visualization, tremor control, refined integration with additional applications, and other improvements.

"We have evolved and matured as a surgical community collectively to the extent that we can now start to really capitalize on the vast experience that's been acquired by some pioneers in this, including those of us who have kind of stayed with it for a long time during a period where it was not necessarily the most common thing to be done," Dr. Balkhy said.

Achieving Proficiency

The learning curve in robotic-assisted cardiac surgery may be determined by factors such as the individual surgeon's experience in open or laparoscopic surgery, case selection, and the robotic platform used during training.

A study published in a 2023 issue of *The Annals of Thoracic Surgery* examined 1,000 robotic-assisted CABG procedures performed at a single institution from 2009 to 2020.[2] Researchers shared that "short-term outcomes suggested expertise was reached between 250 and 500 cases." After the first 100 procedures were performed, safety and efficacy were demonstrated by the surgeons, suggesting a smaller case number may be necessary for developing competency.

"Similar to any surgical procedure, there's a hugely variable learning curve that's dependent on the individual, and I don't think the robot is any different from that," suggested Dr. Emerson. "I think 250 is a lot of cases to complete in order to achieve expertise. I think the important thing is that they demonstrated safety much earlier than that. And I actually think the learning curve is even more blunted when you're in a program that's already established with good mentorship opportunities."

The learning curve for robotic-assisted cardiac surgery is generally understood to comprise three stages: the beginning or initial learning phase, stabilization phase, and maturing or mastery phase.[3]

"There's a difference between a learning curve to be safe versus mastery, and we see that in any technical

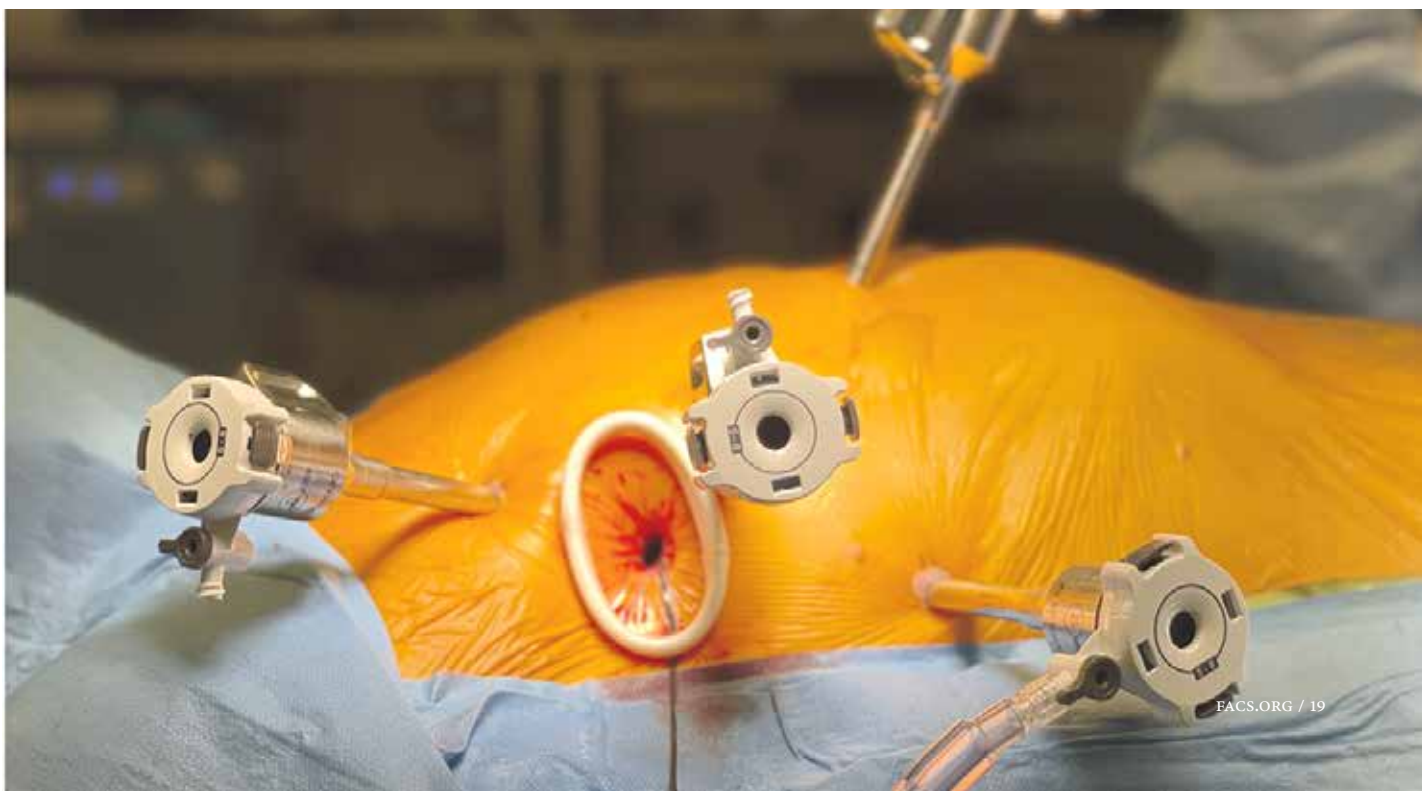
Traditionally, cardiac surgery residents engage in training in conventional open procedures before learning the robotic approach, but that education model is evolving.

skill," explained Dr. Balkhy. "Mastery is defined as reaching a level where you're not experiencing any improvement and you're in a steady state. It also depends on the type of procedure. Mitral valve is the prototypical procedure that's being done now on the heart with the robot, but coronary surgery is seeing the quickest rise in adoption in robotic surgery based on the numbers that we see."

Traditionally, cardiac surgery residents engage in training in conventional open procedures before learning the robotic approach, but that education model is evolving.

"During my residency in the early 1990s, the big conversation was 'Do we need to teach residents how to do open gallbladder resection before we switch over to laparoscopic cholecystectomy?' That's not a conversation anymore—it's a given that the gallbladder will be taken out with a scope, and the residents will learn how to do it that way," said Dr. Balkhy. "We're not there, obviously, in cardiac surgery, but we now see that residents know how the robot works. They know how to operate the arms and the pedals, and they understand the robotic environment. So even though we continue to train them in the open setting, getting them transitioned to the robot is a much easier endeavor."

While robotic skills training is largely absent from cardiac surgical residency training, more institutions are bringing robotic cases into their programs. Notably, the majority of US cardiac surgeons must



Robotic endoscopic ports are used for mitral valve repair at UChicago Medicine.

complete a general surgery residency program—where training in robotics is increasingly an area of focus—before specializing in cardiothoracic surgery.

"We have residents in the middle of their general surgery training coming in and doing rotations with us in the robotic room, and they'll be able to do parts of the operation very easily," explained Dr. Balkhy. "When I first started doing robotics and was 10 years into my practice, it was not that easy because we did not have that training as residents."

Associated Risks and Outcomes Data

"The risks of robotic cardiac surgery are very similar to risks associated with the same procedure in a standard approach," said Dr. Emerson. "The concern we have that is more specific to the robot is the need for conversion. If you're in any kind of minimally invasive approach and you have to urgently change what you're doing and get larger access, obviously that's an additional step, where in a case that's already open, you're right there and you can deal with it more expeditiously."

In a review of articles published between 2015 and 2023, researchers validated the "dependability" of robotic-assisted cardiac surgery with "encouraging" outcomes that demonstrated shorter operating times, reduced blood loss, and a low incident of conversion to conventional interventions.[4] The mortality rates overall were shown to be similar between robotic and traditional cardiac surgery.

"The top cardiac approaches done with the robot are mitral valve and CABG," Dr. Emerson said. "The data indicate that, especially in larger centers with higher volume, you are not in any way sacrificing outcomes. Your outcomes are at least as good as the traditional approaches in select populations. Yes, there are conversion rates—there are times that you have to say 'Okay, well, I need to bail on the robot. I'm going to go to a full thoracotomy or I'm going to do a sternotomy.' But those rates are generally low, and they decrease over time with experience."

A study coauthored by Dr. Balkhy and published in a 2025 issue of *The Annals of Thoracic Surgery* examined 550 robotic totally endoscopic mitral

In the OR during the world's first robotic lung transplant, the primary surgeon sits at a console that is connected to the robot at the bedside.

"The top cardiac approaches done with the robot are mitral valve and CABG."

Dr. Dominic Emerson

valve surgeries.[5] The 30-day surgical success rate was 95.9%, and procedural success was 93%. "Postoperative echocardiography revealed no or trace residual mitral regurgitation (MR) in 95% and mild residual MR in 5%," noted the study authors.

"Our mitral valve experience had a 95%, 5-year freedom from reoperation for recurrent MR," added Dr. Balkhy. "But one of the key takeaways here is to focus on robotics as a matter of routine, so that the device doesn't become a nuance every time you enter the OR, but instead, it is a natural part of the room. If I walk into my room any day of the week and I don't see a robot—I'm lost. Where's my robot?"

Innovations in Robotic-Assisted Cardiac Surgery

Before describing advancements in robotic-assisted cardiac surgery, it is important to understand that the surgeon remains in control of the entire operation. However—as a recent procedure conducted at Johns Hopkins University in Baltimore, Maryland, revealed—that reality may be changing in the future.

"I'm sure a common question faced by every robotic surgeon is 'Who is conducting the procedure—the surgeon or the robot?'," said Dr. Emerson. "I think patients sometimes wonder if I'm just standing off to the side having coffee while the robot is doing the surgery—and the answer is, obviously, 'No.' I tell patients that the robot is simply an extension of me. However, the future is probably going to be different. I believe that at some point there likely will be some independence for the robot—just look at what the group at Hopkins recently accomplished."

In July 2025, an artificial intelligence (AI) system trained on 17 hours of video depicting Johns Hopkins surgeons performing gallbladder removals on pig cadavers.[6] With almost no human intervention, the AI-driven robot separated the gallbladder from the liver in a dead pig, in an event that researchers suggest is the first realistic surgery conducted autonomously by a machine.

"I think AI or machine learning is going to have an impact on cardiac surgery just like it will with every other aspect of medicine," Dr. Emerson said. "I think it will probably manifest most quickly in things like data analysis, which could help us become more efficient in the operation. I also believe there will be continued integration of other technologies, such as imaging analysis and the ability to see overlays of structures in real time."

Dr. Balkhy supports the conclusions drawn by Dr. Emerson regarding wide-scale adoption of independent robotic surgery.

"I am usually on the cutting edge of things and trying to adopt the latest and greatest, but I'm also extremely conservative when it comes to safety," explained Dr. Balkhy. "I think the systems are not refined enough yet, especially in cardiac surgery. Pretty much all my coronary bypass procedures are on the beating heart—so things are moving, the lungs are moving. Now, it's not that AI can't account for that. It probably can. We have very smart engineers and smart systems that can do that, but the safety bar is extremely high."

Before autonomous robotic surgery can move forward, the technology needs to master small, simple tasks. During CABG, for example, when a healthy blood vessel is used to bypass a blocked coronary artery, surgeons need to harvest a vein or in the case of robotic coronary surgery an artery—a task parts of which a robotic device potentially could complete independently.

"This sequence of events, which takes about 30 to 45 seconds between instrument exchanges, could potentially be automated such that there is a self-reloading clip that goes in and it changes into a cutting instrument all within 10 seconds," said Dr. Balkhy. "It seems to me that a simple thing like

that, as long as it's well controlled and there is not a risk of injury, could be done autonomously with a robot—but we're not there yet."

While autonomous surgery remains a future prospect, other innovations in robotic-assisted cardiac surgery are already underway, including applications in transplantation and telesurgery.

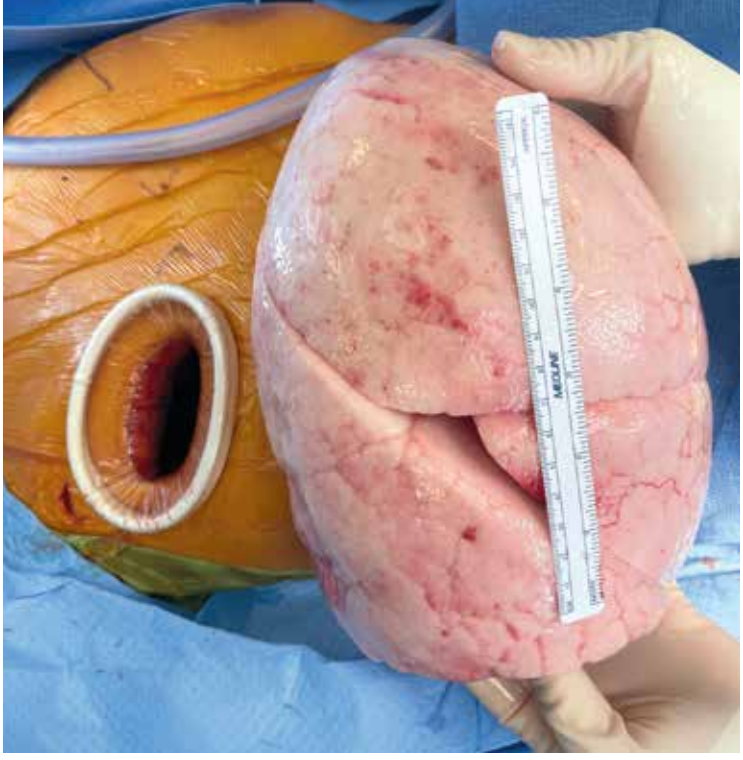
In 2021, surgeons at Cedars-Sinai Medical Center performed the world's first robotic-assisted lung transplant. Using the robotic platform for the donor-to-recipient anastamoses, a 69-year-old patient received a new right lung.

"We believe robotic-assisted surgery is the future of lung transplantation," said Dr. Emerson, the lead surgeon, in a press release.[7] "We have transitioned from offering traditional lung transplantation to minimally invasive lung transplantation to now, robotic-assisted capabilities. This long-awaited achievement is the start of a new era of cardiothoracic care."

The team at Cedars-Sinai initiated the use of smaller incisions "no larger than the short side of a driver's license" that resulted in reduced postoperative pain and improved recovery for the patient.

Robotic-assisted advancements in transplantation also include the world's first fully robotic double lung transplant in 2024 at New York University Langone

Robotic cardiac surgery requires thoughtful setup of the machine to ensure adequate room to maneuver within the chest. Dr. Dominic Emerson prepares the robot for a mitral valve repair.



Using the robot, surgeons can perform a lung transplant through incisions as small as 5 cm-6 cm. Here, the new donor lung is shown alongside the incision used to perform the operation.

in New York, and the first robotic heart transplant in the US performed by surgeons in 2025 at Baylor St. Luke's Medical Center in Houston, Texas.

Another emerging area in robotic cardiac surgery is telesurgery and its ability to expand access to advanced surgical care over great distances. Earlier this year, Dr. Balkhy moderated what is considered to be the world's first intercontinental robotic cardiac telesurgery.[8] The procedure, an atrial septal defect closure, was conducted remotely from a facility in Strasbourg, France, to an OR in Indore, India.

"A lot of these new robotic systems have really jumped into telesurgery, and that's happening through both fiber cables and through 5G," said Dr. Balkhy. "This is exciting because, initially, robotic surgery was focused only on the first world, and now this specialized care can be offered to patients in low- and middle-income countries. Imagine a world where a person can go a short distance, maybe a half an hour away instead of 5 hours and have a blood clot taken care of by an expert living in a main city."

Cardiac surgery will continue to evolve with safer, less invasive, and more efficient interventions that will improve the quality of life for heart patients everywhere.

"The sky's the limit—it really is," said Dr. Emerson. "Ten years ago, if you had said that we're going to use the robot in the valve, people would have thought you were crazy. Five years ago, nobody had done a solid organ transplant in the chest with the robot. Robotics are going to continue to be an essential part of the cardiac surgery armamentarium. Our trainees want to learn it, our patients are asking for it, and our referring physicians want it."

