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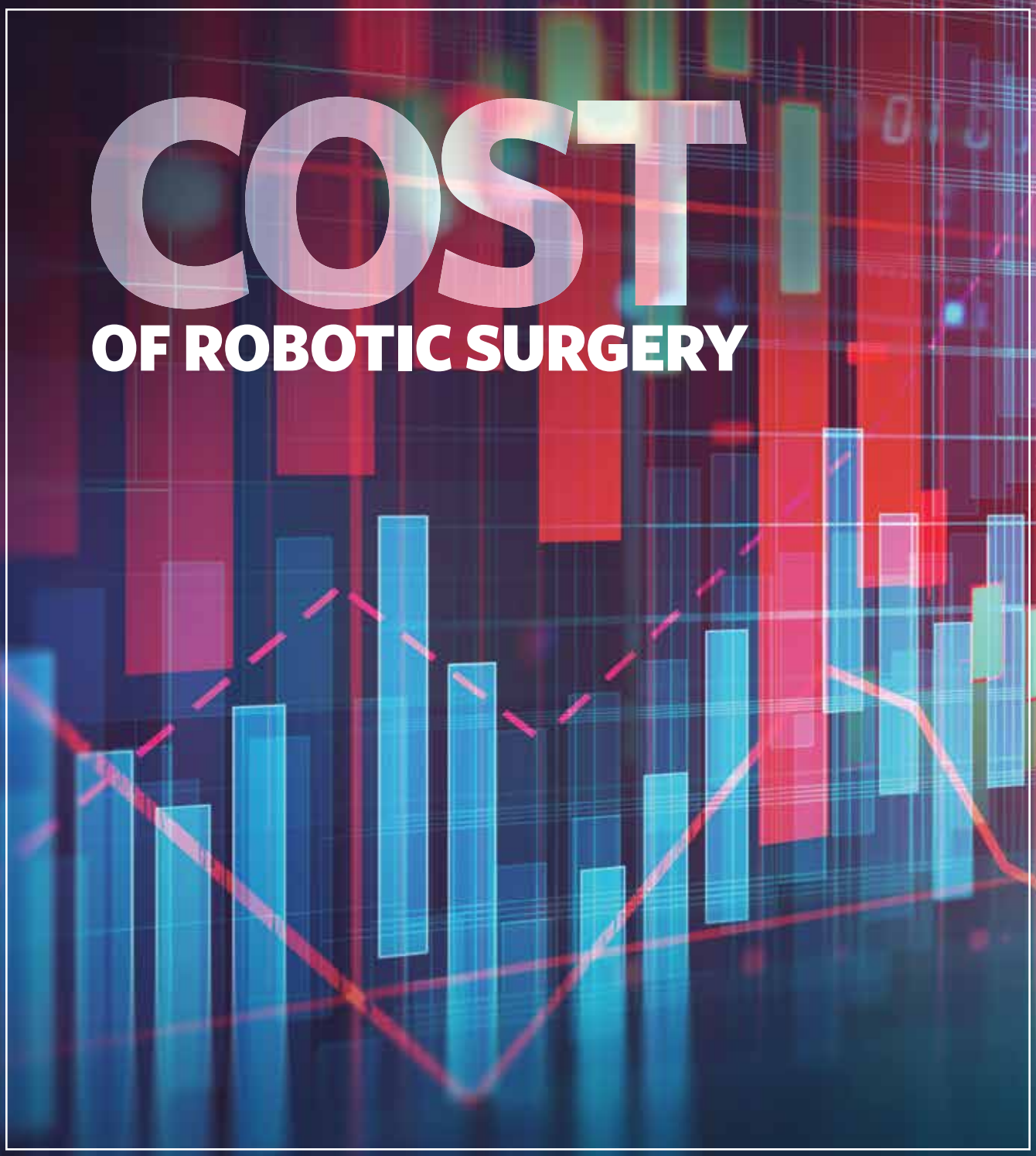

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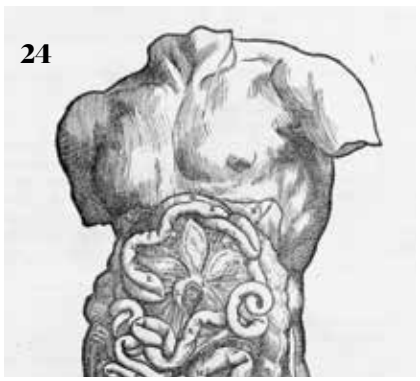

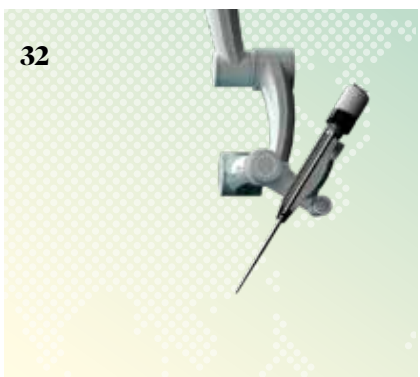

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Advocate in Your State

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

AT THE END of this month, the ACS Leadership & Advocacy Summit will begin in Washington, DC. Each year, we gather hundreds of surgeons and surgical trainees for 3 days: two dedicated to conference sessions on leadership and advocacy and a third spent on Capitol Hill, communicating surgeons' priorities to federal lawmakers.

At this time of mercurial political priorities, advocating on behalf of all surgeons and surgical patients requires our full engagement—we know the effort can pay off. In recent months, there have been several detrimental changes proposed in federal policy, including a reduction in surgeon compensation, based on flawed interpretations of data, that we continue to oppose. It is clear that surgeon advocacy has been crucial to ensuring our priorities are well represented in pending legislation on healthcare funding, access to surgery, and response to emergency bleeding. (See more in the January 23, 2026, *Advocacy Brief*.)

State Advocacy Is Vital

We also recognize the essential role of state-level surgeon advocacy. State governments pass an average of 80 bills for every bill US Congress passes, and many create policies the federal government will also eventually implement.

Numerous issues affecting surgeons have pending federal and state legislation. I urge you to speak on behalf of our colleagues and patients, including within your home state.

Examples of State Issues

In 2025, we tracked numerous state-level issues, including:

Prior authorization (PA): It is imperative that surgical patients receive the care their physicians determine they need in a timely way, without interference. To that end, the ACS is advocating for PA reform on federal, state, and private payer levels. In 2025, nine states passed "Gold Card" laws designed to fast-track PA for physicians with strong histories of approval. Other states enacted laws incrementally improving PA procedures, offering necessary but insufficient change. Dozens of bills remain pending.

Scope of practice: State law determines scope of practice, and 2025 saw a surge in pending legislation on this issue. To protect surgical quality and The House of Surgery®, we oppose expansions to scopes of practice, including bills that would remove physician supervision for certified registered nurse anesthetists, advance practice nurse practitioners, and physician assistants, as well as permission for optometrists to perform certain surgical procedures. Numerous state bills are currently pending.

Stop the Bleed: This year is the 10th anniversary of Stop the Bleed, which instructs individuals on responding to emergency bleeding. We advance this program, in part, via state

legislative victories. In 2025, Connecticut, Maine, Missouri, and Virginia passed laws requiring bleeding control kits and/or training in all state-owned buildings and public schools. Eighteen US states now have such laws; we continue to seek similar policy changes nationwide.

For more information on recent victories and pending bills, see our state legislation review in the November-December 2025 issue of the ACS *Bulletin*. Additionally, the ACS state legislation tracker offers a searchable database and map showing the progress of hundreds of pending state-level bills on many issues, and the State Affairs Updates web page summarizes notable changes year-round.

Ways to Engage in State Advocacy

For surgeons interested in being active on these state-level issues or others, advocacy efforts can be simple.

Options for those short on time or advocacy experience include calling or emailing your state lawmakers on an issue you care about. We know that every issue does not resonate with every member. Pick priorities important to you and focus on them! Visit SurgeonsVoice, the ACS portal for surgeon advocacy, to locate your legislators (under the "My Officials" tab) and access their contact information quickly. (You can also use this site to submit prewritten letters to your federal lawmakers on numerous issues in seconds.)

Similarly, you can share your insights with your state or local lawmakers during public comment periods. An op-ed or letter to your local newspaper also can be a meaningful way to engage on state and local issues. As a surgeon in your home community, your voice carries weight.

Other options include meeting with legislators in their home district offices or inviting them to visit your hospital or clinic. In many locations, the healthcare system or hospital is one of the biggest employers or influences. Many legislators would love the opportunity to visit and learn more.

Power comes from numbers, and connecting with your ACS chapter can offer additional routes for advocacy involvement. For example, in parallel to the Capitol Hill visits we complete each year as part of the Leadership & Advocacy Summit, some chapters have conducted White Coat Days, in which groups of physicians visit the state capitol to communicate with lawmakers. The engagement can be truly impactful over the long term.

Tips and Toolkits

For every kind of advocacy, the ACS offers a means to maximize your understanding and effectiveness. The ACS Advocacy at Home Toolkit offers insights into how to share a message with policymakers, with insights into how legislative change happens. The ACS State Advocacy Day Toolkit offers ACS chapters and other groups a way to clarify their highest-priority issues and learn advocacy techniques. In addition, our state-level toolkits for specific issues offer insights on issues within cancer care, bariatric surgery, and trauma surgery. Finally, the ACS State Lobbying and Ethics Resources web page offers links to lobbying guidelines for each state. Use all these resources to learn more and engage.

Stay Up to Date

Please also stay up to date with ACS advocacy efforts. In addition to attending the Leadership & Advocacy Summit, I encourage you to learn about our political action committee, SurgeonsPAC, and sign up on *facs.org* for our *Advocacy Brief* for monthly updates on advocacy issues and achievements.

Advocating for Us All

Surgeons are well-educated, well-respected members of society. When you advocate, begin with the knowledge that lawmakers often welcome our expertise—and by speaking up, you can help to protect The House of Surgery and fulfill our motto ("To Heal All with Skill and Trust") in your area.

Leadership & Advocacy Summit

The summit will begin on February 28 and conclude March 3 in Washington, DC. Registration is open now at *facs.org/summit*.