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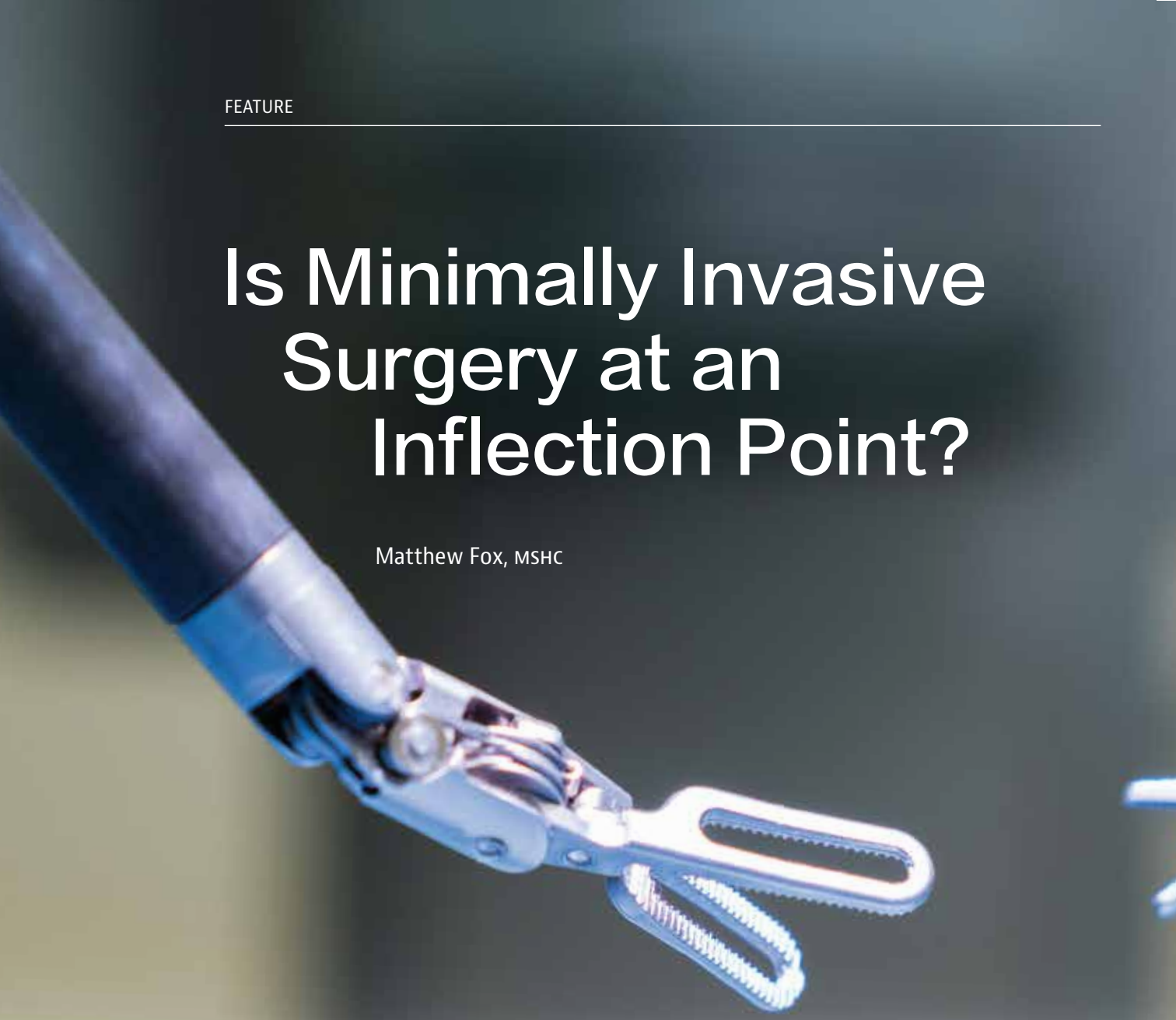
Is Minimally Invasive Surgery at an Inflection Point?

Matthew Fox, MSHC



FOR A FIELD IN A CONSTANT state of development due to advancing knowledge, technique, and technology, no transition over the past 40 years has changed the surgical landscape as much as the shift toward minimally invasive surgery (MIS) from open surgery.

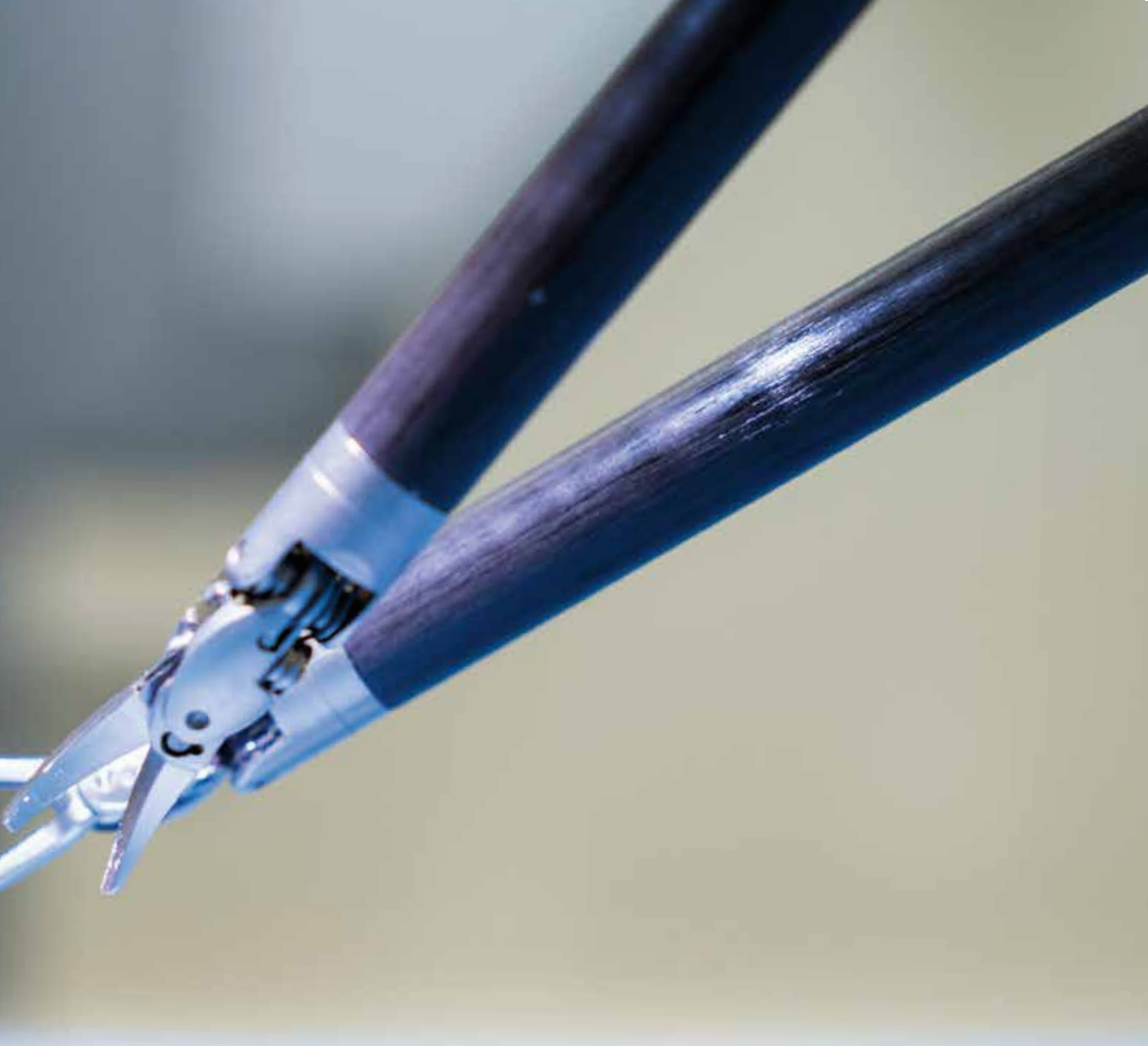
In disciplines ranging from general surgery to neurosurgery to urology, in procedures ranging from cholecystectomy to craniotomy to prostatectomy, surgeons using MIS often provide patients with equal or superior outcomes compared to open surgery, in addition to fewer complications, shortened hospital stays, and faster recovery, among other benefits.[1-2]

MIS encompasses a range of modalities that surgeons around the world are learning, employing, and studying to determine the approach that best meets the needs of their patients and their own professional circumstances and skills—and the field may be at an inflection point that will determine where the focus will lie in the future.

While MIS has undeniably taken a prominent role, open surgery is still being practiced and remains a core part of the profession—and both approaches have implications for the future of surgery.

Shifting Scales Between Robotics and Laparoscopy

The history of MIS is long, but its modern conception for several specialties such as general



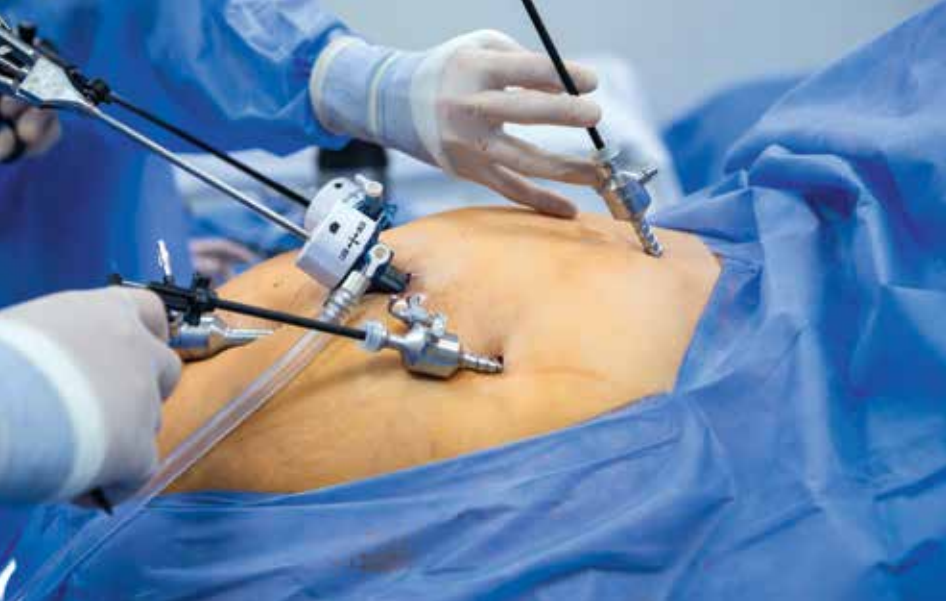
surgery found its footing with the proliferation of laparoscopes in the 1980s and 1990s. Since then, laparoscopic surgery rapidly grew and became the "gold standard" of several high-volume procedures like appendectomy or cholecystectomy.[3]

But in 2025, many surgeons will likely have noticed that robotic surgery, or robotic-assisted surgery, is receiving significant attention in research and use across a range of procedures. The data reveal a notable trend that represents a primary conversation in modern MIS: in general, robotic surgery seems to be waxing and, concomitantly, laparoscopic surgery may be waning for several common surgical procedures.[4]

In fact, some research suggests robotic surgery will overtake, or already has overtaken, laparoscopic surgery in a variety of procedures, including prostatectomy, pancreatectomy, and hepatectomy, among others.[5]

The question is: Why is robotic surgery seeing such rapid growth today?

"Laparoscopy really hasn't changed since the 90s. It still uses the same instrumentation, so there's no technology that has improved beyond the fidelity of the cameras," said David W. Larson, MD, MBA, FACS, a colorectal surgeon at the Mayo Clinic and professor of surgery at the Mayo Clinic Alix School of Medicine, both in Rochester, Minnesota.



"You are looking at more than 30 years of no real technological development."

At the same time, robotic platforms are rapidly iterating, with the most popular multiport robots entering their fifth generation, while single-port platforms are gaining US Food and Drug Administration approval.

"These platforms have all built upon each other, and each one is better than the last, supplying surgeons with new, more improved technology that's faster, more efficient, more facile, and takes less cognitive burden," Dr. Larson said.

Overall, robotic surgery platforms have been advancing toward more complete intraoperative imaging, as well as a more comfortable operating experience for surgeons.

"With laparoscopy, you're using more two-dimensional cameras. You're using straight stick instruments that have some flexibility in them. But in robotics, the difference is, you have 3D visualization and camera technology—which does exist for laparoscopy, but it's not as universal," said Rana Higgins, MD, FACS, a minimally invasive general and bariatric surgeon at Froedtert Hospital in Milwaukee, Wisconsin, and an associate professor of surgery at the Medical College of Wisconsin (MCW) in Milwaukee.

"Robotic technology universally has 3D visualization and camera technology, and the instruments are wristed—there is also a difference, ergonomically, between the two, as laparoscopy requires standing with your arms up next to the patient while robotics allows you to sit," she said.

Those wristed instruments and the overall ergonomics of performing surgery are proving to be critical, defining benefits of robotic approaches. These benefits are more in reference to how a surgeon efficiently works through a procedure, and less regarding surgeon neck, shoulder, and back comfort, although the positive impact of these advantages is undeniable.

Adapting to Robotics

This innate familiarity with the manual ergonomics of robotic surgery has implications not just when considering performing a robotic versus laparoscopic procedure, but also for how surgeons conceptualize the transition from open surgery to MIS.

"With robotic surgery, I can move instruments like my hand. In laparoscopy, they're just straight sticks. So, the jump from open to robotics is a much more direct path," Dr. Larson said. "The operation and how it's performed, the movements—the ergonomics of it all is much more similar between robotics and open than they are from laparoscopy."

Mid-career or more experienced surgeons who have been performing laparoscopy for years had to learn an entirely different way of doing things, because the instrumentation does not move like the hand, he added.

With robotics, the transition from open surgery practice was more direct. This conversion has been particularly noticeable and transformative in some specialties in which laparoscopy did not find a foothold, such as urology, gynecology, and surgical oncology. In these, the ability of robotic platforms to provide superior visualization in compact spaces and more precise movements around sensitive or healthy tissue has resulted in superior outcomes.

General surgeons are likely to face the most challenges when deciding between laparoscopy and robotics as this specialty relies heavily on laparoscopes that can take advantage of larger operative space. But even within that field, common, high-volume procedures such as hernia repair may benefit from a robotic approach.

General surgeons are likely to face the most challenges when deciding between laparoscopy and robotics as this specialty relies heavily on laparoscopes that can take advantage of larger operative space.

"There are studies to show that the learning curve for a laparoscopic inguinal hernia repair is longer than the learning curve for a robotic inguinal hernia repair," said Dr. Higgins, who also specializes in minimally invasive hernia repair. "In addition, robotics may provide the ability to do more complex ventral hernia repairs in more ergonomically challenging positions in ways that you couldn't do laparoscopically because you were limited by the technology."

Hernia repair is an example of how robotic platforms provide an opportunity to perform complex procedures with an ergonomic tool. An element as fundamental as suturing can be transformed into a learned skill that comes more naturally to surgeons with this technology.

"As an MIS surgeon, I do laparoscopic suturing all the time, but it is easier to teach a resident how to do robotic suturing, because it makes more sense. You're using wrists as opposed to straight stick suturing with laparoscopy. While an incredibly important skill, it is not realistic to say that everyone is going to be a master at advanced laparoscopic suturing," Dr. Higgins said.

"The technology provides an opening for surgeons to give patients minimally invasive approaches

that they may not have had if they didn't feel comfortable or have the training or exposure to do it laparoscopically," she added.

Dr. Larson underscored that laparoscopy has a higher skill floor than robotics, meaning that while current practitioners can operate at an expert level, robotic surgery provides additional opportunities for surgeons to be involved in MIS.

"The surgeons who do laparoscopy at the highest level are incredible technicians, but robotics helps to level out skill for people who aren't as technically gifted. They can provide the same outcomes because of the technology," he said. "We're upskilling surgeons from the baseline. A rising tide lifts all boats, and to me, robotics is a rising tide that not only benefits the surgeons but significantly benefits patients."

There also has been a tangible shift toward robotics in terms of the highest-quality research—randomized controlled trials.

"I've been doing robotic surgery since 2008, but we're now just starting to see large, randomized control trials that demonstrate robotic superiority over laparoscopy," Dr. Larson said, noting that at an individual institution level, some of these results started to filter out between 2012 and 2020.

Future Promise, Present Practicalities

While the future appears to be one where the robotic approach will take the lead for many surgical procedures, that transition presently is in its early stages.

To begin with, further studies need to be completed, and research needs to be released providing a higher level of certainty regarding the superiority of robotic or laparoscopic surgery outcomes across the spectrum of disciplines and procedures.

Looking at one of the most common surgical procedures around the world—cholecystectomy—as an example, current research presents a range of findings. Some indicate that the robotic approach incurs a significant increase in bile duct injury complication rate versus laparoscopic, while others show decreased complications, conversion to open procedures, and shorter hospital stays.[6,7]

In this interim period, as additional outcomes research accumulates, one of the most significant questions is related to cost and how that affects availability and the financial practicality of robotic platforms. Robotic surgery is generally found to be a more expensive approach in terms of intraoperative activities and infrastructure,[8] though there is a down trending of costs for robotics over time in certain disciplines such as bariatrics.[9]

Existing OR infrastructure, in particular, could prove to be another financial challenge.

"In terms of hospital resources, we have hundreds of operating rooms in at the Mayo Clinic, and each one of them has a laparoscopic tower. So, I can do laparoscopy in every single OR, but I can't do robotics. That's a huge frame shift for hospitals—

Experienced surgeons recognize that for as much as surgery is continuing to shift toward MIS, a lack of skill with open surgery imperils patient safety.

so as laparoscopy diminishes, we'll need to retool the operating room so that we can do robotics," Dr. Larson said.

"I'm not saying just jettison all of our laparoscopic equipment in every OR in the US, but we need to start thinking about the entire ecosystem," he said. While surgeons over time may "vote with their feet" and move toward robotics, there often are administrative and political considerations that are tied to funding the transition to the new technology.

Open Surgery and Future of Surgical Education

The current era of surgery is defined by MIS, and both patients and surgeons continue seeking operations that lead to easier recovery, fewer complications, and improved outcomes.

However, open surgery remains a necessary part of a surgeon's toolkit. Areas such as trauma, major oncologic resection, and organ transplantation continue to be mainly performed through open surgery because of ingress and egress to the operative space, as well the need to manually manipulate large tissue or organs (although even in these, MIS is advancing[10]).