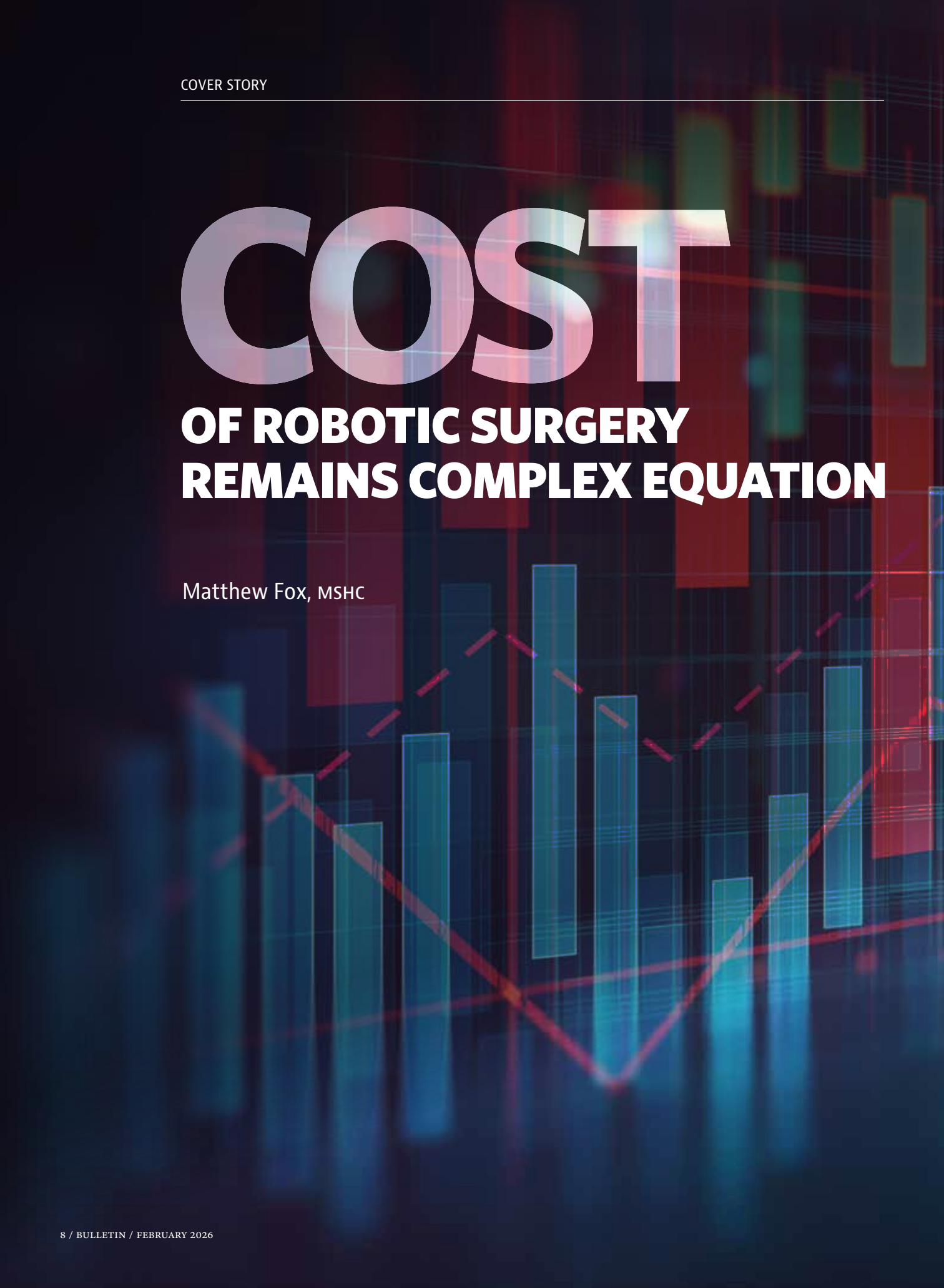
Unionization and Workplace Standards

The ACS strives to help surgeons thrive through many means, including knowledge about careers and workplaces. To that end, we have just launched a new section of *facs.org*, Understanding Surgeon Unionization, to offer insights into unionization for surgeons and surgical trainees. Visit to learn more, and stay tuned for a major undertaking involving every surgical specialty, as we focus on establishing workplace standards for surgeons. Together, we can have a profound impact.

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

COST OF ROBOTIC SURGERY REMAINS COMPLEX EQUATION

Matthew Fox, MSHC



Few medical domains are as affected by innovation and technology as surgery, and the proliferation of minimally invasive surgery was a sea change when it emerged some 40 years ago.

IN RECENT YEARS, though, the gamechanger has been a rapid increase in the use of robotic platforms.

Upgrading and changing technology in any field incurs a cost, and no field in the US receives as much consistent scrutiny for its potential financial burden as healthcare. While research and surgeon experiences paint a positive trendline for use and outcomes of robotic-assisted surgery, the consistent question is—what is the true cost of robotic surgery?

The answer has yet to be defined because each patient, procedure, health system, and individual surgeon's skill is unique and data on costs are still in their nascent stages. However, useful knowledge and perspectives can be gleaned on the financial bottom line for robotic surgery that may help inform decision-making on the best technological approaches.

Examining Outcomes

The costs of robotic-assisted surgery would be a moot issue if there weren't indications that this approach has clinical value, is safe, and is at least as effective as more traditional approaches, such as laparoscopy. While variability exists within the rapidly growing corpus of literature on robotic surgery, the conclusions are similar—robotic surgery can produce neutral or often positive outcomes compared to other minimally invasive options.

"For years, we didn't have a lot of literature looking at robotic surgery as an effective tool for treating patients," said Brian Mitzman, MD, MSCI, FACS, associate professor in the Division of Cardiothoracic Surgery at The University of Utah and Huntsman Cancer Institute in Salt Lake City. He also is medical director of robotic surgery for The University of Utah Health System in Salt Lake City.

"There were subjective accounts of surgeons saying, 'It allows me to do better operations, I can visualize better, it feels better.' But in recent years, we have had quite a few large trials that have come out that point to robotic surgery as just as good, if not better, than laparoscopy," he said.

Outcomes Analyses

Dr. Mitzman pointed to the COMPARE Study, a systematic review of outcomes from robotic surgery versus laparoscopic or video-assisted thoracoscopic or open oncologic surgery across seven procedures, including lobectomy, hysterectomy, and low anterior resection.[1] The results showed that robotic surgery led to shorter lengths of stay, fewer complications, and a much lower risk of conversion to open surgery compared with laparoscopic or thoracoscopic approaches.

Similar findings can be seen for enhanced recovery and lower risk of conversion versus laparoscopy in other specialties as well, including numerous general surgery procedures.[2]

Looking specifically at cholecystectomy—a procedure that is often studied in this context due to its ubiquity and for which the laparoscopic approach has long been the "gold standard"—many studies point to positive outcomes for patient recovery and length of stay.[3]

However, it is important to note that drawing firm conclusions about the efficacy of robotic-assisted surgery from different studies has some inherent hurdles since the research goals may be different.

"When you're assessing whether or not robotics is better than laparoscopy or open surgery, we need to ask, what is the comparison, what is the population and the specific disease you're dealing with, and then what outcome do you care about?" explained Christopher Childers, MD, PhD, assistant professor of hepatopancreatobiliary surgery at the University of Washington and Fred Hutch Cancer Center in Seattle.

"There have been a lot of high-profile trials that have been published in well-reviewed journals that are comparing different buckets of outcomes, from short-term outcomes such as length of stay or complications rates to long-term outcomes like survival, which are particularly germane for surgical oncology," he added.

What this means is that while one can make observations that robotic surgery is showing encouraging results compared to other modalities, studies and data points still need to be aligned to draw definitive conclusions.

Considerable Up-Front Costs?

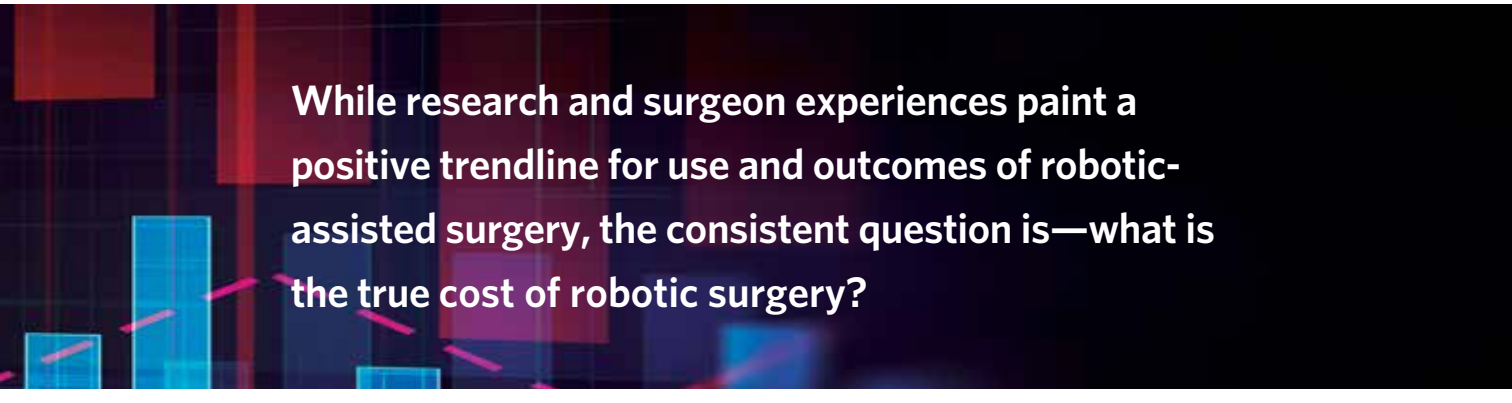
It seems clear that there is broad agreement that robotic surgery can be effective and safely applied to many procedures. But even in studies that are supportive of the technology, many include a similar caveat: robotic surgery is associated with higher healthcare costs compared with other types of minimally invasive surgery.[4]

While implementing a robotic surgery platform into a hospital can be expensive, analyzing current cost models is more complex than simply comparing the price of a surgical robot or a laparoscopy tower.

There is no doubt that there may be an eye-catching cost to buy a surgical robot. Intuitive's da Vinci 5, for example, is the latest release from the largest surgical robotic manufacturer and has a price of $1.8 to $2.5 million. Older products from Intuitive, as well as other manufacturers, routinely sell for hundreds of thousands of dollars to more than $1 million.[5] An up-front price like that would be a significant addition to any hospital's budget and may limit accessibility—however, new pricing models are softening that initial financial blow.

"Historically, the capital cost of building or expanding a robotic program involved buying a robot for $2 million or leasing it with significant up-front costs, but now manufacturers are offering a 'pay-per-click model,' where there really is little capital investment up front," said Dr. Mitzman, who has overseen a significant expansion of the robotic surgery fleet in the University of Utah Health System.

The cost of the unit is spread out over the purchase contract and the number of cases being performed, so the hospital



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Both the up-front costs and subsequent operating costs also could decrease as competition increases.

system will pay a fee every time a robotic case is completed.

"They are essentially amortizing the cost of the robot over 7 years, and however many thousands of cases they expect you to do. So, it's much easier for a system to expand rapidly with little cost up front," he said, which significantly increases the ability of smaller or rural hospitals to install a unit.

In this system, the initial hurdle of purchasing a system is lowered—which is mutually beneficial to the hospital as it gains access to the platform, but also to the manufacturer as the rate of new surgical robots sold inevitably slows in the future.

"Hospitals can only install so many robots," Dr. Childers said. "The bulk of spending on robotics is now on recurring costs, not the cost of the machine itself. Something like 85% of the Intuitive's revenue is now recurring, primarily from purchasing the instruments, because those are effectively disposable. You can use them for 10 times, maybe 18 times, but then you need to buy them again."

Estimating Direct Operating Costs

The need to replace instruments and the cost of doing so inevitably leads to the prima facie financial point of concern for robotic surgery—the direct cost to perform a robotic procedure versus another approach.

The data here also are in their nascent stages. One study looked at hospitalization costs and found that robotic abdominal procedures incur an average additional cost of more than $2,000 compared to laparoscopic,[6] which provides a quantifiable figure for analysis.

One potential way of estimating direct costs is by starting at the foundation. Dr. Childers coauthored an article in 2018 that looked at the revenue generated by Intuitive in 2017—which, by definition, is the amount of money spent by hospitals to purchase and utilize the company's robotic surgery platform—and found that Intuitive robots were used to perform 644,000 procedures in the US that created $2.3 billion in revenue domestically.

Dividing revenue by the number of operations results in a figure of nearly $3,600, the "absolute floor" of robotic surgery costs per procedure in the OR.[7] Estimates from around the same time, place the disposable costs of a laparoscopic cholecystectomy, for example, at less than $1,000 per case.

For more recent numbers, Dr. Childers reviewed Intuitive's 2024 data and found its robots were used to perform 1.7 million operations and made $5.6 billion in revenue, creating a figure of approximately $3,300 per case.[8] These results suggest possibly small reductions in cost over time, although Dr. Childers cautioned that this "could just be reflecting a move toward a higher volume of simpler operations, such as appendectomy and cholecystectomy," Dr. Childers said.

Both the up-front costs and subsequent operating costs also could decrease as competition increases. For example, in December 2025, Medtronic's Hugo robotic system received US Food and Drug Administration clearance to be sold to hospitals, marking a potential major shift in the market.

At this point, it is worth noting that while the cost of robotic equipment and infrastructure are a regular part of the conversation in the finances of surgery, laparoscopy and other approaches also continue to incur a less discussed financial cost, Dr. Mitzman said. Laparoscopic towers, service contracts, and electrocautery generators may be considered a standard part of a budget after decades of regular use, but they, too, need to be included

in any formal cost analysis of equipment acquisition.

Still, it appears that robotic surgery does incur additional costs to the hospital compared to other minimally invasive options. The direct costs also are complicated by inconsistent or nonexistent reimbursement models for robotic-assisted surgery.

"There is no payer or insurer that is paying more for robotic surgery over laparoscopic surgery, either to the physician or to the hospital. So, any math that a hospital will use as a basis for investing into and buying a robotic platform cannot be purely based on a revenue argument," Dr. Childers said.

Can Indirect Costs Balance Economic Considerations?

While consensus holds that the direct costs of robotic-assisted surgery are higher than other alternatives for an index operation, evidence and surgeon experience indicates that a robotic approach to some procedures can lower downstream costs that are integral to balancing the economic bottom line.

Precise assessment varies across procedures and disciplines, but a common throughline in much of the literature on robotic-assisted surgery is that it often provides a reduced length of stay and a lower rate of complications.

If a surgeon can get a patient out of the hospital sooner, that translates into real value to the hospital, according to Dr. Childers.

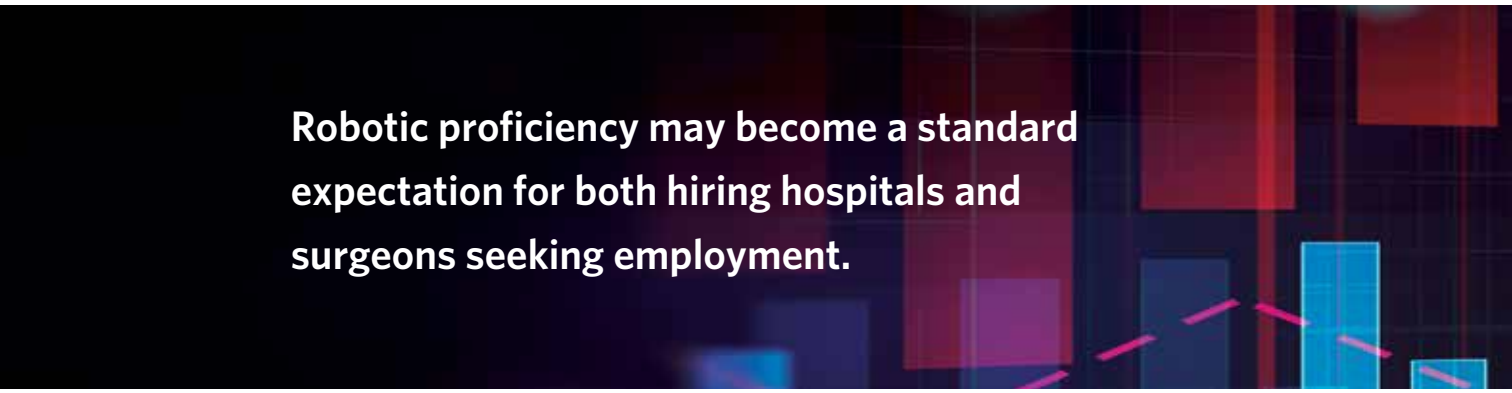
"Hospitals are almost uniformly paid a fixed rate for hospitalization. Medicare reimbursement is based on a Diagnosis-Related Group system or the Ambulatory Payment Classifications system, so they're going to get a fixed rate for a gallbladder surgery or for a pancreas surgery. So, if you can get a patient out of the hospital a day sooner, and all the associated costs to the hospital of that hospitalization are therefore decreased, be it labs, imaging, or nursing care, those are all savings to the hospital system," he said.

In addition, the cost of surgical complication itself can double hospitals costs.[9] But the most significant impact may come from preventing conversion.

"One of the major things we're finding from all these studies is, if you look at nothing else, the rate of conversion to open is substantially lower with robotic surgery than laparoscopy," Dr. Mitzman said, noting that converting creates a much higher cost to the hospital system, payer, and patient, who also will experience more pain, a longer recovery, and a higher chance of morbidity and mortality.[10]

He suggested that the increased risk for conversion should be factored into any cost-benefit analysis of adding a robotic surgery option in a hospital.

Not surprisingly, the balance of direct costs and indirect costs is going to be specific to each procedure, and demonstrating the clinical and subsequent economic benefit of robotic-assisted surgery for certain well-established procedures could prove to be more difficult, particularly when the traditional minimally invasive approach is already deemed to be of high quality.



Robotic proficiency may become a standard expectation for both hiring hospitals and surgeons seeking employment.

"Any incremental quality improvement needs to be assessed in comparison to the cost to get that quality improvement. And the challenge is when we start to introduce robotic technology where it's really hard to move the needle on quality," Dr. Childers said.

"If you already have an operation like laparoscopic cholecystectomy or laparoscopic appendectomy, which have excellent outcomes—most patients go home the same day with very low risk of complications—showing quality improvement with those high-quality standards is going to be hard; any incremental benefit is going to be low," he said.

If you go from 1 in 1,000 to 1 in 2,000 operations incurring a complication, Dr. Childers said, a hospital will need to provide 1,000 additional operations in order to prevent one complication. When adding the higher direct costs of implementation and instruments for a robot, there could be a higher monetary cost to avert rare complications.

Surgeon and Patient Preference Play a Role

Analyzing the direct and indirect costs or cost savings related to robotic-assisted surgery are undoubtedly the cornerstone of a cost-benefit analysis for a hospital, but there are other economic dimensions to consider that drive revenue and may balance the equation.

How is robotic-assisted surgery increasingly being adopted by hospitals and surgeons, growing exponentially in use over the past decade, even as definitive evidence demonstrating clinical benefits continues to elude researchers?

The answer is multivariate, but the fact remains that many surgeons want to use a robot in their practice, which means hospital systems will need to reconsider their approach to workforce retention and recruitment.

Because many current mid- and later-career surgeons completed additional training on a surgical robot and have shown encouraging results, the preference for robotics is firmly taking root during contemporary training—an inclination that may be further strengthened because of the easier transference of open surgery skills to the robotic approach.

"We're in an era where most of our residents in general surgery and the surgical subspecialties are coming into practice with robotic training. If anything, if they want to do laparoscopic surgery, they may need to complete extra, external training in laparoscopy," Dr. Mitzman said.

Robotic proficiency may become a standard expectation for both hiring hospitals and surgeons seeking employment.

"Surgeons are coming out of training wanting to use the robot. If you're trying to recruit for a certain position, and you're not going to provide a robotic platform, you're going to substantially limit your applicant pool," Dr. Mitzman said.