Another reality that any surgeon employing MIS for an operation may encounter is converting to open if a surgeon does not feel that they are able to manage an unforeseen challenge—scar tissue, bleeding, or complex anatomy—with a robotic or laparoscopic approach. Conversion to open across specialties is associated with detrimental outcomes for patients and hospitals compared with a procedure with no conversion.[11]

So, whether through circumstance, preference, or necessity, open surgery will always need to be an option for delivering the highest-quality outcome possible for patients.

"As a minimally invasive surgeon, many of my procedures that I do are minimally invasive, but I also need to know its limitations," Dr. Higgins said. "If a patient isn't tolerating the insufflation from minimally invasive surgery, that's not what's best for the patient, and then you convert to open. You need to have all the tools in your toolbox. It's not fair to patients for us to just know one way, and only that way."

While mastery of open surgery is essential for comprehensive surgical competence, surgical residents are, statistically, performing fewer open operations in their course of their training.[12] Experienced surgeons recognize that for as much as surgery is continuing to shift toward MIS, a lack of skill with open surgery imperils patient safety.

The core knowledge imparted by open surgery training, including a tactile understanding of a patient's unique anatomy and disease presentation, remains a critical underpinning for MIS.

To that end, residency training must continue pushing forward with including evolving MIS technology and techniques, while also allowing adequate exposure to open surgery.

"I emphasize to the residents to get as much exposure as they can to open operative cases, which is even more important today because it is becoming less common," said Dr. Higgins, who also is the General Surgery Residency Program director at MCW.

"We stress that residents try to take advantage of being in those cases, even if you're not the first assist surgeon or the most senior resident. Even if you're a more junior resident, get exposure to as much as you can see," she said.

For open surgery, exposure refers to understanding how a case is set up to begin with.

"If you're seeing less open surgery, it's difficult to really get comfortable with that. You may understand inguinal anatomy, but if you don't know how to set

up an open inguinal hernia repair, you're not going to do right by the patient," Dr. Higgins said.

A major part of contemporary surgical education, and an effective way to address growing gaps with open surgery experience, is surgical simulation. While wet labs and core curricula continue to grow around MIS, simulation provides a safe environment to grow skills in all surgical modalities and is becoming a critical part of residency training for surgery because of duty-hour restrictions and lessened operative experience for junior residents.

Simulation acts as an adjunct for resident training that should include robotic, laparoscopic, and open components. For both cases—setup for open surgery and using the powerful visualization and manipulation tools in the various forms of MIS—simulation has become a core part of residency training to bring trainees up to a level of proficiency that produces high-quality outcomes and provides patient safety.

"We never have our residents just jump in and start doing minimally invasive surgery. They all need to do a robotic training curriculum, they all need to complete a laparoscopic curriculum, and so on. Simulation is a must for training programs to introduce residents to the technology in a safe, protected environment before they perform these techniques on a patient," Dr. Higgins said.

The conversations happening within MIS, open surgery, and surgical training are developing, and will expand well beyond the scope of this article. Within clinical care itself, evolving technology and the balance of current practicalities and future potential will require surgeons to take the lead and emerge from this inflection point in a way that ensures patients are receiving the best possible care.

Matthew Fox *is the Digital Managing Editor in the ACS Division of Integrated Communications in Chicago, IL.*

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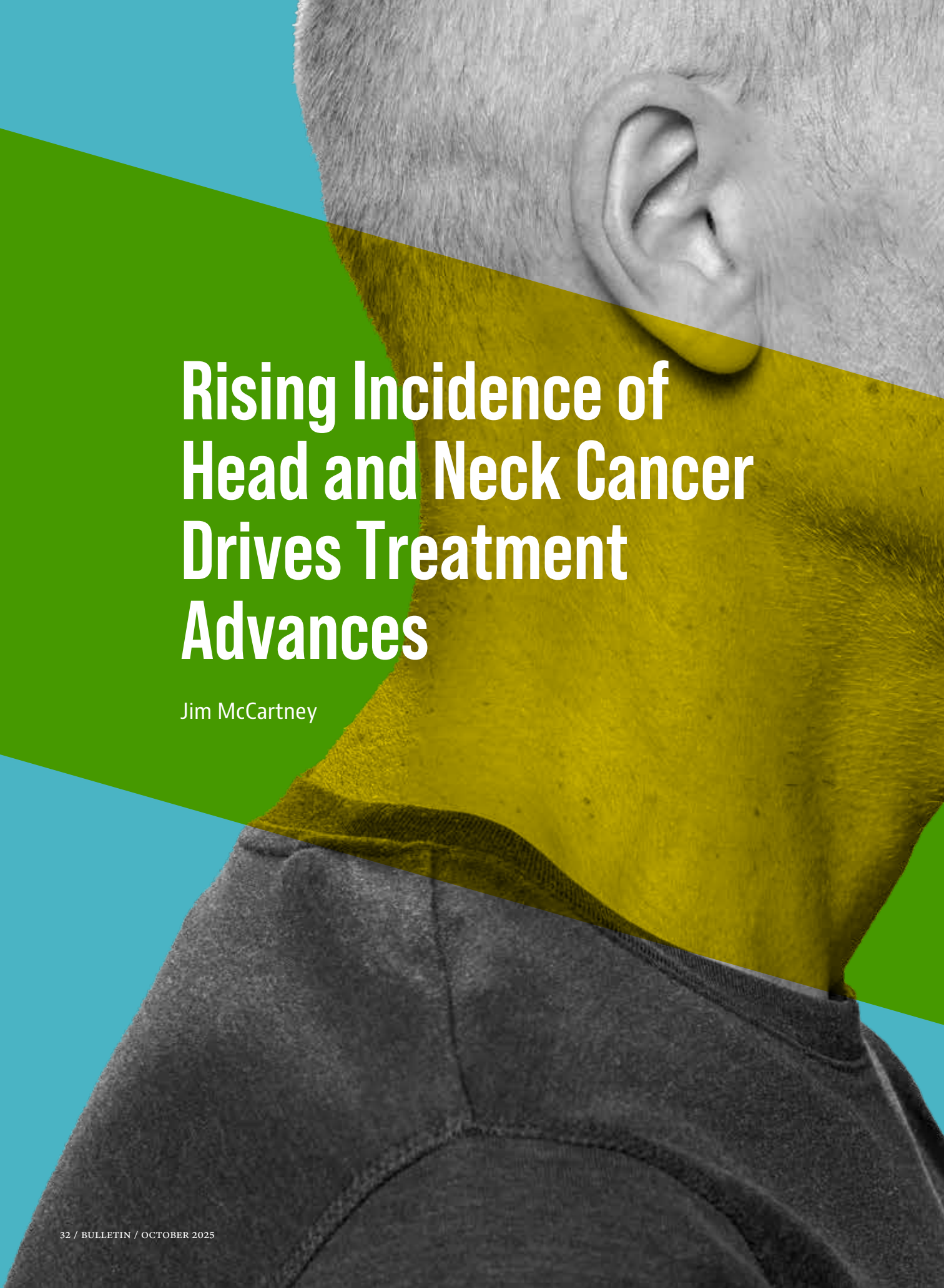


Rising Incidence of Head and Neck Cancer Drives Treatment Advances

Jim McCartney

After years of decline driven by successful tobacco cessation efforts, certain head and neck cancers—particularly oropharyngeal cancers—are on the rise in the US, largely due to increasing rates of infection with high-risk strains of human papillomavirus (HPV).

"The traditional cancers associated with tobacco consumption, such as mouth, tongue, and larynx cancer, have decreased," said Dennis H. Kraus, MD, FACS, ACS Second Vice-President. "But other cancers, especially those related to HPV, are increasing significantly."

Head and neck cancers are a diverse, challenging disease group because they are near vital organs and complex in nature, and their treatments have the potential for significant side effects. The tumors' proximity to structures like the larynx, salivary glands, and nerves can make it difficult to effectively target cancer cells without damaging healthy tissue.

Despite its morbidity, open surgery was once the mainstay of treatment for head and neck cancer, Dr. Kraus said. Then radiation and chemotherapy showed effectiveness but came with toxic side effects.

In recent years, minimally invasive surgical techniques and robotic-assisted surgery have been shown to treat head and neck cancers with less morbidity. Meanwhile, efforts to make radiation and chemotherapy more effective and less toxic are advancing, as are promising new developments in immunotherapy.

Since these treatments often are used in combination, effectively treating, reconstructing, and rehabilitating the head and neck cancer patient requires a multidisciplinary team.

Evolving Nature, Risk Factors

Head and neck cancers usually begin in the squamous cells that line the mucosal surfaces of the head and neck, or, less commonly, in the salivary glands, sinuses, or muscles and nerves in the head and neck.[1] Other head and neck cancers include skin cancer and thyroid cancer.[2]

"Head and neck cancer is not one single cancer, it's a constituency of diseases," Dr. Kraus said.

The National Cancer Institute estimates that approximately 72,680 people in the US will be diagnosed with a major type of head and neck cancer—oral cavity, pharynx, or larynx cancer—in 2025. An estimated 16,680 people will die from these diseases.[3]

Most head and neck cancers can be divided into two different categories—those related to HPV and those that are not, said Jamie A. Ku, MD, FACS, director of the Head and Neck Robotic Surgery Program at the Cleveland Clinic in Ohio.

Historically, most head and neck cancers in the US were caused by tobacco use, often combined with alcohol use, and typically affected men 50 years and older.

Currently, though, HPV-driven cancers represent a large proportion of new head and neck cancer diagnoses in the US, which occur more commonly in men who are in their 40s or older, but also in women, said Ryan J. Li, MD, MBA, FACS, professor and chief of the Division of Head and Neck Surgery at Oregon Health & Science University in Portland.

"These patients are younger, healthier, and usually nonsmokers. They also have a slightly higher socioeconomic and educational background," Dr. Ku said.

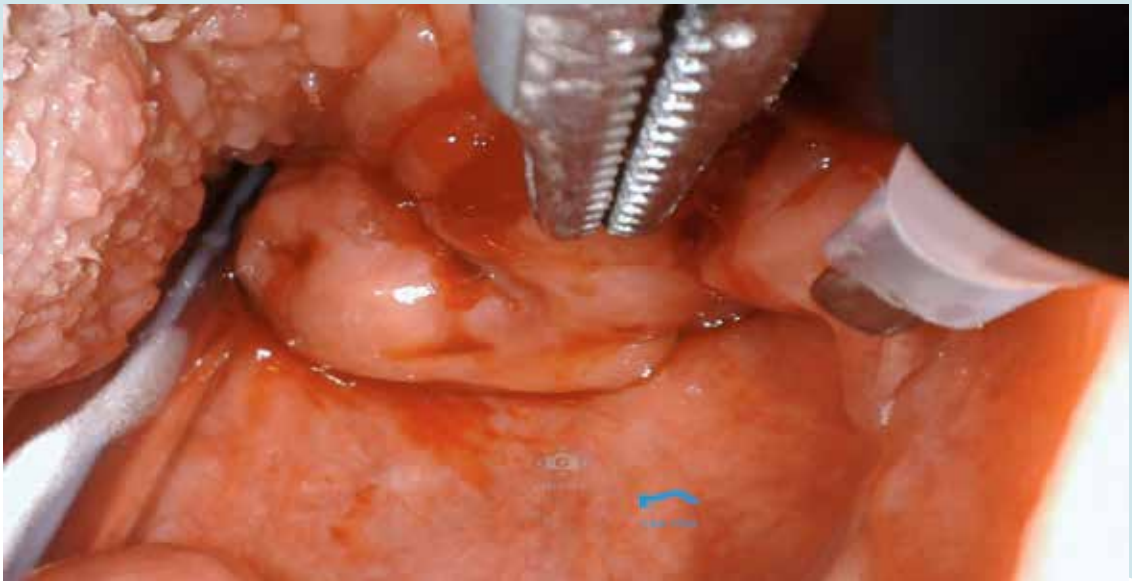
Tobacco-related head and neck cancers, however, are still prevalent in much of the world and are the third-most prevalent cancer, according to the Global Cancer Statistics of 2020. These diseases account for 7.6% of all cancers, 4.8% of all cancer-related deaths, and are predicted to rise 30% annually until 2030.[4,5]

"In Southeast Asia and India, oral cancer related to tobacco use and betel nut chewing is a major epidemic," Dr. Li said.

Other risk factors include alcohol, environmental and occupational exposures (such as wood dust and mining), and genetic predisposition.

HPV Leads to Cancer Resurgence

HPV is the most common sexually transmitted infection in the world. Although most people resolve HPV infection without medical intervention, HPV-driven head and neck cancer can remain latent, grow slowly, and may not appear for years.[6] In the US, head and neck cancers now surpass cervical cancer as the most common HPV-related malignancy, in part due to the success of cervical cancer screening.[7]



A robot-assisted transoral approach is used to resect a right-sided tongue base HPV-associated squamous cell carcinoma.

The rise in HPV-driven head and neck cancers in the US may be in part due to substantial differences in sexual practices in North America, Dr. Li said. The number of oral sex partners is a risk factor associated with HPV-related head and neck cancer, specifically oropharyngeal cancer.

HPV cancers have risen despite the introduction of the HPV vaccine in 2006 for girls and young women, and a few years later, for boys and young men. The most recent vaccine protects against nine high-risk HPV variants and is typically offered to patients upon their sexual debut up to the age of 26, but clinicians and patients can consider vaccination up to age 45 years, Dr. Li explained.

According to Dr. Ku, it may take 20 to 30 years before the HPV vaccine starts to reduce HPV-driven head and neck cancers.

Multidisciplinary Team Approach

Multidisciplinary collaboration is important when developing a patient plan that considers the roles of surgery, radiation, and systemic therapy, Dr. Li said.

The team typically includes surgeons, particularly otolaryngologists and head and neck, maxillofacial, and reconstructive specialists. At some US centers and around the world, this team includes general surgeons who subspecialize in head and neck cancer surgery, Dr. Li explained. In addition, many other specialists engage in treatment, reconstruction, and rehabilitation of these patients, including pathologists, radiologists, radiation and medical oncologists, speech and language pathologists, dentists, and nutritionists.

"Multidisciplinary care, especially for these complex head and neck cancer patients, is very important," Dr. Ku said. "Patients should not be seeing just a surgeon. They should be under the care of a well-run team of specialists."

"High-Risk Real Estate"

Cancer in the head and neck area can affect a patient's appearance and sense of identity, as well as their ability to speak, swallow, and interact with others.

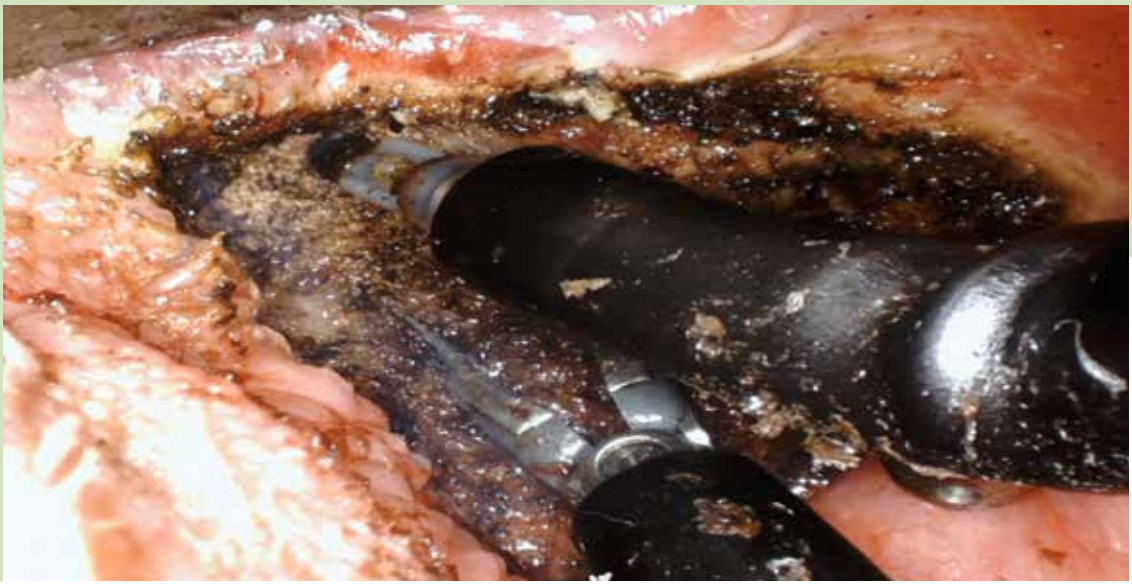
"The head and neck are very high-risk real estate," Dr. Ku shared.

Minimally invasive and reconstructive techniques are critical to protecting patient quality of life. As a result, treatment decisions must take into account not just effectiveness in treating the cancer but also potential side effects—both short and long term. Radiation toxicity, for example, can potentially create quality-of-life issues, especially around swallowing and speech functions and dental and oral cavity health.

"That's why patient selection is such a critical art and why surgeons must help patients understand the advantages and disadvantages of each approach," Dr. Li said.