A hospital may try to save on costs by choosing not to invest in a fleet of robotic devices, but if they are unable to hire one of the increasing number of surgeons seeking to use a robot, they risk losing a considerable source of income.

Hospitals also risk losing revenue if surgeons develop musculoskeletal injuries, which are frequently caused by the demanding positions and angles required in laparoscopic procedures.[11]

"One of the possible benefits of the robot for surgeons is in its improved ergonomics. One question that surgeons need to ask themselves is, am I less likely to develop neck and back pain or end up having to go out on disability because I'm able to use

the robot, as opposed to doing laparoscopy or open surgery?" Dr. Childers added.

Surgeons are central in driving adoption and access to any operative technology, but as surgical robots and their potential to provide easier recovery becomes more ubiquitous, patients themselves are now becoming important factors in compelling hospitals to procure surgical robots.

"For better or for worse, the robotics companies have done an amazing job marketing robotics to patients. They are coming to the hospital, to surgeons, saying, 'I will only have this operation robotically,'" Dr. Mitzman said. "And I'm not here to argue whether that's right or wrong, but if you don't have the ability to provide a robotic-assisted approach, you're going to limit your market share and your ability to provide an operation to your community."

Ultimately, the true bottom line regarding the relative costs of robotic surgery is still being written. This is a topic that has many inputs—both in data and surgeon experience—and new realms of "cost" continue to come into focus. For example, some findings suggest that robotic surgery has a higher environmental cost in terms of greenhouse gas emissions, compared to other minimally invasive approaches.[12]

It is incumbent upon surgeons to be aware of the many cost dimensions of robotic surgery so they can be a leading voice in helping their hospitals and the field advance toward the surgical approach that will produce the best outcomes and meet the needs of their patients. B

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

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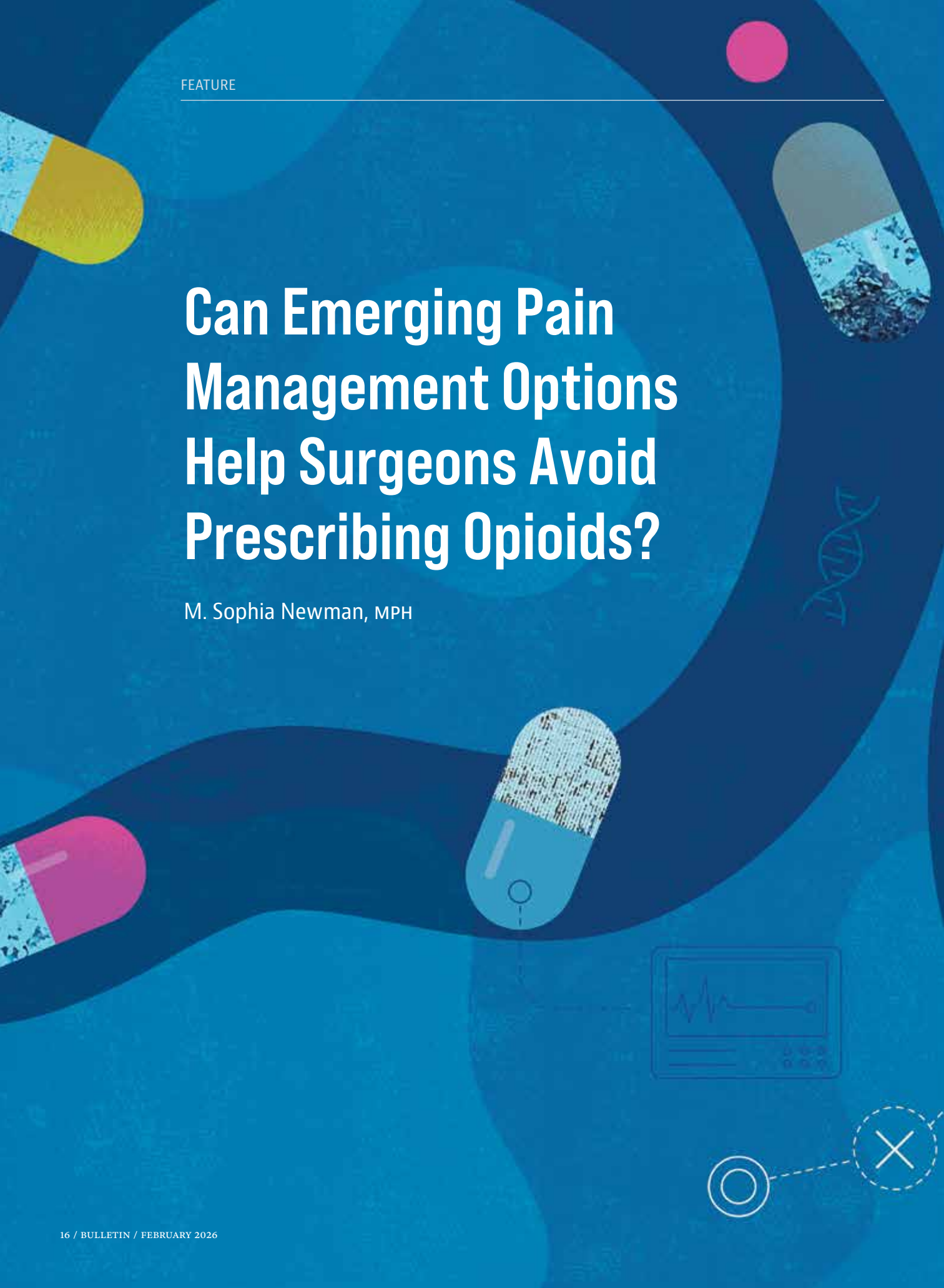
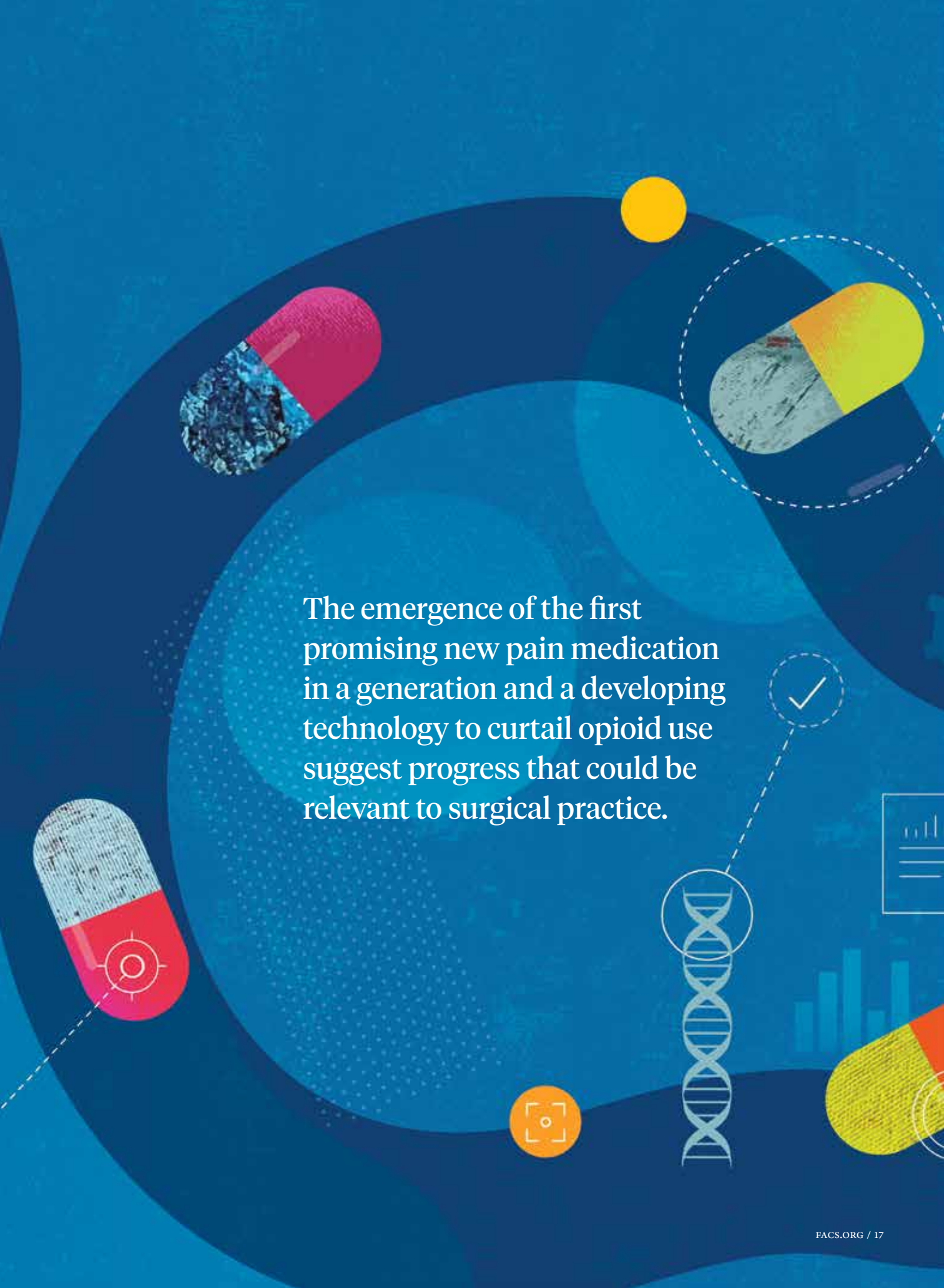
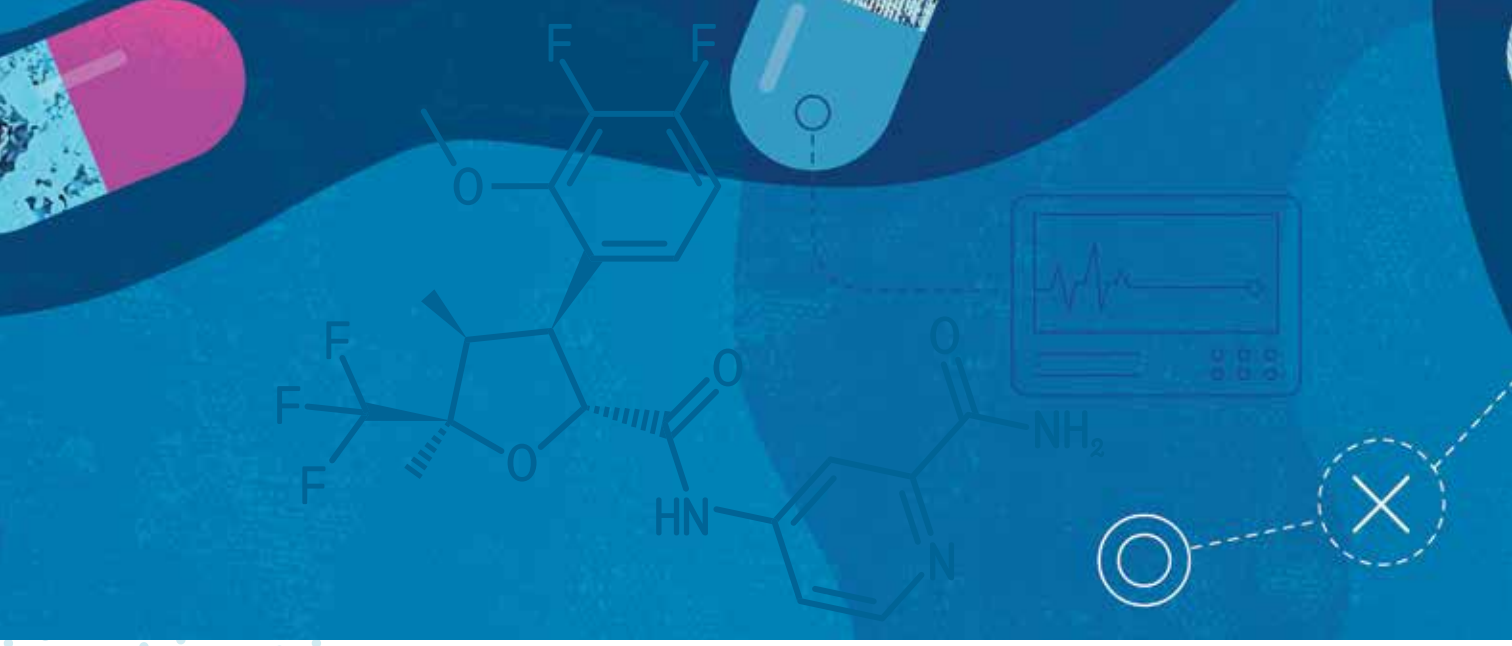
Can Emerging Pain Management Options Help Surgeons Avoid Prescribing Opioids?