The effects of toxic radiation have become a rising concern in the US as HPV-driven cancers have become the most common cause of head and neck cancer.

HPV-related head and neck cancers, which primarily occur in the oropharynx behind the oral cavity, have a higher probability of cure than the classic head and neck cancer diagnosis that was related to tobacco use, Dr. Li said, adding that the longer the patient lives after treatment, the more likely the cumulative effects and toxicity of radiation can affect them post-treatment.



A surgeon resects the right side of the tongue base transorally with the assistance of a surgical robot.

"They have a longer runway of time to experience adverse effects," he said.

Restoring Appearance, Function, and Quality of Life

Reconstruction has made many advances over the last few decades, particularly complex reconstruction.

Up to 3 decades ago, a large resection of the jaw would leave the patient without the profile of their jaw, Dr. Kraus said. Now, titanium implants and prosthetic teeth implants can be used in reconstruction, as can tissue transferred from other parts of the body, such as the leg, hip, scapula, or forearm.

Patients who have a large cancer removed from their oral cavity, such as their tongue, often need immediate reconstruction as the resulting surgical wound is not compatible with life or function, Dr. Li explained.

As a result, many reconstructive surgeries are performed at the time of cancer removal, often with one team of surgeons removing the cancer in tandem with another team preparing to reconstruct the surgical site.

"Collaboration between ablative and reconstructive teams reduces the length of time a patient is under general anesthesia," he said.

Reconstruction cases can take from 6 to 12 hours, or longer if there are technical challenges, and even the best efforts may not be able to fully restore functions such as speech and swallowing. As a result, patients must be counseled as to what functional deficits to anticipate. Speech-language pathologist support is central to preparing patients for life-changing consequences of treatments.

Advances in Diagnosis and Early Detection

Like most cancers, head and neck cancers are more treatable and curable if found early.

The most effective screening efforts for head and neck cancers often are the result of routine primary care and dental oral care examinations, Dr. Ku said.

Tests can profile a patient's tumor and identify the molecular basis for malignancy, according to Dr. Kraus. For example, some tests use molecular markers to risk-stratify the malignancy in thyroid neoplasms. Previously, patients with an indeterminate thyroid nodule would require an open surgical procedure.

Finally, there are efforts to identify head and neck cancer biomarkers from tissue or liquid specimen, such as blood, Dr. Ku said. Blood tests or "liquid biopsies," will be a major component of future diagnostics for patients as well as monitoring their response to treatment. Molecular and genetic markers can be used during surveillance to predict tumor behavior and can determine if there is minimal residual disease by looking for tumor DNA circulating in the blood. This approach can inform surgical decision-making; eventually, these markers also could be used for diagnostic purposes, she shared.

And in the future, AI could help evaluate blood tests and biopsies.

Advances in Biopsies

There have been many advances in biopsy technology for head and neck cancer.

A key advancement in this area is the sentinel lymph node biopsy, which is used in early stage squamous cell carcinoma

In the past, radical open surgeries were performed on hard-to-reach areas, resulting in a temporary tracheostomy and a feeding tube. Now, there are multiple tools to access these areas.

to reduce unnecessary neck dissections. This preserves the patient's immune system to help them fight cancer.

"Rather than perform a huge operation to remove all of the lymph nodes on one side of the head and neck, we now take out one or two lymph nodes, which are then evaluated for cancer," Dr. Kraus said.

According to Dr. Li, for patients with a neck mass without a clear primary site, physicians now test a confirmed cancer for expression of a protein that is commonly a surrogate marker for HPV—a protein called p16—that can indicate a hard-to-see cancer that originated in the oropharynx.

A thorough endoscopy of the upper aerodigestive tract can identify and biopsy suspicious lesions, and for hard-to-reach or -see areas of the throat, biopsies can be done using robotic systems or interventional radiology expertise, he explained.

Advances in Minimally Invasive and Robotic-Assisted Surgical Techniques

In the past, radical open surgeries were performed on hard-to-reach areas, resulting in a temporary tracheostomy and a feeding tube. Now, there are multiple tools to access these areas.

For example, transoral robotic surgery uses small instrumentations and articulating arms to reach tight, remote areas performed by endoscopic visualization tools, Dr. Ku said, explaining that a surgical micro robotic system with microsurgical tools also is being explored.

Patients who receive robotic resection of the primary tumor in the back of the oropharynx may avoid morbid neck dissection, have a lower risk for recurrence, and may no longer need chemotherapy or radiation (or require lower doses), Dr. Kraus said.

As in other industries, artificial intelligence (AI) is likely to have an increasing role in imaging and pathologic analysis and could soon be used in preoperative planning and risk stratification in head and neck cancer surgery. It could even help plan the surgery, Dr. Li said, adding that a major factor in the success of such computing advances is the quality of data that are input into analytical platforms.

This AI-guided approach is common in sinus surgery for some noncancer and cancer cases, but so far, it hasn't been applied much to head and neck cancer surgery.

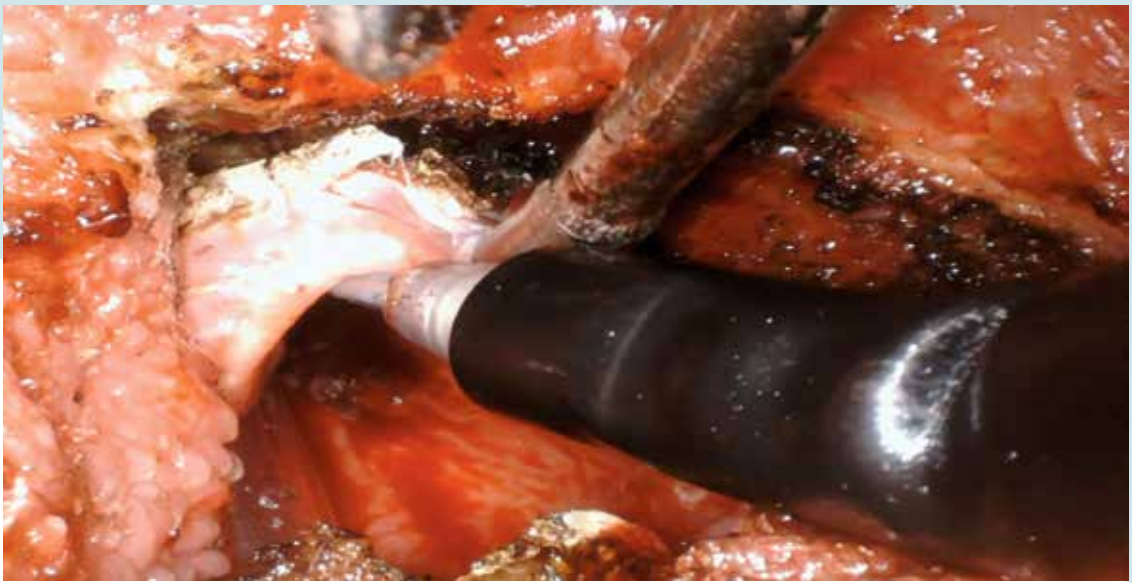
Immunotherapy and Other Developments

For years, attempts to improve overall survival or quality of life in the adjuvant phase for head and neck cancer patients were unsuccessful. Recently, however, immunotherapy has shown success in treating these patients, such as those with advanced squamous skin cancer.

"In terms of both oncologic outcome and functional, quality of life, and cosmetic outcomes, immunotherapy will lead to significant improvement in the way we treat these patients," Dr. Ku said.

In addition, checkpoint inhibitors, such as pembrolizumab, also have shown progress in treating recurrent or metastatic disease, and more recently in the primary treatment of head and neck cancers, Dr. Li shared. The Keynote-689 study showed that checkpoint inhibitors, in combination with standard of care treatment, produce significant benefits in treating various locally advanced head and neck cancers, including cancers of the larynx, hypopharynx, oropharynx, and oral cavity.

"This is one of the most exciting paradigm changes that likely will be widely adopted in the treatment of head and neck cancer, as it stands to materially improve pathological response and survival rates in many patients in an area where movement of survival rates have largely remained stagnant," noted Dr. Li.



The right-sided tongue base cancer has been successfully removed using a transoral, robot-assisted approach.

Other new treatment developments include:

- **Targeted radiation:** Radiomics is an area in which radiation will target cells with molecular changes. In addition, studies are underway to reduce the dose and/or volume of radiation based on when or in what combination with other treatments it is delivered.
- **Advances in personalized medicine:** Tumor genetic profiling can guide surgical decisions and target therapies. "Based on your own molecular markers, we're now able to use much more specific drugs and really target those molecular events," Dr. Kraus said.
- **Novel therapies:** Therapies such as vaccines beyond the HPV vaccine; for example, a melanoma vaccine is in development.
- **Bioengineered tissues and regenerative medicine in reconstruction:** These approaches aim to create biocompatible, tailor-made tissues that can be implanted to restore functionality and appearance.

As the treatment of head and neck cancer continues to evolve, with increasingly sophisticated diagnostic tools and expanding treatment options, the role of the multidisciplinary care team—led by the surgeon—has never been more important. Advances in minimally invasive surgery, reconstructive techniques, immunotherapy, and personalized medicine are transforming outcomes, offering patients improved survival and better function and quality of life. Yet with the rise of HPV-driven disease, the challenges remain complex. Continued collaboration, innovation, and patient-centered care will be essential to shaping the future of this cancer treatment. B

Jim McCartney *is a freelance writer.*

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Annika Kay

APPs Play Critical Role in Supporting Trauma Teams

Annika Kay, PA-C, MPAS

I am not a surgeon. I am a physician assistant (PA) or advanced practice provider (APP). I am just a PA.

I say "just" not to belittle my profession, but to illustrate that my experience and accomplishments are not specific to the letters behind my name but rather were made possible through the environment and team with which I have worked and grown.

This is a story about partnership, specifically the power of effective partnership between surgeons and APPs. Central to this partnership is the ability of APPs to function at the top of their scope, both clinically and administratively.

In this viewpoint article, I address two concepts critical to my career as a trauma APP. First is the power of physician-APP partnerships in clinical care and education. Second is the power of this partnership in advancing the science of patient care. As a final thought, I offer strategies for sustaining successful collaboration between these two important roles.

I want to acknowledge my sincere admiration for the trauma team. A trauma team must operate on a foundation of trust, determination, confidence, and cohesiveness. Sometimes we win, and sometimes we lose. And when you endure that reality with a team, they become family.

Trauma surgeons have inspired me from the beginning of my career, as they lead teams that are adaptable, ready to go at any given moment, unflappable under pressure, and experts at making difficult decisions in seconds. I have learned that trauma teams don't say "no" and rarely shy away from a complicated situation.

To be a part of that environment, to be a player on that team, to have discovered a sweet spot where APPs and surgeons work together effectively and collaboratively—that has been a dream come true for me.

Privilege of the Podium

As the first nonsurgeon to give a named lecture at the Southwestern Surgical Congress (SWSC), I could feel in my chest both the weight of pressure and lightness of excitement that comes with the realization that something special is about to happen.

As famously quoted by tennis legend Billie Jean King: "Pressure is a privilege." Of all the opportunities I have had at the podium, none surpassed the privilege of that podium on April 23, 2024, when I delivered the Edgar J. Poth Memorial Lecture.[1] To stand with a microphone in front of a room of surgeons and speak about what the optimal surgeon-APP partnership looks like and the goal of effectively advancing trauma care felt like a career pinnacle in my 15 years and counting as a trauma APP.

My journey began with a trauma APP fellowship in 2010 and the SWSC organization where I delivered my first scientific oral podium presentation in 2013, which addressed the efficacy of weight-based enoxaparin for venous thromboembolism prevention in obese trauma patients. Five minutes before I took the stage, someone mentioned that no APP had ever been at the SWSC podium.

Doubt crept in, but it was quickly replaced with a sense of belonging and community. We are surgical providers who are passionate about advancing patient care through science and collaboration.

After a few moments, I didn't think twice about my credentials. I was transformed by the sense of camaraderie that permeated that space. Genuinely surprised to be one of the only APPs in the room, I was determined to blaze a path forward for us, specifically in the research arena.

Over the past decade, I have found myself at the helm of various trials and analyses and have had the privilege of speaking from many scientific podiums. And while over the years I have seen more APPs at the scientific podium, it is important to support even more APP participation in this area.

APP-Based Team Model

The real key to my success as a trauma APP and researcher is the support and mentorship of my surgeon colleagues. I am a product of my team in Salt Lake City, Utah, where I have been nurtured to function at the top of my APP scope.

At Intermountain Medical Center, an ACS-verified Level I trauma center serving the Salt Lake Valley and broader Intermountain West in Utah, our team consists of six trauma surgeons, 13 APPs, and various residents (e.g., surgical, emergency medicine). We are an APP-based team—originating in the 1990s from a visionary trauma surgeon who was clearly ahead of his time.

Our APPs are involved in all aspects of trauma care, from the bay to the door. Practicing at the top of our scope, we serve in both clinical and administrative roles (see Table 1, page 42). And all of this occurs equitably with physician residents.

This APP-led model works well to provide high-quality trauma care, largely because of the consistent APP presence and commitment to our protocols and practices that support the revolving door of residents. It also works because trust (and thus autonomy) is inevitably built between the surgeons and APPs.

Postgraduate Training for APPs

Since 2010, our team has supported a trauma and critical care fellowship for APPs, of

The Intermountain trauma team, including (left to right) Thomas White, MD, Steven Granger, MD, Dave Morris, MD, Annika Kay, PA-C, Michael Long, MD, Brad Morris, Sarah Majercik, MD, Scott Gardner, PA-C, and Christina Pelo, PA-C, attends the SWSC.

Annika Kay connects with SWSC President Thomas White, MD, after presenting the Edgar J. Poth Memorial Lecture in 2024.

which I was the first graduate. We are one of the few postgraduate programs for APPs with a focus on inpatient trauma care.

It is well documented that postgraduate training for APPs produces highly skilled, competitive, and confident providers in any given specialty.[2-3] Unique to our program is a required research project, leading to many graduates presenting at national meetings and publishing in peer-reviewed journals. Promoting a research mindset and an academic culture that is inclusive of APPs has been central to the ongoing partnership among our surgeons, APPs, and resident physicians.

Unfortunately, for most APPs practicing in surgical and critical care specialties, postgraduate training is the exception. Despite rigorous standards set by the ACS for trauma center verification, there remains a gap in specialty training for APPs. Many begin clinical practice with limited exposure to acute surgical diseases and traumatic injuries, often lacking the confidence and support necessary for success. This lack of experience can lead to poor retention, and it hinders collaboration.

While trauma fellowships for APPs do exist, they are limited in number and are not a feasible option to adequately train all APPs in our specialty. The 2022 ACS Leadership Survey assessed demographics, patterns, and opinions across a spectrum of issues facing today's surgeons, including the use of APPs in clinical practice.

Although the majority of respondents were satisfied with the competency of APP graduates entering surgical practice, 69% believed APPs should be required to complete some type of surgical training prior to clinical practice. Furthermore, the majority of respondents noted that it is extremely important for the ACS to be involved in establishing requirements and verifying APP surgical training programs.

Table 1. Roles and Responsibilities of Trauma APPs

Clinical Roles	Administrative Roles
Team lead in trauma bay	Process improvement
Independently perform procedures	Trauma research
APP-led trauma floor and ICU teams	EMS outreach
Surgical first-assist	CME/conference director
Massive transfusion response team	APP fellowship program director
Trauma clinic	Executive leadership structure

Establishing a Trauma APP Certification

The first Trauma APP Certification Course is being developed. This national, skills-forward educational program is designed for nurse practitioners and PAs entering trauma care or transitioning from another specialty.

Designed to establish a standardized baseline of trauma knowledge and procedural competency, the course combines high-yield didactics with immersive hands-on skills training. Content includes injury patterns, diagnostics, acute interventions, and critical trauma decision-making. Course objectives focus on improving clinical readiness, enhancing procedural proficiency, and promoting provider confidence in trauma settings. The course

Table 2. How to Incorporate APPs into Acute Care Surgery Teams

Value	Recgonize APP as valued clinicians and colleagues
Team Structure	Build a team that promotes autonomy, critical thinking, and an equitable environment with residents
Academic Culture	Cultivate an academic culture and research mindset that includes APPs
Participation	Include APPs in grand rounds, journal clubs, peer review
Education	Standardize onboarding for clinical skill development; Start an APP Fellowship
Protected Time	Advocate for APP-protected administrative time
Network	Attend annual scientific meetings

will launch at the 2025 ACS Trauma Quality Improvement Program Annual Conference as a 2-day preconference workshop. Upon successful completion, participants will receive a Trauma APP Certificate of Completion along with Continuing Medical Education (CME) credits.

Surgeon-APP Partnerships Are Recipe for Success

That first podium was a doorway into a world few APPs had entered. My training taught me there were no limits on how APPs could function—at the bedside and beyond. I have since learned that APPs are still commonly underused and underestimated. But in reality, being underestimated is like having a superpower. It creates momentum. It inspires change.

And change is happening—our national surgical organizations are creating space for APPs on panels, in leadership, and in specialty training.