M. Sophia Newman, MPH





The emergence of the first promising new pain medication in a generation and a developing technology to curtail opioid use suggest progress that could be relevant to surgical practice.



THE EMERGENCE OF SUZETRIGINE (Journavx) and ongoing research into opioid vaccines both have ignited attention among surgeons, pain specialists, and scientists, although the full benefits of each new option remain unclear.

New Painkiller

Suzetrigine is the newest pain medication in the US, approved in January 2025, by the US Food and Drug Administration (FDA). This drug offers pain control via a somewhat novel mechanism: it is a highly selective inhibitor of the voltage-gated sodium channel $Na_V1.8$, part of the peripheral nervous system.[1]

Because this target is not present in the brain or spinal cord, suzetrigine does not have the central nervous system effects that opioids and other drugs do, such as sedation and euphoria. As a result, the drug is considered to have no addictive potential.[1] Suzetrigine therefore brings new hope to the longstanding conundrum facing physicians: opioid therapy for pain carries a risk of substance use disorder, especially for susceptible patients, but avoiding opioids can leave few options to adequately manage moderate to severe pain.

"Although the data are limited, the findings suggest that suzetrigine may provide analgesic efficacy comparable to opioids, raising the question of whether suzetrigine could be used to achieve similar pain control while potentially mitigating opioid-specific harms," said Jay V. Karri, MD, MPH, an interventional pain medicine clinician and researcher at the University of Maryland Medical Center in Baltimore.

Gap Between Efficacy and Safety in Pain Treatment

The search for better pain management options has been lengthy, with novel pain drugs with sufficient efficacy, usability, and safety disappointingly rare.

The most famous setback may be rofecoxib (Vioxx), a cyclooxygenase-2 inhibitor (COX-2) selective nonsteroidal anti-inflammatory drug (NSAID) that the FDA approved for use in 1999. The manufacturer subsequently withdrew the drug from the market in 2004, after data showed significantly increased risks of heart attack and stroke in the patients who used it.

Other COX-2 NSAID drugs also have failed. These include valdecoxib (Bextra), which the FDA approved in 2001 and the manufacturer withdrew in 2005 after serious cardiovascular and skin reactions, and lumiracoxib (Prexige), which the FDA declined to approve in 2007 and several European countries abandoned after severe hepatotoxicity cases emerged.

Other painkillers have remained in use, demonstrating limited efficacy compared to opioids in terms of usability and/or safety. Celecoxib (Celebrex), a COX-2 inhibitor that entered the market in 1999, is commonly used but effective only for mild to moderate pain. Ziconotide (Prialt) won FDA approval in 2004, but is suitable for a niche patient population, largely because it requires intrathecal infusion via a surgically installed pump. Gabapentin (Neurontin), an oral anticonvulsant that emerged in the 1990s, is now widely used for neuropathic pain but also associated with misuse, as well as overdose risk in the context of polypharmacy.

Suzetrigine Use

In contrast, suzetrigine appears to offer safe, effective, easily usable pain control. In two randomized clinical trials (RCTs) assessing pain in patients after abdominoplasty and bunionectomy, the groups receiving a 100 mg oral loading dose of suzetrigine, followed by 50 mg doses every 12 hours, had superior pain relief over 48 hours compared to the group receiving a placebo and comparable relief (noninferiority) to a group given 5 mg of hydrocodone and 325 mg of acetaminophen.[2] Suzetrigine also is marketed as suitable for multiple surgical and nonsurgical purposes, including orthopaedic, plastic, otorhinolaryngologic, general, and urologic surgery.[3] In the media, private-practice plastic surgeon Luis A. Vinas, MD, FACS, has described it as a "significant advantage" for surgical practice.[4]

However, the efficacy for all these uses is somewhat questionable, as is its full impact. In RCTs, suzetrigine has outcomes similar to, not better than, those of the active comparison arm. Thus far, how much pain control it might offer at larger doses is unclear.[5]

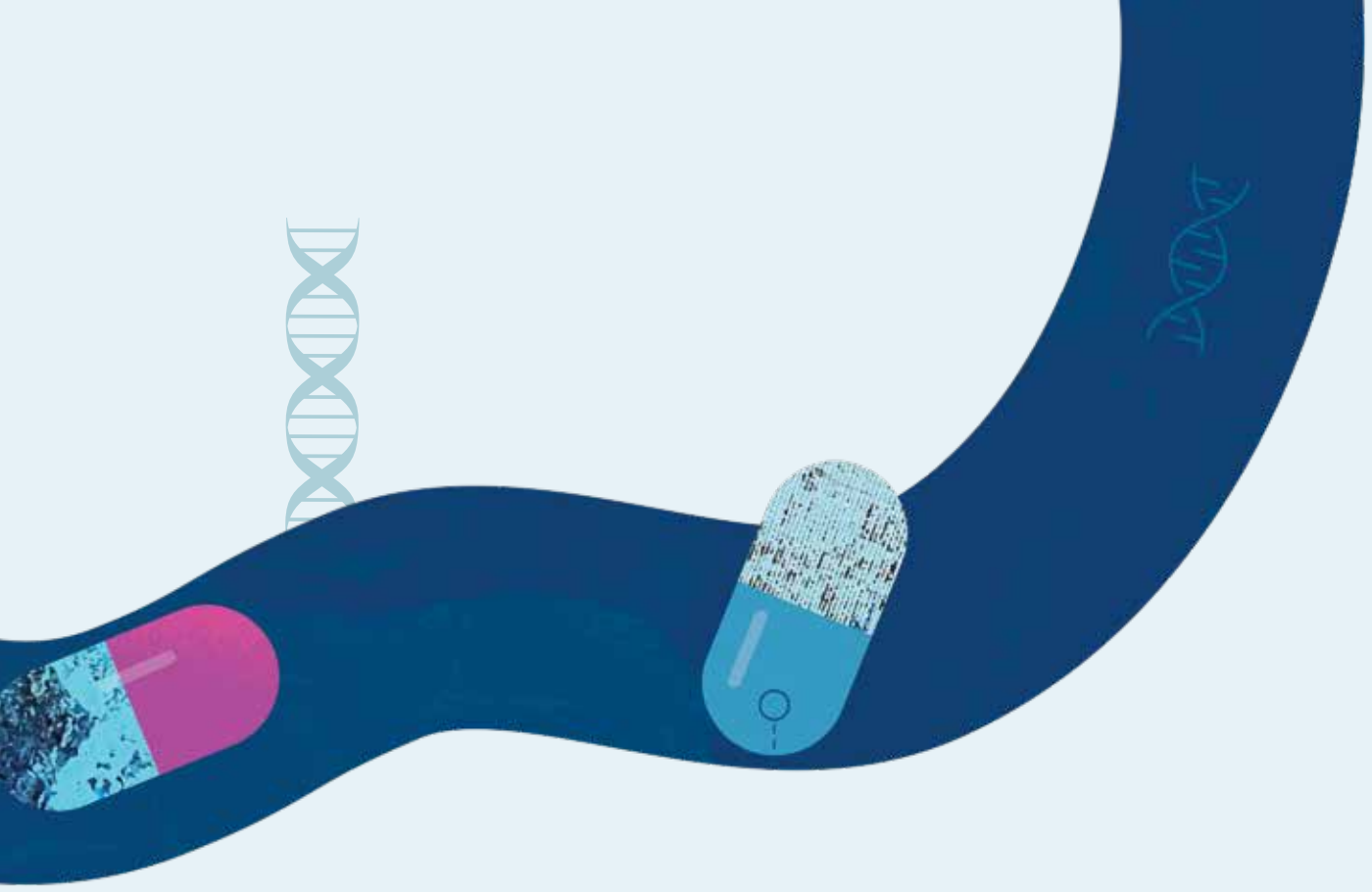
For now, many surgeons cannot rely on experience to ascertain its clinical value. For example, Lourdes Castañón, MD, FACS, director of the Burn Program at Banner-University Medical Center in Tucson, Arizona, and a clinical associate professor of surgery in the Department of Surgery, Trauma, Surgical Critical Care, Burns, and Acute Care Surgery at The University of Arizona College of Medicine–Tucson, said, "I don't have any experience with this medication, but it may be something we can start using."

Dr. Karri, who has prescribed suzetrigine, said he finds it useful in practice, including for postsurgical patients. Mindful that adverse effects have been minimally explored, he administered the drug only at the dosage studied in the RCTs, often as part of multimodal analgesia. "This is a good option to include as part of a cocktail," he said.

Steven P. Cohen, MD, the Edmond I. Eger Professor of Anesthesiology at Northwestern University in Chicago, Illinois, concurred. He said that opioid sparing in a diverse population may be possible, because the mechanism of action allows for additive effects with opioids or other drugs. Per manufacturer-affiliated scientists,[1] this approach may include combinations with other nonselective Na_V blockers, such as carbamazepine, perhaps enhancing the drug's utility.

Aspects of Suzetrigine Not Yet Fully Understood

- Full range of common and uncommon side effects and adverse events
- Maximum dosage at which pain control increases
- Maximum safe dosage
- Full efficacy of use in combination with regional anesthesia
- Efficacy in preventing pain
- Loss of efficacy over time



Like Dr. Karri, Dr. Cohen (who is Dr. Karri's coauthor[5]) saw possible uses for the drug. "Opioid use disorder is pretty common, and when some of the affected patients have surgery, there are data from Veterans Affairs and the nonveteran populations that show they're more likely to relapse, overdose, and die. So you want an alternative for these patients," Dr. Cohen said.

Nonetheless, Dr. Cohen also saw cause for skepticism, estimating that blocking just one of many sodium channels would lead to a ceiling effect. "$Na_V1.8$ is probably not going to have much of an effect on the affective and cognitive components" of pain, he noted.

Financial Limits

Dr. Cohen described payment bundling for postsurgical pain as decreasing the likelihood clinicians will choose suzetrigine, a pricey new medication, when cheaper NSAID or opioid options would suffice. Dr. Karri agreed, describing insurance coverage as favorable for the acute uses for which suzetrigine is on label, but less so for chronic pain. "It's much easier to use this drug in the inpatient setting, given some of the reimbursement restrictions," he said.

Drs. Castañón and Cohen also discussed other potential uses—albeit ones that may be limited by payment models. Dr. Castañón noted that using some management techniques, including administration of acetaminophen before surgery, may help reduce the intensity of pain at later points in time. Although acknowledging a lack of objective evidence to date, she theorized that suzetrigine "may be something we can preemptively give to reduce the activation of nerve endings, so the pain would be less than it would be without that drug."

Another prospective use has been suggested by suzetrigine's manufacturer, Vertex. Because local anesthetics block all sodium-gated voltage channels, including $Na_V1.8$, they have conducted in vitro studies that combined two local anesthetics (bupivacaine and ropivacaine) with suzetrigine. They found simple additive pharmacological effects that suggest suzetrigine could provide continuous $Na_V1.8$ inhibition as an anesthetic block wears off.[1] This finding may make suzetrigine a worthwhile option for pain control after a patient with a regional block has been discharged.

But these uses will occur in clinical settings only if they make financial sense. "If you do a nerve block and you give people high-dose NSAIDs," Dr. Cohen said, "Is it the same as giving

them a systemic sodium channel blocker? I think that could make sense, but I don't know if it's better than drugs that you can get for pennies."

Making Opioids Less Dangerous

While suzetrigine is a new option for those needing pain medication, other scientific inquiries are opening the door to another improvement in opioid-based pain management: supporting patients in discontinuing prescribed opioids at the right time. (Read "In Surgical Care, Opioid Use Is Complex" from the March 2024 issue of the *Bulletin*.)

One option under current research may assist with this: vaccines for opioid drugs.

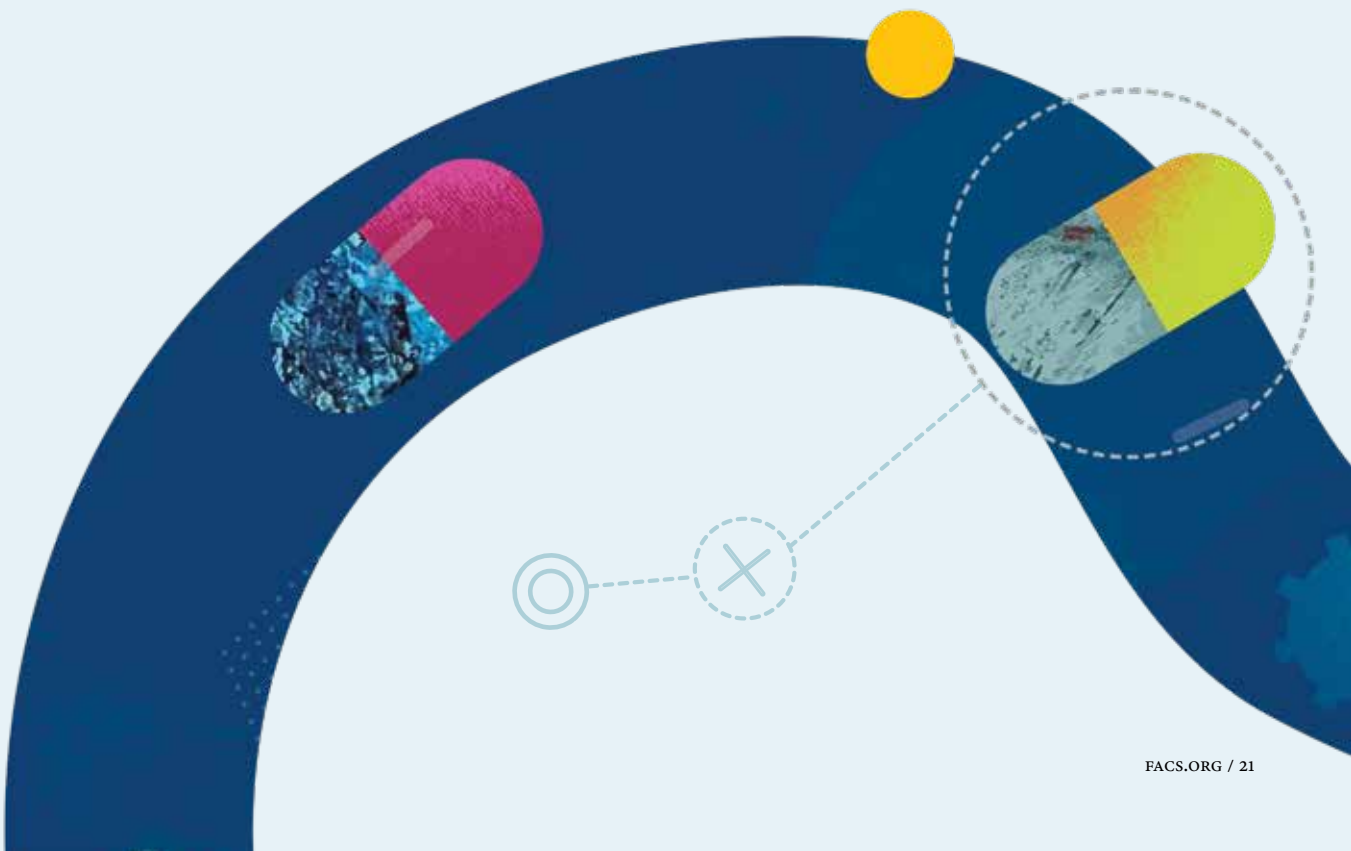
The concept is similar to that of vaccines for infectious diseases. The aim is to activate the immune system to make antibodies, in this case targeting a specific drug rather than a microorganism. The idea of using immunotherapies for this purpose first emerged decades ago,[6] and research has since found appropriate vaccine selectivity and safety for a variety of opioids (as well as other illicit drugs).[7] Efficacy is variable but generally considered sufficient, with some opioid vaccines requiring multiple injections before sufficient immune response is reached.[7]

The vaccines can prevent a given opioid from entering the brain, thus removing its central antinociceptive, euphoric, and respiratory depressive effects, as well as lessening the compulsion toward using the drug that people with opioid use disorder (OUD) experience. This can help prevent overdoses and ensure patients in recovery from OUD maintain sobriety.

Specificity and Limitations

The perception that an opioid vaccine can remove population-wide risk of OUD, in the way that vaccines can reduce or even eliminate the risk associated with specific microorganisms, is incorrect.

"If we were giving them an honest name, we would call them 'drug-stranding technologies,'" said Travis N. Rieder, PhD, an associate research professor at the Johns Hopkins Berman Institute of Bioethics in Baltimore, Maryland,



who served on an advisory committee for the National Institute on Drug Abuse. "It keeps the drug away from the central nervous system by keeping it floating around the bloodstream."

This distinction can help clarify the use case for these vaccines: to help patients in recovery from OUD avoid relapse, including patients without established substance use disorders who struggle to end their postsurgical opioid use.

"As long as a person meets criteria for OUD, then they should be a good candidate for the vaccine," said Sandra Comer, PhD, a professor of neurobiology in the Department of Psychiatry at Columbia University in New York City, whose research is focused on testing vaccines for opioid drugs.

At present, the vaccines are largely being tested in those with established OUD. Many have noted that such patients may benefit from vaccines particularly when clinical (including surgical) needs make use of pain medication essential.

The clinical situation this creates is different from that of patients using existing medications for OUD, such as naltrexone, buprenorphine, and methadone.

"One of the features of the vaccine that I think is unique and differs from other medications that are used for treating OUD, is that it's pretty selective," Dr. Comer explained. "If somebody is on the traditional medications for OUD, they cover any kind of opioid agonist that would be used for treating pain."