The most common question I hear is "How do you retain APPs?" Best practices for APP retention are summarized in Table 2 on this page. A panel presented at the 2023 Eastern Association for the Surgery of Trauma Annual Scientific Assembly on how to advance the use of APPs in trauma care highlighted the fact that APPs have become essential to trauma teams in the US. The presenters also acknowledged that optimal APP use is not well defined and is highly variable.[4]

We can all agree that APPs are needed to support trauma and emergency general surgery programs. But I hope I can convince you to develop a broader perspective for what APPs could add to your surgical program. Think beyond the bedside. Think outside the box. This message is as much for surgeons as it is for APPs and residents in training. Let us not underestimate what we are capable of in partnership. In the spirit of trauma care, the whole is greater than the sum of its parts. Physicians and APPs are better together, and we can go further for our surgical programs and for our patients.

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Dr. Rondi Kauffmann

Bidirectional Training Promotes Equity, Supports Global Health

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A COMMITMENT to alleviating suffering, improving health, and advocating for the disenfranchised are core tenets of medical practice. These principles apply to individual patients and communities in the US, as well as those around the globe.

Much of the world's burden of disease is borne by those in economically disadvantaged countries. The highest incidence of infectious diseases, such as malaria and HIV, occurs in low- and middle-income countries (LMICs) throughout South America, Africa, and Asia.[1] While much funding has historically been allocated to combat communicable diseases, noncommunicable diseases (NCDs), including traumatic injury and cancer, continue to increase in LMICs.[2]

NCDs require healthcare systems with a higher level of complexity and availability of specialists. With the evolution of global health as a field of academic study, there is a growing focus on capacity building through longitudinal partnerships between institutions in high-income countries (HICs) and institutions in LMICs focused on education, clinical care, and research. These partnerships are increasingly important, as federal funding for global health programs has been significantly reduced in recent years, particularly in 2025.

International clinical training remains largely unidirectional, with learners from HICs benefitting from these experiences without reciprocity for trainees and faculty from LMICs.[3] This educational inequity stems from prohibitions restricting participation in clinical care for international medical graduates (IMGs) outside of an Accreditation Council for Graduate Medical Education-approved training program. Hence, short-term medical education programs (MEPs) that include clinical care, even if supervised, are not permissible for IMG trainees or faculty. Rather, these individuals are restricted to observerships and simulation, which offer limited educational value, particularly for procedure-based specialties. The US is unique in these restrictions, with peer countries such as Canada and the UK freely allowing IMGs to participate in short- or long-term clinical MEPs that are not part of a formal training program.

Bidirectional Education Sustains Global Workforce

These unidirectional partnerships with LMIC institutions create an imbalance of opportunity and limit the potential of global health system strengthening and security. Without the opportunity to engage in hands-on clinical care in the US, many IMGs turn to other countries that offer this training, thus undermining American diplomatic and academic relationships.

In turn, US training programs lose the opportunity to host, learn from, and exchange clinical skills with world-class talent. As a global leader in healthcare, peace, and security, the US is in a strong position to strengthen bidirectional healthcare education and promote healthcare diplomacy.

As federal funding for global programs is reduced, bidirectional education MEPs are one strategy to maintain engagement in building a strong healthcare workforce worldwide. Furthermore, such programs promote equity in medical education opportunities, facilitate partnerships, drive innovation, and promote global health stability. Additionally, bidirectional MEPs will allow the US to fulfill its security objectives to bolster interoperability with military partners and allied nations.

True bidirectional MEPs offer multiple benefits to IMGs and US-based institutions.

Benefits to IMGs: The US has one of the premier medical education systems in the world and offers one of the highest levels of medical care. Opportunities to spend short periods of time training alongside US physicians allow for expertise and skill transfer. Systems-based learning on how to run a Level I trauma center or establish a multidisciplinary cancer center is most effectively accomplished by seeing one in action. Only a few such centers exist in LMICs, so experience in an HIC is one of the only ways to acquire these specialized skills. Exposure to different medical paradigms fosters creativity and collaboration in addressing local health challenges.

Building capability for healthcare in LMICs means a higher level of care when medical issues arise for US citizens abroad.

Benefits to the US: IMGs from LMICs bring unique perspectives on providing high-quality healthcare when resources are constrained. These individuals offer creative solutions and novel approaches that are sometimes adopted in the US. The current technique for temporary abdominal closure for severe abdominal injuries in the US is known as the "Bogota bag," named after the city in which it was pioneered.

Building capability for healthcare in LMICs means a higher level of care when medical issues arise for US citizens abroad.

Barriers to Establishing MEPs

Currently, no pathway exists for establishing equitable MEPs because of three barriers.[4]

Institutional: Potential host institutions in the US cite concerns about the adequacy of supervision, obtaining malpractice coverage, Health Insurance Portability and Accountability Act compliance, and potential risk to patients.

Licensing: State medical licenses and license exemptions are the responsibility of individual state medical boards. Equitable, bidirectional clinical MEPS would allow IMGs who are short-term clinical visitors to "practice medicine." While the precise definition of what that includes is defined by individual boards, it generally means to "engage, with or without compensation, in medical diagnosis, healing, treatment or surgery."[5]

While state boards are generally supportive of opportunities for bidirectional exchange, there is tremendous variation in licensure categories that could unintentionally act as barriers for a short-term, supervised MEP.

Federal Visas: Current visas for nonimmigrant medical trainees require multiple steps, including passing Steps 1 and 2 of the US Medical Licensing Examination, passing an English language proficiency test, obtaining certification by the Educational Commission for Foreign Medical Graduates, and being accepted into an approved residency/fellowship program. Aside from the time (1–3 years) and cost ($5,000) required to navigate this process, the effort is hardly worth it for a short-term clinical rotation in the US. None of the existing visas allow for a short-term rotation that would include patient contact.

Potential Solutions for Attaining Reciprocal Training

Achieving bidirectionality in global MEP requires changes at state and federal levels. Several state medical boards have already created temporary licenses or exemptions for IMGs participating in a short-term clinical MEP, with other states considering such amendments.[6] These licenses cannot be used without a visa to legally enter the US.

The Building Reciprocal Initiatives for Global Healthcare Training (B.R.I.G.H.T.) coalition was established by key stakeholders to enhance global health education by fostering reciprocal training programs between HICs and LMICs and addressing policy barriers that prohibit short-term clinical MEPs for IMGs. Current work addressing the visa barrier centers around efforts to collaborate with Congress in order to determine and establish an appropriate pathway for IMGs to participate in a short-term clinical MEP.

It is important to note that these efforts to create opportunities for short-term (<12 months) MEP for IMGs in partnership with US-based academic institutions are distinctly different from other efforts to facilitate IMG immigration to the US, which seek to provide a solution to the US physician shortage or address the maldistribution of physicians in rural and socioeconomically disadvantaged communities within our country.[7]

In contrast, short-term clinical MEPs are partnerships between institutions in LMICs and HICs with the intent of building capacity in the LMIC by enhancing the skill and expertise of the LMIC provider, who will then return to their home country and continue building a stronger healthcare system.

The US, along with other countries around the world, would benefit greatly by developing a critically needed pathway for bidirectional global academic, research, and clinical partnerships.

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Evaluation Reveals Insights into Pediatric Trauma Cervical Spine Clearance for Obtunded Patient

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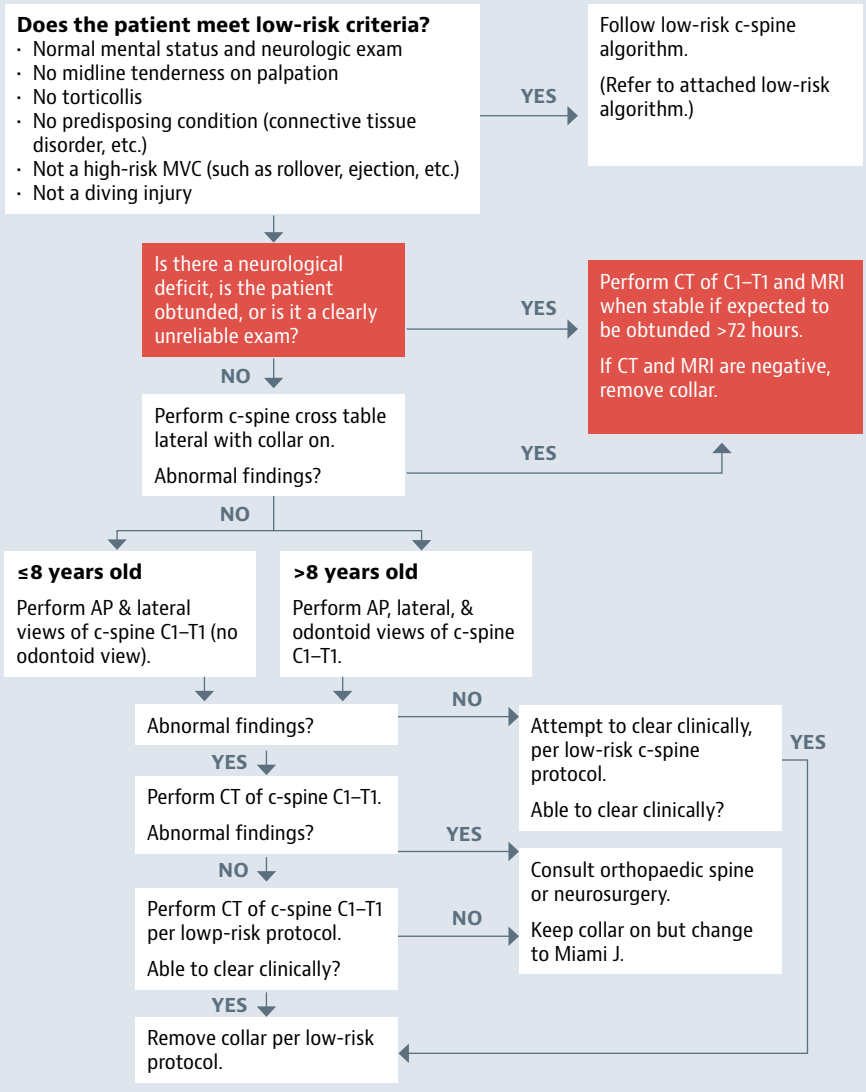
Evaluation of the cervical spine (c-spine) in pediatric patients must be thorough and accommodate a wide range of development and ability to cooperate with a neurologic exam.

ALTHOUGH PEDIATRIC C-SPINE INJURIES are rare events, they can lead to potentially life-altering consequences.[1-3] The incidence, characteristics, and severity of c-spine injuries in children differ from adults, but often the traumatic workup of the c-spine follows that of adult trauma patients.[4]

Separate pediatric-specific c-spine clearance pathways have been found to be effective and reduce radiation exposure.[5-8] Diagnostic algorithms become even more important in this patient population considering that pediatric patients with significant head or c-spine injury often may be obtunded or unable to participate and produce a reliable neurological exam.

Earlier work at our institution showed that implementation of a pediatric c-spine clearance pathway (CSCP) was feasible, helped reduce radiation exposure, increased clinical clearance of c-spines, and improved resource allocation.[8,9] Our pathway led to fewer c-spine radiographs, reduced

Figure 1. Clinical Pathway for Evaluation and Management



Confirm low-risk criteria:
- Normal mental status and neurologic exam
- No midline tenderness on palpation
- No torticollis
- No predisposing condition (connective tissue disorder, etc.)
- Not a high-risk MVC (such as rollover, ejection, etc.)
- Not a diving injury

- Maintain inline stabilization while removing collar.
- Exclude pain or musculoskeletal abnormality in posterior c-spine on palpation.

- **ENSURE** active (not passive) rotational movement 45 degrees in each direction without pain.

- The collar may be removed without imaging if c-spine is clinically cleared. Ensure spine clearance is documented in the medical record AND a physician order is placed.

NOTE: Revert to high-risk guidelines if ANY of the following conditions are not clearly favorable.

Anteroposterior (AP)
Motor vehicle crash (MVC)
Computed tomography (CT)

spine specialty consults, and an increase in the number of patients who were cleared clinically.[8] The algorithm also specifically offers clinicians guidance for patients who had neurologic deficits or were obtunded, calling for advanced imaging in those cases.

Reviewing the Clinical Pathway to Enhance Quality Improvement

During development of our institution's pediatric CSCP, input from pediatric orthopaedic spine surgery and neurosurgery coupled with an evidence-based review, lead to including a computed tomography (CT) scan with magnetic resonance imaging (MRI) of the c-spine for patients with a neurologic deficit or who remained obtunded for longer than 72 hours, regardless of the CT results (see Figure 1, this page). Our institution included this requirement in light of the controversy regarding plain radiograph, CT, and MRI in the obtunded pediatric patient.[10-12]

Prior work by Brockmeyer and colleagues evaluated 24 comatose, intubated children using four different imaging modalities: plain radiographs, flexion-extension radiographs under fluoroscopy, CT, and MRI. Results showed that MRI had a high false-positive rate, and therefore this study advised against the use of MRI in the comatose, obtunded pediatric patient.[10] The study's authors recommend the use of either plain radiographs or CT for initial c-spine injury and flexion-extension radiographs for the evaluation of ligamentous instability with normal CT results.

Table 1. Demographics and Patient Presentation

	Study population n=95
Age, years	12.3 (5.9-15.8)
Sex (n, %) male female	 64 (67.4) 31 (32.6)
GCS score at presentation (median, IQR)	5.0 (3.0-8.0)
GCS score at presentation (n, %) 3 4 5 6 7 8 9 10	 41 (43.2) 4 (4.2) 4 (4.2) 7 (7.4) 13 (13.7) 10 (10.5) 8 (8.4) 8 (8.4)
C-collar in ER	75 (78.9)
Mechanism of injury (n, %) MVC Fall Pedestrian/bike vs. motor vehicle Hanging, asphyxiation Sports-related injury Drowning Gunshot wound Crush injury	 30 (31.6) 21 (22.1) 18 (18.9) 7 (7.4) 7 (7.4) 6 (6.3) 4 (4.2) 2 (2.1)

Cervical-collar (C-collar), Emergency Room (ER), Glasgow Coma Scale (GCS), Interquartile Range (IQR), Motor vehicle crash (MVC).
Continuous variables are shown as median (IQR); categorical variables are shown as number (percent).

Table 2. Imaging Data

	Study population n=95
Time from presentation to CT* (hours)	0.8 (0.4-1.4)
CT slice thickness, mm	2 (2-2)
CT findings normal abnormal equivocal	 80 (84.2) 12 (12.6) 3 (3.2)
Had MRI	22 (23.2)
Time from presentation to MRI**, hours	62.6 (25.8-118.1)
Injury on MRI	8 (36.4)
Time from CT to MRI, hours	62.1 (24.7-118.1)
Patients with MRI-associated complications	0

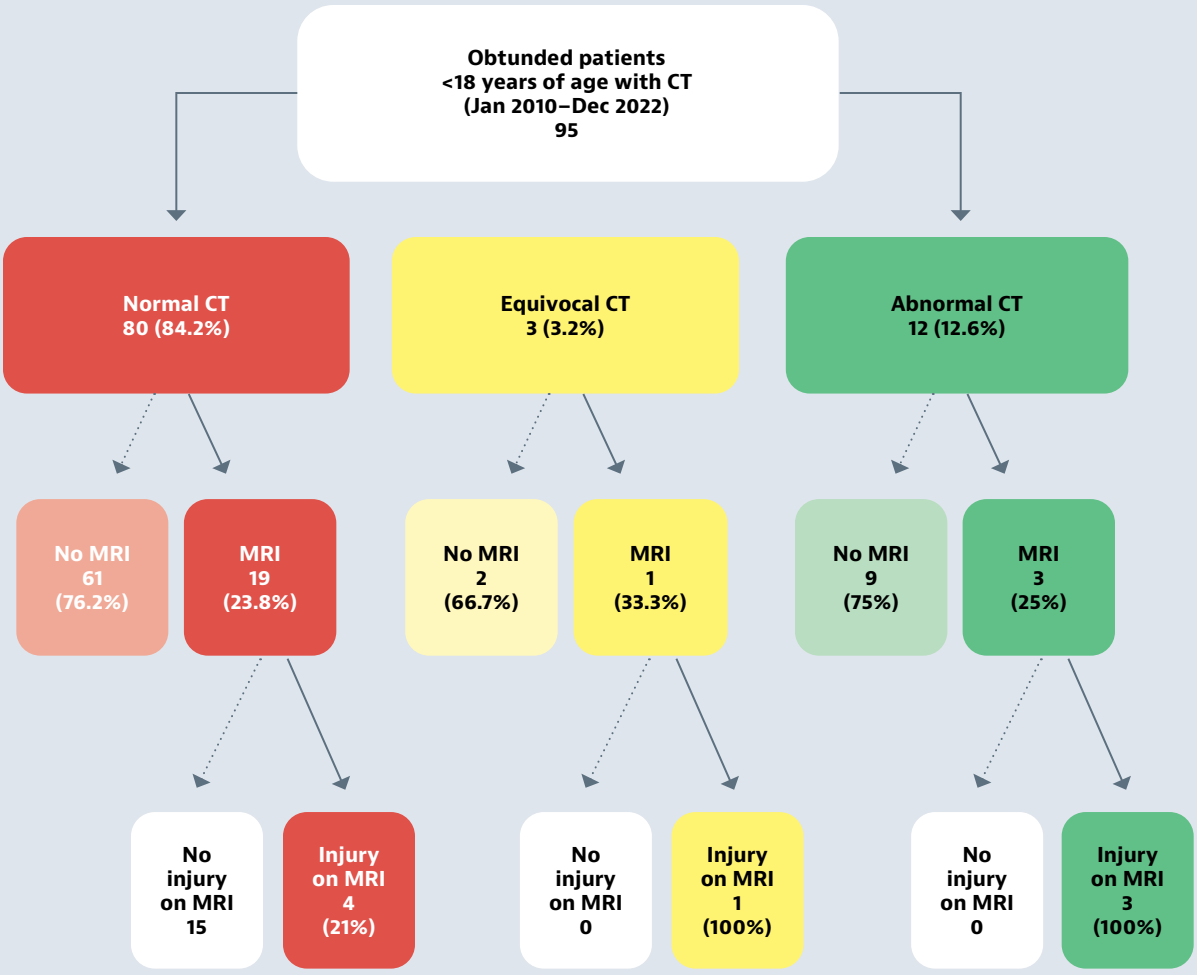
Continuous data are shown as median (IQR); categorical data are shown as number (percent).
*Six patients had CTs performed at other institutions and 86 were performed at our institution; CT time data were available for 92 of 95 patients.
**MRI time data were available for 19 of 22 patients.