In contrast, each opioid vaccine is specific to a given large molecule, and for this reason, it is necessary to design a vaccine specific to each opioid drug. (At present, Dr. Comer's research team is working on separate vaccines for oxycodone, heroin, and fentanyl.)

Use of each vaccine also is further challenged by the complex, everchanging street-level drug supply, which now mixes fentanyl, carfentanil, nitazenes,[8] and various other opioids. It is a challenge that Dr. Comer has acknowledged,[9] noting the need for the development of multivalent vaccines.

For patients with OUD, the specificity of each opioid vaccine may be clinically helpful. Clinicians treating patients who have received a specific opioid vaccine could simply choose a different opioid medication for pain relief when needed.

However, it also means that patients with OUD might use the opioids their vaccine does not block, obviating any protective effect of vaccination. Ongoing trials of multivalent opioid vaccines may solve this problem, but only by eliminating a number of effective options for relief of severe pain.

"There are a lot of questions about opioid vaccines, particularly from a bioethics standpoint," Dr. Karri pointed out, describing his concern about an inability to treat patients' pain effectively.

Other limitations exist. Dr. Karri mentioned that consent to treatment is fraught among patients with OUD, and consent to vaccination may pose a similar issue for these patients and others with vaccine hesitancy. Meanwhile, Dr. Rieder, who briefly struggled with withdrawing from opioids after a motor vehicle crash several

years ago, said he doubted opioid vaccines would ever succeed. He also argued that patients motivated to cease opioid use may respond well to social services and clinical advice and not require a vaccine at all.

Additionally, the option of offering opioid vaccines to a broad range of patients, including postsurgical patients who do not have established OUD in a bid to avoid them ever developing it, is largely uncharted territory. "We've talked about using the vaccine as a prevention measure," Dr. Comer said. "There's currently not a regulatory pathway established for that, so that would have to happen later and in discussion with the FDA about what that kind of program would look like."

Search Continues for Improved Pain Management

Pain is, by its very nature, urgent, intrusive, and difficult. It is a condition that can seem to require a response as intense and aggressive as the experience itself.

By contrast, improvements in research science and clinical care are often incremental, with setbacks and limitations accompanying nearly every step forward. Dr. Comer, whose work has repeatedly been interrupted by events as historic as the COVID-19 pandemic and as mundane as regulatory bureaucracy, sighs when asked about the future, admitting gently, "I don't have a crystal ball."

If opioid vaccines emerge as a clinical option, offering alternative medication to patients who receive them may be important. With advancing research, suzetrigine may be found to be such a drug.

Meanwhile, the quest for better, safer pain relief will go on: work that is challenging to complete but unethical to abandon and crucial to many of the patients who surgeons serve. B

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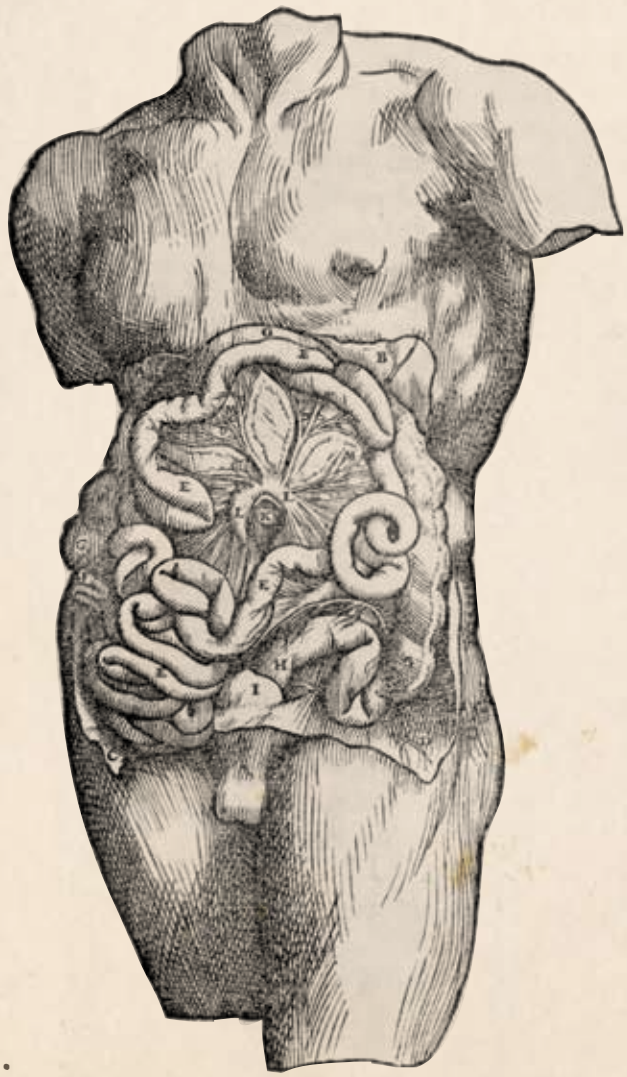
Vesalius's *Fabrica* Transforms Medicine Through Observation and Illustration

Brendan P. Lovasik, MD



Andreas Vesalius's *De Humani Corporis Fabrica Libri Septem* ("On the Fabric of the Human Body in Seven Books"), published in 1543, is viewed as a revolutionary medical textbook on human anatomy that continues to be studied today for its scientific and artistic merits.

This illustration from *Fabrica* provides anatomical details of the human body, reflecting Renaissance medical knowledge, scientific observation, and artistic representation.


ANDREAE VESALII
BRVXELLENSIS, SCHOLAE
medicorum Patauinæ professoris, de
Humani corporis fabrica
Libri septem.
CVM CAESAREAE
Maiest. Galliarum Regis, ac Senatus Veneti gra
tia & priuilegio, ut in diplomatis eorundem continetur.

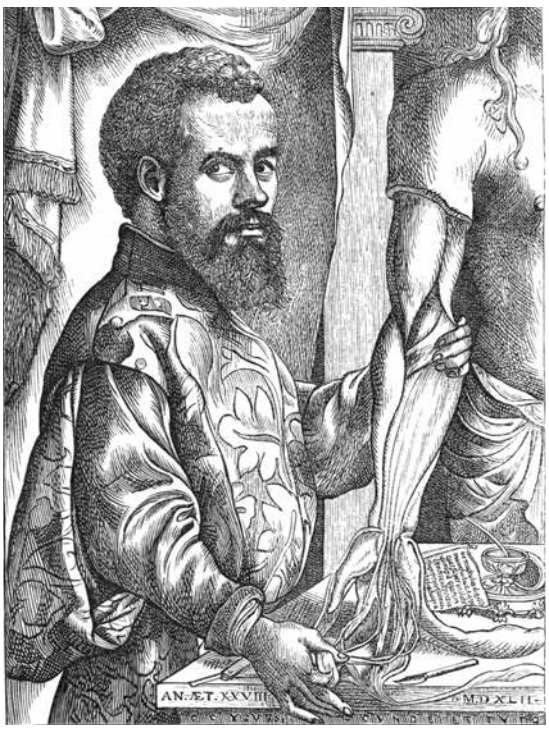
HIS COLLECTION OF BOOKS features anatomical illustrations and depictions that set a new standard due to their size, detail, quantity, and quality—and its iconography is known to individuals well beyond the medical field.

These visual representations of anatomy are considered to be among the most significant accomplishments of the Renaissance scientific revolution, which initiated a drive toward observation and experimentation in medicine.

It also is important to note that this collection represents one of the first mass distributions of contemporary scientific content, helping to establish commercial printing as an effective channel to publicize new ideas.

Andreas Vesalius: Anatomist and Physician

Vesalius, born on December 31, 1514, in Brussels, Belgium, was descended from a line of five generations of physicians serving the Hapsburg dynasty. He completed his studies in Louvain, Paris, and Padua, Italy, finishing his medical studies at the prestigious University of Padua in 1537. This city proved to be a fertile ground for Vesalius's talents, as it was one of the centers of scientific renaissance and medical humanism, with a very progressive faculty and supportive government administration.



Overleaf:
The frontispiece from *Fabrica* depicts Vesalius demonstrating a human dissection in a grand anatomical theater, surrounded by spectators, allegorical figures, and his family's coat of arms.

Right:
A portrait of Andreas Vesalius, likely woodcut by Vesalius himself, is found in *Fabrica*.

Following the completion of his doctorate of medicine, Vesalius was named *explicator chirurgiae* (lecturer in surgery) at the University of Padua, with the responsibility of teaching anatomy.

At the time of his studies in the 1500s, instruction in medieval anatomy was simultaneously rudimentary yet strictly regimented. The dogmatic method of university teaching included three participants: the *lector* (scholar), who delivered or recited classical texts *ex cathedra* (from the chair); the *ostensor* (assistant), who performed the demonstration and directed attention to the cadaver with a wooden pointer; and the menial *sector* (dissector), typically a barber, who performed the actual incisions and exposures.

Vesalius took issue with the fact that the scholar was not performing the dissection, and the assistants often were not educated enough to know what they were meant to be demonstrating. Vesalius wrote in the Preface of *De Humani Corporis Fabrica Libri Septem* (1543):

"The deplorable division of the art of treatment introduced into the schools that detestable procedure by which usually some conduct the dissection of the human body [humani corporis sectionem administrate] and others present the account of its parts, the latter like jackdaws aloft in their high chair, with egregious arrogance croaking things they have never investigated but merely committed to memory from the books of others, or reading what has already been described. The former are so ignorant of languages that they are unable to explain the dissection to the spectators [ut dissecta spectoribus explicate nequeant] and muddle what ought to be displayed according to the instructions of the physician who, since he has never applied his hand to the dissection of the body [qui manu corporis sectioni nunquam adhibita], haughtily governs the ship from a manual. Thus everything is wrongly taught in the schools, and days are wasted in ridiculous questions so that in such confusion less is presented to the spectators than a butcher in his stall could teach a physician."

Vesalius's first innovative approach to teaching was to descend from the lector's chair and perform the

These visual representations of anatomy are considered to be among the most significant accomplishments of the Renaissance scientific revolution, which initiated a drive toward observation and experimentation in medicine.

dissections himself, allowing him to observe and compare actual anatomy, not just recite classical sources. To clarify his presentations for the audience, Vesalius introduced large charts with illustrations of the anatomy. These visual representations also were unique, as few anatomic works to date featured illustrations. In fact, most academics at the time were strictly opposed to including images in their work, as illustrations were thought to degrade scholarship.