However, work with larger patient populations has demonstrated the benefit of MRI to detect injuries not visible on plain radiographs. In 2002, Flynn and colleagues described the protocol implemented at their institution. This protocol required an MRI be obtained for various indications, including the obtunded or altered patient. A total of 237 children were included in their study, 74 of which underwent MRI of the c-spine, while 64 of these patients had negative plain radiographs. Despite this, 15 of the 64 patients (23.4%) had additional injuries that would not have been detected or treated without MRI investigation.[11] More recently, in 2015 Qualls and colleagues evaluated 1,196 children with head injuries. C-spine CT and MR imaging were obtained for children with a Glasgow Coma Scale (GCS) score of ≤8. A total of 63 children underwent both imaging modalities, and MRI identified injuries in seven out of 63 (11%) children that were not detected on CT alone.[12]

In response to these conflicting opinions regarding various imaging studies in the evaluation of pediatric c-spine injuries, a consensus position and algorithm from a large multidisciplinary panel of fellowship-trained pediatric c-spine experts was developed.[13]

In their algorithm, Herman and colleagues required MRI of the c-spine for patients with negative CT if a patient's GCS score was less than 8 and not expected to improve within 72 hours of admission.[13] They acknowledge the potential for increased radiation exposure in CT imaging and the potential for false-positive findings in MRI, and yet

Figure 2. Study Population



strongly recommended the use of both modalities, especially in a patient with a GCS score less than 8. The authors cite decreased access to MRI, the need for sedation, and costs associated with MRI as reasons for using CT as the initial imaging modality in the obtunded patient.

As the evidence supporting these imaging mechanisms varies, we decided that it was critical to review this portion of our pathway for further quality improvement. Thus, this study aims to review our experience over the last 13 years with c-spine evaluation in pediatric blunt trauma patients who present with neurologic deficits or are obtunded.

The c-spine clearance pathway was implemented in August 2016, with medical executive board approval. The original data were published May 1, 2019.[9] Since that time, the c-spine clearance pathway has continued to be a part of every level of pediatric trauma activation.

In order to determine the need for CT and MRI evaluation of an obtunded patient, we conducted a retrospective review from January 2010 through December 2022 of pediatric trauma patients who underwent imaging of their c-spine. This project was initiated to evaluate the use of MR and CT imaging in an obtunded patient. Patients included in the retrospective review were younger than 18 years, presented as a leveled trauma activation site between the time period noted earlier, had a GCS score of less than 10, and had some form of CT of their c-spine.

Table 3. Injuries Identified on MRI

CT Results	Injuries on MRI	
Normal	Patient 1	Syrinx in the cervical cord
	Patient 2	Anterior ligamentous injury, rotary subluxation, spinal cord contusion
	Patient 3	Ligamentous injury
	Patient 4	C6-C7 disc bulge and desiccation
Equivocal	Patient 1	C6 fracture, C5-C6 ligamentum flavum injury
Abnormal	Patient 1	Anterior ligamentous edema C2-C4
	Patient 2	Ligamentous injury
	Patient 3	Infarction of right paramedian pons and right lateral medulla, subarachnoid hemorrhage, occipital condyle fracture, narrowing of spinal canal

A total of 95 patients were included in the review. Median age of presentation was 12.3 years (range 1.4-18.0); 64% of patients were male, and median GCS score was 5 (IQR 3.0-10.0). Descriptive analysis and mechanisms of injury are summarized in Table 1, page 50. Additionally, time from presentation to initial imaging, as well as time from initial imaging to MRI, if ordered, also were recorded (see Table 2, page 50).

Patients included in the study had a median time from presentation to CT of 48 minutes or 0.8 hours. Patients for whom MRI was ordered had a median time from presentation at our institution to MRI of 62.6 hours. There were no MRI-associated complications (Table 2).

A total of 23 patients underwent an MRI after they had a CT scan of the c-spine. Of the patients who underwent MRI, eight (36.3%) had an injury identified using this imaging modality (Table 2). Of the eight injured patients identified by MRI, only three (37.5%) of the injuries were captured fully on CT (Figure 2). Of note, MRI diagnosed four injuries for patients with a normal CT scan and one injury for a patient with an equivocal CT scan. Furthermore, three patients with an abnormal CT scan had an MRI that further detailed their injuries.

Of the 20 patients who underwent MRI despite a normal or equivocal CT, five (26.3%) had a newly diagnosed injury after undergoing MRI. These injuries included: a syrinx in the cervical cord, anterior ligamentous injury, rotary subluxation, spinal cord contusion, C6-C7 disc bulge and desiccation, C6 fracture, and a C5-6 ligamentum flavum injury (see Table 3, this page). One patient with normal CT imaging required surgical management of their c-spine injury with fixation via Halo for a C1-C2 ligamentous injury with subluxation and a C2 cord contusion. The remainder required prolonged C-collar immobilization.

Results Support MRI for CSCP Obtunded Patients

Our review revealed five newly diagnosed injuries in obtunded patients that would have otherwise been undetected and potentially undertreated. One such injury, not seen on CT, required surgical treatment with fixation. Without MRI, this patient could have been severely undertreated. MRI was obtained for these patients without significant delay in care and without MRI-related complications. This review supports the use of both CT and MRI for c-spine evaluation in neurologically compromised patients after blunt trauma and will be kept in our pathway.

Our rate-of-injury identification is consistent with previously published literature. Qualls and colleagues reviewed 1,196 children with head injuries. They identified seven children with negative CT imaging and positive MRI findings.[12] Garagas and colleagues

similarly evaluated pediatric trauma patients. In their cohort of 173 patients, 30 (17%) had significant abnormalities on MRI without corresponding findings on CT. Of these 30 patients, five required surgical stabilization.[14]

This combined with our own experience suggests that requiring MRI imaging for an obtunded patient with a negative CT of the c-spine may lead to the identification of clinically significant injuries without delay in care and without imaging-related complications. Consistent with comprehensive consensus statements[12] our results support the continued use of MRI in our CSCP for patients who remain obtunded.

Consistent use and review of a clinical decision pathway is needed to ensure best care. Our prior experience demonstrated that including the decision-making pathway in our electronic health record documentation led to improved adherence with the CSCP. By monitoring adherence and deviations, we can further evaluate how well we provide this evaluation to our patients. We encourage regular monitoring to show effectiveness and benefit.

We also suggest a review of parts of the pathway that may need revision or review based on current literature, as we have done here. This approach can help ensure that the pathway changes as the evidence and available modalities for work-up evolve. In addition, feedback and review during monthly trauma quality improvement meetings to help address issues or concerns related to the pathway are encouraged. B

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Civilian Surgeons Helped Shape Casualty Care in World War II

Danielle B. Holt, MD, MSS, FACS
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Collaboration between civilian and military surgeons has long accelerated surgical innovation.

IN WORLD WAR II (WWII), the US Army embraced this synergistic approach by commissioning experienced civilian surgeons as consultants. Amid intense fighting and high casualty numbers, these consultants promoted a culture of practice improvement and disseminated lessons learned. After the war, the surgeons continued to spread their hard-earned knowledge through academic society meetings and written histories.

Foundations of the Consultant System

At the beginning of WWII, the US War Department's medical system was under-resourced for a large-scale conflict having dramatically downsized after World War I (WWI). Brigadier General Fred Rankin, MD, FACS, a highly regarded general surgeon and WWI veteran, brought together leading civilian academic surgeons—including Edward ("Pete") D. Churchill, MD, FACS, and Elliott Cutler, MD, both of Harvard Medical School, and Ashley W. Oughterson, MD, of Yale University—into the newly formed Surgical Consultants Division within the Army Surgeon General's office.[1-3] As described in Dr. Churchill's *Surgeon to Soldiers,* this consultant network standardized surgical treatment for soldiers during the war.[4]

"Circular letters" (official correspondence distributed widely to disseminate information) to military forward surgical units, with in-person follow-up, represented the primary means of achieving optimal "end results." Regarding one of his first circular letters, Dr. Churchill noted, "Wound infection and suppuration emerged as one of the major considerations as it has been in every war since the dawn of history." To wit, he promptly chastised sloppy dressing techniques and decried the practice of dousing wounds in

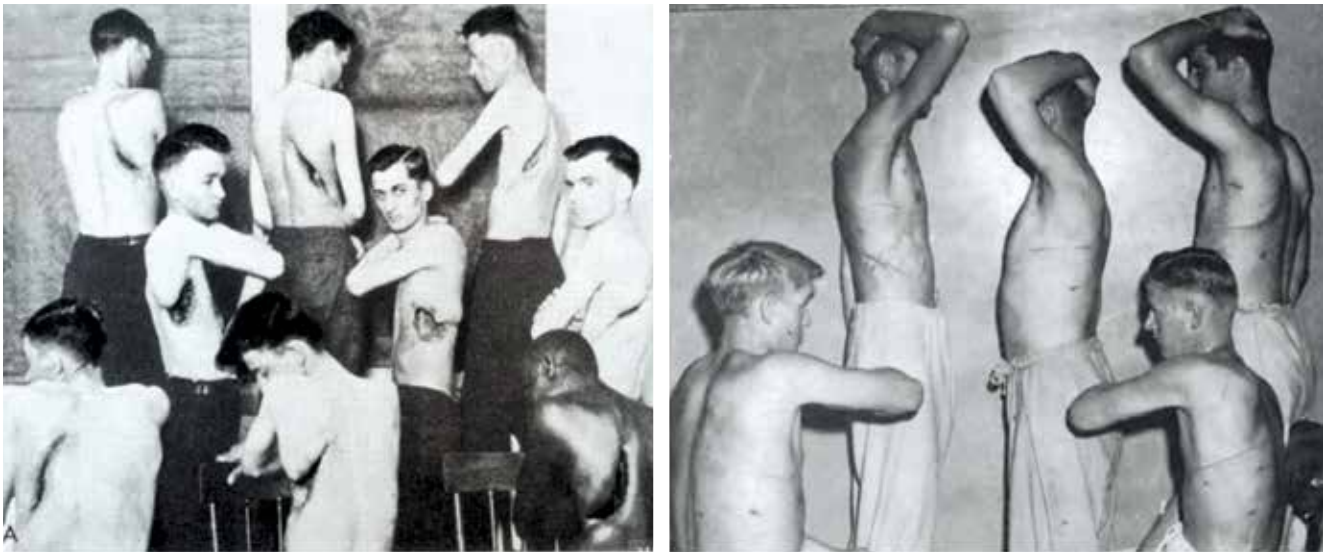

Figure. Comparison of infected hemothorax outcomes from WWI (left) and WWII (right). *(Credit: Army Medical Department Center of History & Heritage)*

sulfa powder rather than debriding devitalized tissue. One of his deployed colleagues, Frank Berry, MD, FACS, observed:

> "Such were the initial days of Dr. Churchill and our own fledgling period, feeling our way with treatments, watching the experiences of others and finally learning under his guidance that adequate, clean surgery, carefully performed, was the primary need in war, that the sulfonamides and penicillin and antimicrobials were adjuncts but never substitutes."[4]

Dr. Churchill also challenged prior dogma in the management of infected hemothorax. In WWI, wide decortication, open drainage, and closure by secondary intention left patients severely disfigured. Instead, he promoted primary closure after decortication and debridement leading to superior functional results (see Figure, this page).

> "Even after the vast experience of World War II, I had to defend primary closure of an infected hemothorax at one of the first meetings of the American Association for Thoracic Surgery. Evarts Graham still could not accept this because it was a departure from a principle he had stood for in the era when streptococcus empyema was rampant."[4]

Data Collection and Academic Conferences

According to Dr. Churchill, "Opinions and impressions are plentiful and cheap, particularly under the emotional tension of a world at war. Facts are rare and precious. Complete data are next to impossible to obtain under combat conditions."[4]

Nevertheless, he relentlessly pursued data collection to the extent that was possible. Established during WWI, the National Research Council laid the foundation for scientific research during WWII. Having served on the Council's Subcommittee on Thoracic Surgery, Dr. Churchill was intimately familiar with this organization. He leveraged their scientific credibility to establish an in-theater research program on shock. Efforts to systematically record combat injuries began with the Board for the Study of the Severely Wounded in WWII and continued with the Vietnam Vascular Registry at what was then Walter Reed General Hospital.

Table. Wartime Medical Conferences: Major Themes and Notable Quotes

Clinical Conference on Recent Advances of Medicine in War Time

Jan 11, 1944
Oran, Algeria

Morning Plenary Session
- Amputation management
- Nephrosis after hemolysis and sulfonamides
- Venereal disease management
- Underwater concussion
- Burn management
- Neurosurgical demonstration

Afternoon Parallel Tracks
- Surgery, medicine, laboratory and diagnostic medicine, dentistry

Dr. Churchill quoted Sir Clifford Allbutt: "How large and various was the experience of the battlefield, and how fertile the blood of warriors in rearing good surgeons."

Surgical Congress of the Royal Army Medical Corps (Central Mediterranean Force Army Surgeons)

Feb 12–16, 1945
Rome, Italy

Conference Program
- Opening address by Major General W. C. Hartgill, Director of Medical Services, Allied Force Headquarters
- Treatment of war wounds
- Wounds of the chest
- Abdominal trauma
- Genitourinary injuries
- Burn management
- Series of short papers on various topics ranging from gas gangrene to transfusion complications

Tuesday, Feb 13, 1945: Special Audience of His Holiness the Pope

Demonstrations and Exhibitions in the Eastman Dental Clinic
- Brain Wounds in Pictures
- Late Repair of Skull Defects
- Transfusion Stand
- Illustrations of War Wounds in Colour
- The Manufacture and Repair of Surgical Instruments

Clinical Ward Rounds (No. 104 Br. Gen. Hosp.)
- Genitourinary cases (Lt. Col. D. S. Poole-Wilson, RAMC)
- Orthopaedic cases (Major Barbara Stimson, RAMC)

In discussing a paper given on wound management, Dr. Churchill remarked, "I offer two items, neither of which is debatable, for incorporation in the records of this congress so that the students of wound healing 50 years from now will know that we had some idea of our place in surgical history." He went on to discuss the technique of delayed primary closure as practiced during WWI and the principles of antisepsis from Lister.

These initiatives motivated establishment of the Joint Theater Trauma Registry, now known as the Department of Defense Trauma Registry.

During the war, surgeons met intermittently to discuss their experiences and observations. By tracking outcomes and sharing best practices based on these results, surgeons not only improved clinical care but also led the dissemination of doctrine and training across hospital units. Dr. Churchill quipped, "Doctors are addicted to medical meetings where they can mingle with each other and talk shop to their hearts' content" thus implying these events also served to boost morale during a grueling yearslong tour of duty.[4]

Dr. Churchill recorded the proceedings of two major conferences during his tour (see Table, this page) in addition to multiple smaller meetings. The final conference in Rome served as an international surgical extravaganza. Held at the Eastman Dental Clinic and hosted by the Royal Army, the agenda proved expansive, but

> "Doctors are addicted to medical meetings where they can mingle with each other and talk shop to their hearts' content."
>
> Dr. Edward "Pete" Churchill

ultimately, most discussions returned to wound management.

Following this meeting, the US attendees decamped for a debriefing under Dr. Churchill's leadership at the Excelsior Hotel, which was the Allied Headquarters in Rome, to reflect on what they had heard over the previous 5 days. Wound care, including counter-incisions, bone fragment removal, and amputation care, were reviewed. Lieutenant Colonel Michael E. DeBakey, MD, FACS, visiting from the Surgeon General's office, remarked that diverting colostomies for rectal injuries should be brought up as separated stomas—a topic of discussion that persisted for decades afterward, ultimately landing in favor of loop stomas providing adequate diversion.

After the war, attendees at the meeting, including neurosurgeon Eldridge Campbell, MD, FACS, and orthopaedic surgeon Oscar Hampton, MD, founded the Excelsior Surgical Club with Dr. Churchill as the sole "Honor Member."[5] This group met annually for fellowship, intellectual exchange, and preservation of hard-learned lessons during combat. To support this same mission and approach in a modern context, the Excelsior Surgical Society was re-established in 2015 by the Military Health System Strategic Partnership with the American College of Surgeons (MHSSPACS).

Dr. Churchill also spoke at numerous medical and surgical society meetings in the US during his brief leave, and for years after the war. A master storyteller, he illustrated the advances made during the war for members of the Yale Medical Society in March 1946. With timely resuscitation and expert surgical intervention, a mortally wounded patient with a destructive thoracoabdominal injury survived to return home to the US 6 weeks later.

"The case of this particular soldier is admittedly dramatic, partly because the missile reached the heart. Aside from that it may be taken as representative of emergency forward surgery in World War II. In no way can it be passed by as a single lucky episode or stunt."[4]

Drs. DeBakey, Churchill, and many others also disseminated their knowledge in written form. Dr. DeBakey edited several volumes of the *Medical History of World War II* and also advocated for founding the National Library of Medicine. In *Surgeon to Soldiers,* mentioned earlier in this column, Dr. Churchill offers a more intimate account of the sacrifices made by civilian surgeons during WWII.

Dr. Danielle Holt *is a general surgeon and associate dean for admissions and recruitment at the Uniformed Services University School of Medicine in Bethesda, MD.*

Dr. Jeremy Cannon *is a trauma surgeon and professor of surgery at the Perelman School of Medicine at the University of Pennsylvania in Philadelphia, PA.*

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ACS Clinical Congress 2025

October 4–7
Chicago, IL

Major Awards at Clinical Congress 2025

THE ACS CLINICAL CONGRESS serves as a distinguished platform for surgical education, networking, and professional development, while also honoring surgeons for their significant contributions to the advancement of optimal patient care.

The awards presented at Clinical Congress not only recognize these accomplishments, but also highlight selfless service, the spirit of excellence, and dedication to progress. From the beginning, these qualities have been essential foundations of the ACS as an organization and the surgical profession as a whole.

The Distinguished Service Award is the highest honor bestowed by the ACS and acknowledges a Fellow of the ACS with a longstanding career of outstanding quality. The Dr. Mary Edwards Walker Inspiring Women in Surgery Award recognizes a surgeon who has helped advance women in surgery.

Both awards will be given on Saturday, October 4, during the Convocation ceremony, which begins at 5:45 pm. The ceremony also will be livestreamed at *facs.org/convocation.*

The Wangensteen Scientific Forum will include the presentation of the Wangensteen Scientific Forum Award. This honor celebrates an individual whose career exemplifies the clinical, educational, and research achievements of a successful academic surgeon. The forum convenes on Monday, October 6, from 8:00 to 9:30 am.

The ACS/Pfizer Surgical Volunteerism and Humanitarian Awards, which honor ACS Fellows and members whose efforts to provide clinical care, education, research, and/or leadership have made a positive impact on surgery worldwide, will be presented at the annual Board of Governors dinner on Monday, October 6. In addition, the awardees will share insights into their motivations and accomplishments during the "Humanitarian Surgical Outreach at Home and Abroad: Reports of the 2025 Surgical Volunteerism and Humanitarian Award Winners" session on Sunday, October 5, at 9:45 am.

For more information about Clinical Congress and to register, visit *facs.org/clincon2025.*

Dr. Marshall Schwartz Will Receive Distinguished Service Award

MARSHALL Z. SCHWARTZ, MD, FACS, an emeritus surgeon-in-chief at St. Christopher's Hospital for Children in Philadelphia, Pennsylvania, will receive the Distinguished Service Award—the ACS's highest honor—at Convocation during Clinical Congress 2025 in Chicago, Illinois.

This award, established in 1957 by the ACS Board of Regents (BoR), recognizes the exceptional and continuous service of an ACS Fellow, as well as a career with outstanding emphasis on patient care and commitment to the ideals of surgical practice.

Dr. Schwartz, a pediatric surgeon, called his lengthy involvement with the ACS "truly a labor of love."

Longstanding Service

An ACS Fellow since 1982, Dr. Schwartz initially brought his expertise to the Advisory Council for Pediatric Surgery and Pediatric Surgical Forum. He served on the advisory council for many years in a variety of roles, including as a board member, representative of the surgical forum, Chair, and representative of the ACS BoR, and on the Surgical Forum as both a member and Chair.

In the early 1990s, Dr. Schwartz's career in pediatric surgery led him to a role as surgeon-in-chief of Children's National Hospital in Washington, DC, and he began to recognize the potential for the ACS to become more engaged in health policy and advocacy—areas that were just coming into focus. Thus began his longtime involvement in promoting ACS advocacy efforts.

Dr. Schwartz became a member of the ACS Health Policy and Advocacy Group, and "I became the squeaky wheel," he said. "I felt it was important that our government know our positive history in promoting patient surgical quality of care, access, and cost containment."

He served on the Health Policy and Advocacy Group for many years and ascended to roles as Vice-Chair and later Chair. He shared that his proudest advocacy-related achievements included the fact that, with the excellent support and hard work of the ACS Division of Advocacy and Health Policy: "We gradually educated federal legislators on what the ACS did in the past and currently are doing. It took a while but fast forward, they call us now for advice on health policy."

Leadership at the ACS and Beyond

Dr. Schwartz's leadership extended to serving on many ACS committees, including Patient Education, Member Services, Finance, Investment, Honors, and Research and Optimal Patient Care. He has been Chair of the ACS Surgery Advisory Chairs and was a member of the BoR from 2009 to 2018, serving as its Vice-Chair 2017-2018. A prolific researcher, he served as an associate editor of the *Journal of the American College of Surgeons* from 1996 to 2023.

His leadership in academic surgery also is significant. In addition to his roles at Children's National Hospital and St. Christopher's Hospital for Children, he served as surgeon-in-chief at the Child Health Center of The University of Texas Medical Branch in Galveston. Currently, he is a professor at the Wake Forest University School of Medicine in Winston-Salem, North Carolina, and conducting tissue engineering research the Wake Forest Institute for Regenerative Medicine.

Dr. Schwartz, a pediatric surgeon, called his lengthy involvement with the ACS "truly a labor of love."

Dr. Schwartz also served as director of the American Board of Surgery, including as chair of the Pediatric Surgery Board, president of the American Pediatric Surgical Association, and a member of the Accreditation Council for Graduate Medical Education's Residency Review Committee for Surgery.

For all his leadership and guidance in these and other roles, Dr. Schwartz received a University of Minnesota Department of Surgery Alumnus of the Year Award and an honorary fellowship from the Royal College of Surgeons of England.

The Distinguished Service Award recognizes an ACS Fellow whose service to the mission of the College has been exceptional, amid a career exemplifying high-quality patient care and surgical ideals.

Dr. John Cameron Will Receive Wangensteen Scientific Forum Award

FOR DECADES after the advent of the Whipple procedure (pancreaticoduodenectomy), approximately 1 in 3 pancreatic cancer patients who received the challenging, complex operation died. But through the research, technical skill, and dedication of John L. Cameron, MD, FACS, the odds radically changed for Whipple patients, with surgeons now reporting mortality rates of less than 5% and often even lower.

For his contributions to dramatically improving outcomes of the Whipple, as well as improvements to hepatobiliary and pancreatic surgery and the broader field of surgery, Dr. Cameron will receive the 2025 Wangensteen Scientific Forum Award during Clinical Congress.

This honor is given by the ACS Scientific Forum Committee to a surgeon who exemplifies research, educational, and clinical achievements.

Education and Career

Born and raised in Michigan, Dr. Cameron obtained his undergraduate degree from Harvard University

in Cambridge, Massachusetts, in 1958; in 1962, he earned his medical degree at The Johns Hopkins University School of Medicine in Baltimore, Maryland. From 1963 to 1965, he was a research surgeon for the US Army at the Walter Reed Army Institute of Research in Silver Spring, Maryland, while additionally completing his training at Johns Hopkins, where he remained for the duration of his career.

In 1971, he was appointed assistant professor of surgery at Johns Hopkins, rising in the ranks to full professor in 1978, which—at the time—was a record-speed career development trajectory that reflected his clinical achievements, strengths as an educator and mentor, and loyalty and dedication to his trainees.

Dr. Cameron was named surgeon-in-chief and chair of the Department of Surgery at The Johns Hopkins University School of Medicine in 1984. After 19 years, he stepped down from his role as surgeon-in-chief to assume the Alfred Blalock Distinguished Service Professor of Surgery—a position he holds to this day.

Transformative Clinical Practice and Research

In the mid-1980s, Dr. Cameron was able to intensify his focus on improving pancreatic surgery through reducing morbidity and mortality associated with the Whipple and improving long-term survival.

He aimed to improve outcomes from the Whipple by adhering to Halstedian principles, which emphasized tissue handling, hemostasis, and careful dissection and anastomosis to lower postoperative bleeding, leak, and infection. Notably, he used an innovative closed-suction drainage at the pancreaticojejunal anastomosis during the operation to reduce the occurrence of sepsis from pancreatic leaks.

Dr. Cameron personally performed more than 2,000 pancreaticoduodenectomies over 5 decades, which is more than any other surgeon in the world. At his peak, Dr. Cameron performed 120–130 Whipple procedures a year, and sometimes up to five per week—notable for a lengthy operation that involves multiple organ resections.

In the 1980s and 1990s, Dr. Cameron and his colleagues received continuous grant funding from the National Institutes of Health and other research foundations to study various aspects of pancreatic surgery. He also trained hundreds of surgeons, many of whom went on to become directors of programs, chiefs of service, chairs of departments, and deans of medical schools.

Systematizing his techniques at Johns Hopkins led to greatly improved outcomes for the Whipple and one of the largest and most successful multidisciplinary pancreatic centers in the world. By the 1990s and 2000s, perioperative mortality for the Whipple was reduced to 1%. Based on his principles and techniques, other high-volume pancreatic surgery centers have been able to achieve similar outcomes in recent decades.

Dr. Cameron personally performed more than 2,000 pancreaticoduodenectomies over 5 decades.

A Lasting Legacy

Dr. Cameron has published more than 500 scientific papers, 100 book chapters, and 26 books focusing on gastrointestinal diseases, with a particular focus on those of the pancreas, liver, and biliary tract.

Perhaps his most influential publication is *Current Surgical Therapy*, a renowned surgical textbook for which Dr. Cameron is the primary editor. Published initially in 1984, the textbook is currently in its 14th edition, has been translated into five different languages, and has sold thousands of copies across the world. *Current Surgical Therapy* also is one of the preferred texts used to prepare for the American Board of Surgery Certifying Examination.

Within the ACS, Dr. Cameron achieved several of its highest roles, serving as ACS President in 2008–2009, as well as a member of the Board of Regents and Board of Governors. He also has been a leader in other organizations, including The Society for Surgery of the Alimentary Tract, Southern Surgical Association, Society of Surgical Chairs, and American Surgical Association. B

Trauma Surgeon Is Recognized with Inspiring Women in Surgery Award

ANNA MARIE LEDGERWOOD, MD, FACS, is the 2025 recipient of the Dr. Mary Edwards Walker Inspiring Women in Surgery Award.

Dr. Ledgerwood is a general and trauma surgeon with Wayne State University School of Medicine in Detroit, Michigan, where in her 40-year tenure as a full professor, she has built a reputation for mentoring and advising students and junior colleagues in surgery.

Excellence in Leadership

An ACS Fellow since 1975, Dr. Ledgerwood has been the President of ACS Michigan Chapter, a member of the Board of Governors, a First Vice-President of the Board of Regents, and the first woman to deliver the Scudder Oration on Trauma (1996).

Additionally, Dr. Ledgerwood also was the first woman to serve as president of the Academy of Surgery of Detroit, the ACS Michigan Chapter, Midwest Surgical Association, The American Association for the Surgery of Trauma, and American Surgical Association.

Throughout her career, she has won accolades for excellence in surgery. These include the Nina Starr Braunwald Award from the Association of Women Surgeons, the Trailblazer Award, Lawrence M. Weiner Award, and Munuswamy Dayanandan, MD, Humanitarian Award, all from Wayne State University, and an Honorary Alumna Award from her alma mater, the Medical College of Wisconsin in Milwaukee.

Despite her impressive curriculum vitae, Dr. Ledgerwood remains humble. When asked about her feelings on winning the Inspiring Women in Surgery Award, she offered a few simple words, "I was very honored."

Advancing Trauma Surgery

Dr. Ledgerwood's achievements have extended to her entire institution, state, and specialty. The points of pride many cite about the Detroit Receiving Hospital, including its status as a site of education for roughly half of all Michigan physicians and the first Level I trauma center in the state, have been made possible in part by her work.

For example, after witnessing quality improvement efforts at another institution, Dr. Ledgerwood became involved with the ACS Committee on Trauma's Verification, Review, and Consultation Program at the time of its inception in the mid-1980s. That program has since become the basis for accrediting trauma centers nationwide at levels I through IV, including her own Level I hospital.

Dr. Ledgerwood's achievements have extended to her entire institution, state, and specialty.

In large part because of the design Dr. Ledgerwood and other committee members put in place and sustained, ACS trauma center verification has since been shown to significantly decrease mortality in adult and pediatric patients. Dr. Ledgerwood also noted that the program "has now gone on to be pretty important to quite a lot of hospitals," in that it has helped inspire the development of quality programs across several other surgical disciplines.

The Inspiring Women in Surgery Award is presented annually at Clinical Congress in recognition of an individual's contributions to the advancement of women in the field of surgery. The award honors the fortitude and accomplishments of Mary Edwards Walker, MD, the first female surgeon to serve in the US Army and the only female recipient of the Congressional Medal of Honor.

Six Surgeons Are Honored for 2025 ACS/Pfizer Volunteerism and Humanitarian Awards

THE ACS BOARD OF Governors Surgical Volunteerism and Humanitarian Awards Workgroup has announced the recipients of the 2025 ACS/Pfizer Surgical Volunteerism and Humanitarian Awards. These prestigious honors recognize and celebrate ACS Fellows and other members whose altruism, vision, leadership, and dedication provide models to emulate and whose contributions have made a lasting difference to caregivers and patients around the globe. The awards are administered through the ACS Health Outreach Program for Equity in Global Surgery (ACS H.O.P.E.®).

The contributions of the six award recipients are briefly summarized in this article and will be formally recognized at Clinical Congress 2025 in Chicago, Illinois. Clinical Congress attendees are invited to hear the honorees speak on their experiences at the Panel Session, "Humanitarian Surgical Outreach at Home and Abroad: Reports of the 2025 Surgical Volunteerism and Humanitarian Award Winners," on Sunday, October 5.

Academic Global Surgeon Award
Linda P. Zhang, MD, FACS

Dr. Linda Zhang is a distinguished academic surgeon and global health leader whose 2-decade career has shaped the future of surgical education and care in low- and middle-income countries. She currently serves as associate professor of surgery and director of global surgery at the Icahn School of Medicine at Mount Sinai in New York, New York, where she also practices advanced minimally invasive and bariatric surgery.

From her early work with the International Rescue Committee in South Sudan to co-leading the creation of the Kyabirwa Surgical Center in Uganda—the country's first ambulatory surgery facility— Dr. Zhang has prioritized sustainable system changes. Her leadership helped launch a new surgical residency in Liberia and establish laparoscopic training centers across eight countries, reaching more than 280 surgeons.

As chair of the Global Affairs Committee for the Society of American Gastrointestinal and Endoscopic Surgeons, Dr. Zhang spearheaded the Global Laparoscopic Advancement Program, creating in-country curricula and certification pathways for laparoscopic surgery in partnership with national surgical societies. She also pioneered virtual Fundamentals of Laparoscopic Surgery testing in Africa and launched telementorship models to support continued professional development.

Dr. Zhang has published extensively on global surgical access, ethics, and education, securing nearly $2 million in funding, including a National Institutes of Health's R21/R33 Phased Innovation Award Grant for integrating mobile technology into postoperative care in Uganda. She is a respected mentor, educator, and advocate who continues to drive policy, research, and innovation in global surgery through her roles with the College of Surgeons of East, Central, and Southern Africa, Association of Academic Global Surgery, and other international groups.

Dr. Zhang's visionary leadership has redefined what is possible in global surgery. Through a unique blend of surgical expertise, cross-sector collaboration, and steadfast advocacy, she has built systems that not only expand access to care but also empower the next generation of surgical leaders worldwide.

International Surgical Volunteerism Award
Ziad C. Sifri, MD, FACS

Dr. Ziad Sifri is a professor of surgery and division chief of trauma and surgical critical care at Rutgers New Jersey Medical School in Newark, where he

In May 2025, Dr. Linda Zhang attended the Global Laparoscopic Advancement Program in Addis Ababa, Ethiopia.

Dr. Ziad Sifri facilitates a conversation about future capacity-building initiatives in Kabala, Sierra Leone, while showing local hospital staff video and photos from the US.

Dr. Thomas Romo meets with a pediatric patient during a post-surgery follow-up appointment at his office in New York City.

Dr. Tamara Worlton performs minor procedures in Talara, Peru.

also directs the Rutgers Center for Global Surgery. For more than 15 years, Dr. Sifri has exemplified the highest ideals of surgical volunteerism, combining humanitarian outreach with sustainable global impact.

In 2009, Dr. Sifri cofounded the International Surgical Health Initiative (ISHI), a nonprofit organization dedicated to delivering free, high-quality surgical care to underserved communities worldwide. Under his leadership, ISHI has conducted 37 surgical missions across countries including Bangladesh, Ghana, Peru, the Philippines, and Sierra Leone—mobilizing more than 700 volunteers and performing nearly 3,000 surgeries.

Beyond clinical care, Dr. Sifri has pioneered efforts in global trauma training, leading the expansion of the ACS Stop the Bleed program in low- and middle-income countries. His advocacy helped integrate bleeding control training into national emergency systems in Ghana and Sierra Leone, training more than 1,500 first responders.

A champion of sustainable systems, Dr. Sifri created lasting programs for postoperative care, surgical education, and infrastructure development. He founded the RECOVER initiative to repurpose medical supplies from US hospitals, and he has mentored more than 100 students and fellows in global surgery.

Through his leadership, mentorship, and tireless volunteerism, Dr. Sifri has advanced the field of global surgery and inspired the next generation of humanitarian surgeons.

Domestic Surgical Volunteerism Award
Thomas Romo III, MD, FACS

For nearly 4 decades, Dr. Thomas Romo has provided life-changing surgical care to children with complex facial deformities. A double board-certified facial plastic and reconstructive surgeon, Dr. Romo is the founder and medical director of the Little Baby Face Foundation (LBFF), a nonprofit organization that provides free, comprehensive facial reconstructive surgery to underserved children from the US and around the world.

Early in his career, Dr. Romo participated in international surgical missions, which revealed the limitations of short-term care—particularly for patients requiring follow-up or multiple procedures. In response, he established LBFF in 2002 to bring children in need to New York City, where they could receive safe, high-quality surgical care in a well-resourced environment. Under Dr. Romo's leadership, LBFF has served more than 660 children from 22 countries and 40 states, performing nearly 2,500 procedures to date.

Dr. Romo personally reviews every patient's application, oversees care planning, and remains directly involved in each case. He performs the most complex procedures himself, particularly those related to microtia, hemifacial microsomia, and congenital vascular anomalies. In addition to clinical care, Dr. Romo has led advocacy efforts to expand access to treatment for uninsured and underinsured children, raised more than $4.5 million to support patient services, and helped establish housing partnerships to ensure families receive care without financial burden.

He also is the principal investigator on a first-of-its-kind FDA-approved clinical trial using 3D-printed ear implants, with the potential to expand access to reconstructive care globally. Through his commitment to service, innovation, and sustainability, Dr. Romo has redefined surgical volunteerism and brought renewed hope to hundreds of families.

Military Surgical Volunteerism Award
Tamara J. Worlton, MD, FACS, FASMBS

A Navy surgeon, academic leader, and global health advocate, Captain Tamara Worlton has spent more than a decade strengthening surgical systems in low-resource and conflict-affected settings while mentoring the next generation of global health professionals. She currently serves as director of the Division of Global Surgery and director of surgical operations at the Center for Global Health Engagement at the Uniformed Services University (USU) in Bethesda, Maryland.

Dr. Worlton's passion for global surgery began during her 2011 deployment to Afghanistan, where she trained Afghan National Army medics and physicians and became deeply engaged in the ethical complexities of providing care during conflict. Since then, she has led trauma training and disaster preparedness missions in more than a dozen countries, including Djibouti, India, Nepal, Sri Lanka, the Philippines, and Uzbekistan. She has participated in multiple US Navy hospital ship deployments and was part of the COVID-19 response aboard the USNS Comfort in New York City.

In addition to delivering care, Dr. Worlton has built enduring educational programs that connect military trainees with global surgery opportunities. She established the Global Surgery Interest Group at USU, developed ethics curricula for global health

courses, and helped create a research partnership between USU and Harvard Medical School in Boston, Massachusetts. She also played a key role in organizing the annual USU/Walter Reed Global Surgery Day and has served as a Fulbright Scholar studying trauma systems in Sri Lanka.

Through her tireless efforts in advocacy, education, and surgical service, Dr. Worlton has advanced the role of the military in global health and inspired a generation of clinicians to approach global surgery with humility, purpose, and respect for partner nations.

Resident Surgical Volunteerism Award
Nathan Brand, MD

Dr. Nathan Brand has demonstrated exceptional dedication to global surgical capacity building throughout his early career, with a particular focus on strengthening systems in East Africa. What began as childhood exposure to short-term global health trips evolved into a career marked by sustained partnerships, rigorous advocacy, and a deep commitment to equity in surgical care.

As a surgical resident at the University of California San Francisco, Dr. Brand has led or co-led numerous initiatives to expand surgical training and improve access to specialized surgical services in Kenya, Tanzania, and Uganda. His work includes the development of national surgical oncology capacity assessments, laparoscopic training programs, vascular access surgery initiatives, and low-cost surgical skills laboratories. In each effort, he has worked hand-in-hand with local partners, emphasizing long-term sustainability and context-specific solutions.

During a yearlong National Institutes of Health Fogarty Fellowship in Tanzania, Dr. Brand supported multiple national training efforts at Muhimbili University of Health and Allied Sciences in Tanzania, including simulation-based laparoscopic education and vascular surgery capacity-building. His efforts have helped expand access to minimally invasive surgery and arteriovenous fistula creation, improved emergency laparotomy protocols, and supported regional efforts in breast, liver, and colorectal cancer care.

Dr. Brand has raised more than $400,000 in support of these initiatives and serves on the board of the Alliance for Global Clinical Training. He is widely recognized for his ability to mobilize resources, build trust among diverse collaborators, and mentor both US and African trainees.

This fall, Dr. Brand will begin an academic surgery position at The University of New Mexico in Albuquerque, where he will continue his global surgery work while also serving an underserved population in the US. His career exemplifies the principles of partnership, sustainability, and service.

Surgical Humanitarian Award
William Rhodes, MD, FACS

For more than 25 years, Dr. William Rhodes has exemplified an unwavering commitment to delivering surgical care in some of the world's most underserved and austere environments. A board-certified general and plastic surgeon, Dr. Rhodes has served full-time at AIC Kapsowar Hospital in rural western Kenya since 1999—making him one of the longest-serving American surgeons in sub-Saharan Africa.

In Kapsowar, Dr. Rhodes performs a full spectrum of general and reconstructive procedures, from cleft lip repairs and complex burns to craniotomies and cesarean deliveries, often in resource-limited settings. Alongside his wife, Laura—his scrub nurse and partner in service—he has expanded the hospital's infrastructure, helping raise more than $4 million to construct new operating theatres, an intensive care unit, and housing for medical staff and trainees.

Beyond Kapsowar, Dr. Rhodes and his wife have conducted more than 50 trips to Somaliland and frequent missions to Chad, the Democratic Republic of the Congo, Sudan, and other regions affected by conflict or limited surgical access. Dr. Rhodes also has played a key role in launching a 5-year surgical residency program in Kenya through the Pan-African Academy of Christian Surgeons, training the next generation of African surgeons.

In 2021, Dr. Rhodes and his wife received the Gerson L'Chaim Prize from African Mission Healthcare in recognition of their life's work. Fluent in Hebrew and Kiswahili, Dr. Rhodes also pursues advanced study in Biblical languages and is completing a PhD in the Hebrew Bible.

Dr. Rhodes's career reflects a rare blend of surgical excellence, deep cultural humility, and lifelong service. His legacy is one of faith, family, mentorship, and an enduring commitment to those most in need of care.

Dr. Nathan Brand (right) participates in a vascular access surgery course at Muhimbili National Hospital in Dar es Salaam, Tanzania. Others pictured (left to right): Babueddy Mohammed, MD, Fransia Arda, MD, Arnold Levine, MD, and Ali Mwanga, MD.

Dr. William Rhodes examines a patient at a mission hospital in rural Chad.

Dr. Kyla Terhune Becomes Incoming Senior Vice President, Education

General surgeon Kyla P. Terhune, MD, MBA, FACS, from Nashville, Tennessee, began her role as Incoming ACS Senior Vice President, Education on September 15.

SHE WILL succeed Ajit K. Sachdeva, MD, FACS, FRCSC, as Senior Vice President, Education, on November 1, when Dr. Sachdeva transitions to focusing solely on the Academy of Master Surgeon Educators until his retirement in September 2026.

"Dr. Terhune is an extraordinary leader, clinician, and educator. I look forward to her contributions to the ACS as we advance our ability to deliver timely, evidence-based training and education, modernize College educational platforms, and optimize our offerings to help us deliver the highest quality of care to our patients," said Patricia L. Turner, MD, MBA, FACS, ACS Executive Director and CEO.

An ACS Fellow since 2014, Dr. Terhune has been a professor of surgery and anesthesiology and the associate dean for graduate medical education at the Vanderbilt University School of Medicine; senior vice president for educational affairs and the Designated Institutional Official (DIO) at Vanderbilt University Medical Center (VUMC); and an associate chief of staff at Vanderbilt University Hospital. She has practiced acute care surgery at VUMC and was previously a staff surgeon and chief of general surgery in the Veterans Administration Tennessee Valley Healthcare System. She also served as program director for surgery residency at Vanderbilt.

"I have greatly valued Kyla as an innovative, creative colleague, but even more so as a trusted

and compassionate friend. I am happy for her to have this exciting new role where she can influence surgical education on a national scale. The ACS has chosen very well," said Donald W. Brady, MD, executive vice president for educational affairs at Vanderbilt University Medical Center and senior associate dean for health science education at Vanderbilt University.

After receiving her undergraduate degree in molecular biology from Princeton University in New Jersey, Dr. Terhune taught high school biology and chemistry, and coached basketball before earning her medical degree from the Perelman School of Medicine at the University of Pennsylvania in Philadelphia. She completed her surgery residency and a critical care fellowship at VUMC. Dr. Terhune also earned a master of business administration degree from Vanderbilt University Owen Graduate School of Management.

A nationally renowned lecturer, Dr. Terhune has been the recipient of several distinguished teaching awards, including the inaugural David Leach Award from the Accreditation Council for Graduate Medical Education (ACGME) and the Philip J. Wolfson Outstanding Teacher Award from the Association for Surgical Education. She is a past president of the Association of Program Directors in Surgery, was a founding officer of the National Association of DIOs, and serves on the ACGME Board of Directors and on committees for the National Board of Medical Examiners.

Her educational philosophy emphasizes the importance of building systems of innovative educational practices that support the on-the-ground delivery of patient care.

"I am excited to take all the lessons learned [at Vanderbilt] and apply them in a new setting, one that will allow me to reach new communities and meet new needs at an extremely exciting time of changing technology and practices," Dr. Terhune said. B

Statement of Ownership, Management, and Circulation

ACS Bulletin

Statement of Ownership, Management, and Circulation, PS 3526. 1. Publication Title: BULLETIN OF THE AMERICAN COLLEGE OF SURGEONS. 2. Publication Number: 0002-8045. 3. Filing date: 10/1/25. 4. Issue Frequency: Monthly. 5. Number of Issues Published Annually: 10. 6. Annual Subscription Price: 0. 7. Complete Mailing Address of Known Office of Publication: 633 N. Saint Clair St., Suite 2400, Chicago, IL 60611-3295. 8. Complete Mailing Address of Headquarters or General Business Office of Publisher: American College of Surgeons, 633 N. Saint Clair St., Suite 2400, Chicago, IL 60611-3295. 9. Full Names and Complete Mailing Addresses of Publisher, Editor, and Managing Editor: Publisher: American College of Surgeons; Jennifer Bagley, MA, Editor-in-Chief, *Bulletin of the American College of Surgeons*, c/o American College of Surgeons, 633 N. Saint Clair St., Suite 2400, Chicago, IL 60611-3295. 10. Owner: American College of Surgeons, 633 N. Saint Clair St., Suite 2400, Chicago, IL 60611-3295. 11. Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages, or Other Securities: None. 12. Tax Status: Has Not Changed During Preceding 12 Months. 13. Publication Title: *Bulletin of the American College of Surgeons.* 14. Issue Date for Circulation Data Below: 09/10/2025. 15. Extent and Nature of Circulation: 15a: Total Number of Copies (Net press run): 3,350. 15c: Total Paid Distribution: 0. 15e: Total Free or Nominal Rate Distribution: 0. 15h: Total: 3,350. 15f: Total Distribution: 3,250. 15g: Copies Not Distributed: 100. 15i: Percent Paid: 0. 16. Electronic Copy Distribution: 16b. Total Paid Print Copies + Paid Electronic Copies: 3,250. 16c: Total Print Distribution + Paid Electronic Copies: 0. 17. Signature: Jennifer Bagley, MA, Editor-in-Chief, *Bulletin of the American College of Surgeons.*

Member News

Kibbe Is Named President of UTHealth Houston

Melina R. Kibbe, MD, FACS, is the new president of The University of Texas Health Science Center at Houston (UTHealth Houston). She previously served as chief health affairs officer at University of Virginia Health and dean of the University of Virginia School of Medicine, both in Charlottesville. Dr. Kibbe is a practicing vascular surgeon and a physician-scientist.

Allen Takes Over as Chair of Surgery at Duke

Peter J. Allen, MD, FACS, is chair of the Department of Surgery in the School of Medicine at Duke University in Durham, North Carolina. A surgical oncologist and with Duke University since 2018, Dr. Allen currently is the David C. Sabiston Jr. Distinguished Professor of Surgery, chief of the Division of Surgical Oncology, and chief of surgery for the Duke Cancer Institute. He also serves as the Duke University Health System vice president for cancer services.

Have you or an ACS member you know achieved a notable career highlight recently? If so, send potential contributions to Jennifer Bagley, MA, *Bulletin* Editor-in-Chief, at jbagley@facs.org. Submissions will be printed based on content type and available space.

Farma Receives Endowed Chair Position at Fox Chase

Jeffrey M. Farma, MD, FACS, was named the Paul Grotzinger and Wilbur Raab Chair in Surgical Oncology at the Fox Chase Cancer Center in Philadelphia, Pennsylvania. He also is a professor and chair of the Department of Surgery at Temple Health and surgical director of the Melanoma and Skin Cancer Program at Fox Chase. This endowed chair position commemorates the legacy of Paul J. Grotzinger, MD, the first chief of surgery at Fox Chase and a force behind the Center's 1974 National Cancer Institute designation.

Peterson Becomes ASMBS President

Richard M. Peterson, MD, MPH, FACS, was elected president of the American Society for Metabolic and Bariatric Surgery (ASMBS), a professional organization of metabolic and bariatric surgeons focused on the treatment of obesity. His 1-year term will carry the theme "No One Left Behind," emphasizing that too few people receive evidence-based treatments, including metabolic and bariatric surgery, that could improve their health and change their lives forever. Dr. Peterson is a professor and chief of metabolic and bariatric surgery at The University of Texas Health San Antonio.

JACS JOURNAL OF THE AMERICAN COLLEGE OF SURGEONS

Highlights

The following articles appear in the October 2025 issue of the *Journal of the American College of Surgeons (JACS).* A complimentary online subscription to *JACS* is a benefit of ACS membership. See more articles at ***facs.org/jacs***.

Comparison of Outcomes of Microsurgical Breast Reconstruction after Premastectomy and Postmastectomy Radiation Therapy

Mark V. Schaverien, MD, MSc, Med, Puneet Singh, MD, FACS, Henry M. Kuerer, MD, PhD, FACS, and colleagues

The complication rate for microsurgical breast reconstruction was similar for premastectomy radiation therapy (RT) followed by mastectomy with immediate breast reconstruction and postmastectomy RT (PMRT) followed by delayed breast reconstruction. However, nine of 66 patients (14%) in the PMRT group with tissue expander placement required explantation because of complications.

Robotic vs. Laparoscopic vs. Open Ventral Hernia Repair: Insights from a Network Meta-Analysis of Randomized Clinical Trials

Giulia Almiron da R Soares, Josélio Rodrigues de Oliveira Filho, MD, Pedro Bicudo Bregion, and colleagues

This network meta-analysis of 34 studies found that open operation had the shortest operative time, laparoscopic intraperitoneal onlay mesh reduced wound infection risk, and robotic surgery had prolonged duration. No significant differences were observed in recurrence, seroma, or hematoma rates. Surgical approach should be individualized based on patient factors.

Meaningful Community Partnership: Recommendations from the Improving Social Determinants to Attenuate Violence (ISAVE) Workgroup of the American College of Surgeons Committee on Trauma

Tracey A. Dechert, MD, FACS, Altovise Love-Craighead, MS, Meera Kotagal, MD, MPH, and colleagues

ISAVE, a workgroup of the ACS Committee on Trauma, was formed in 2019 with the goal of developing strategies to help trauma centers better address the root causes of violence. This multidisciplinary workgroup represents the collective effort of professionals, hospitals, and communities to implement effective initiatives that enhance health and healthcare for marginalized communities that are disproportionately impacted by violence. This paper provides a framework for community engagement.

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