In 1538, Vesalius published a series of six anatomic woodcut plate illustrations known as the *Tabulae Sex*, which set a new standard in biological illustration because they were reference-based rather than created via verbal descriptions of anatomy. These plates also are considered pioneering work because they were created specifically for well-educated doctoral students and physicians, unlike previous large broadside prints, which were designed as quick visual references for nonacademic barber-surgeons rather than detailed study tools.

In 1539, Vesalius published the Venesection Letter, which some medical historians consider to be the first evidence-based report. This important pamphlet described a European-wide debate on the best technique for humoral rebalancing via bloodletting for treatment of pleurisy. Most of the assertions in this report were based on classical sources, debating the Hippocratic method versus the Arabic method.

Vesalius contributed his insights to the debate based on his anatomic studies in the letter, which included a diagram of the thoracic venous drainage that Vesalius developed informed by his personal dissections. Thereafter, scientific arguments debating the two treatments were compelled to use direct evidence in their defense of their preferred approach, reflecting a growing emphasis on empirical observation.

Across multiple plates in *Fabrica*, "muscle men" figures are shown in consistent poses and settings (often standing in landscapes) and with successive layers of musculature removed.

The flayed muscle figure reveals layered musculature of the torso and limbs with meticulous detail, exemplifying Vesalius's fusion of anatomical science and classical artistic tradition.

Merging Illustration with Knowledge

The word "fabrica" in the title *De Humani Corporis Fabrica Libri Septem* is intriguing, as this word could be simultaneously understood as "structure/construct" or "art/craft/production," perhaps as a reference that human anatomy is an expression of purpose and artisanship. This combination of purpose and artisanship is a defining attribute of the *Fabrica*, because Vesalius's anatomic observations gleaned from years of human dissection are paired with exquisitely detailed and artistic illustrations from Titian's workshop—which included artists associated with Titian, a well-regarded Venetian painter—integrating the text and illustrations into a single, unified entity.

What separates *Fabrica* from similar 16th-century publications, and why it is still studied today among art scholars, is the extraordinarily high level of detail in the images, coupled with explicit references to classical antiquity and iconography.

Among the illustrations, Italian Renaissance artistic imagery is omnipresent. In the frontispiece, Vesalius is shown with one hand pointing upward and the other resting on the cadaver, which recalls Raphael's *The School of Athens* (1510-1511) as a simultaneous synthesis of both the Platonic and Aristotelian philosophies.

The osteological plates with lamenting skeletons resemble Renaissance *vanitas* themes of death and *memento mori* ("remember you must die"). The second plate of the muscle men illustrations is modeled on a well-known Titian portrait, the *Allocution of Alfonso d'Avalos to His Troops* (1541), and the ninth plate is similar to classical poses as demonstrated in the *Capitoline Antinous*—a marble statue of a young male found at Hadrian's Villa in Tivoli, Italy (though unlikely to be a direct reference).

The pages of *Fabrica* exemplify the book's groundbreaking format, in which illustrations and descriptions work together to advance the Renaissance study of human anatomy.

In contrast, the abdominal visceral plates appear to be fragmentary classical sculpture, including one plate that resembles the *Belvedere Torso*. Interestingly, the artist who created these captivating illustrations has not been firmly established. Most modern scholarship supports the fact that the images came from Titian's workshop in Venice, Italy, where Titian oversaw the artistic invention of the figures and scenes, and Flemish artist Jan Stephan van Calcar served as a medical designer.

The typography and print work of the *Fabrica* deserve specific mention. Vesalius's use of a legend in his figures is notable. In the anatomic illustrations, one can see italic letter markings on the structures. Overall, this system of legends that cross-references the illustration with the textual descriptions was unique as a method of communicating descriptive science, and set a precedent for future scientific instruction that continues to be used today.

The intricacy of the illustrations is due to the engravers' novel method of soaking the woodblocks in linseed oil prior to their engraving, which hardened the wood, making it more receptive to finer lines of engraving.

Also, the choice of Johannes Oporinus as the printer was crucial to the collection's enduring success. Oporinus's progressive publication ideas (he was the first to publish a printed version of a Latin translation of the Quran, for which he was briefly jailed), his previous medical studies under Celsus, and the location of his print shop in Basel, Switzerland, allowed for rapid distribution of the *Fabrica* to the French, German, Italian, and Flemish academies where Vesalius's teachings would take hold. These factors converged to make Vesalius's work one of the earliest widely distributed collection of scientific textbooks in European scholarship.

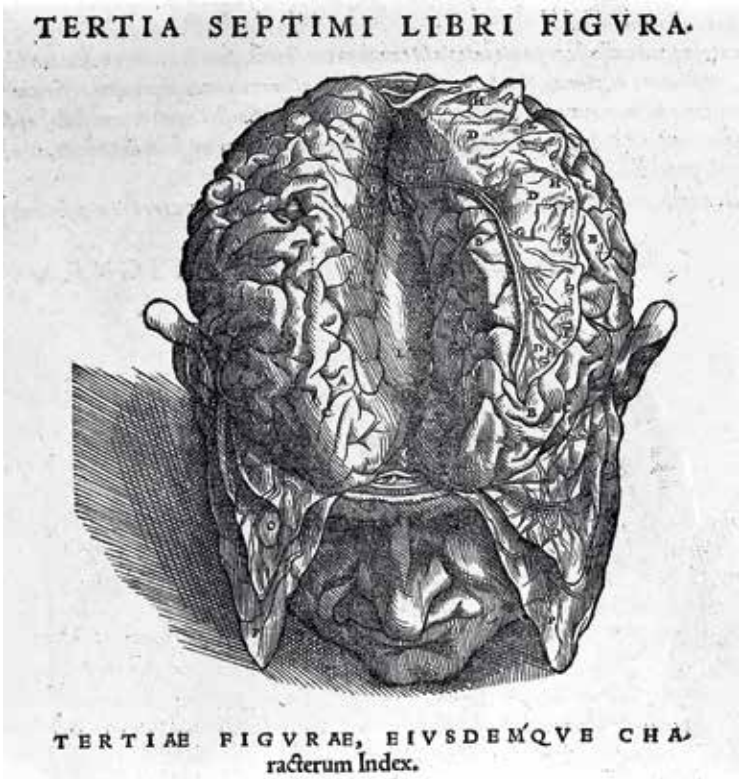
The *Fabrica*'s frontispiece, a striking and hectic scene, is a singular work of art that is among the highest achievements of wood engraving, incorporating clean and precise lines, crosshatching and shadowing, and remarkable use of perspective projection (a defining characteristic of Renaissance art).

The image depicts an open-air public anatomy conducted by young Vesalius in a renaissance-style Palladian courtyard. Vesalius is surrounded by students and fellow physicians, the rectors of the city and university, and councilors and representatives of the nobility and church.

In this piece, Vesalius serves as the lector, ostensory, and dissector, demonstrating his absolute control over all aspects of anatomical knowledge. Three figures in ancient antiquarian dress demonstrate the classical foundations of anatomic knowledge. Galen's reliance on animal anatomy is indicated by the dog (with a human foot) and a chained monkey in the foreground. The fully articulated skeleton in the center of the scene reinforces the Vesalian importance of bones as the underpinning of anatomic dissection, while the nude figure clinging to the column to the left reflects the importance of surface anatomy and function.

The entablature above the columns is a nod to Vesalius's sponsors with the lion of the Venetian state and ox of the University of Padua. Above the title block, Vesalius's family crest featuring three weasels *en courant* is held by two putti. The inscribed letters I and O, the monogram of Oporonius, is to the left of the crest.

The frontispiece of the *Fabrica* includes a self-fashioned portrait of Vesalius dissecting a hand and forearm. This is an overt reference to Aristotle's *De partibus animalium* in which Aristotle views the



An anatomical engraving of the human brain exemplifies the precision and visual clarity that transformed the study of anatomy in the sixteenth century. (*Credit: Wellcome Collection*)

Vesalius exemplifies an early modern commitment to grounding medical knowledge in direct observation and hands-on anatomical investigation.

hand as the *organum organorum* (organ of organs)—the organ that best demonstrates human intellect and capability to create civilization. The hand as a symbol of vital human essence also is seen in the *Creation of Adam* by Michelangelo (1511) on the Sistine Chapel ceiling.

Vesalius's depiction of a tendon dissection finds a visual echo in Rembrandt's *The Anatomy Lesson of Dr. Nicolaes Tulp* (1632), where the dissected forearm similarly serves to assert the physician's mastery of science and the order of nature.

Summary of Each *Fabrica* Book

The first of the seven books in the *Fabrica* collection focuses on bones, which Vesalius believed to be the most critical as a framework for understanding anatomy. Three full-body skeletons appear to be in various stages of lamentation, perhaps of their own mortality.

The second book focuses on the muscles in which Vesalius's series of muscle men are shown in an order of progressive flaying. The initial plates depict superficial muscles, and each subsequent plate reveals one deeper layer of muscles. The muscle men represent the body as a living organism with accompanying functional movements, the movements of which degrade as muscles are stripped away. These first two books account for more than half of the pages of the collection perhaps showing the sixteenth-century anatomists' command of structural anatomy even as the physiologies of the circulatory, metabolic, and neurologic systems remained poorly understood in Vesalius's time.

Book three features illustrations of the vascular system with venous and arterial anatomy, while book four contains representations of the central and peripheral nerves. The placement of vasculature so early in the books is a notable promotion of Vesalius's skills as a dissector, since venous anatomy was the weakest topic area in Galen's classical writings.

The fifth book includes illustrations of the abdominal visceral organs and both male and female reproductive systems. Book six contains images of the thoracic visceral organs, and book seven features illustrations of the brain, presented as serial axial sections.

Fabrica's Lasting Impact

Following the publication of the *Fabrica*, Vesalius was appointed imperial physician to Emperor Charles V of the Holy Roman Empire in 1544, a role in which

he served until his death. (Vesalius is believed to have died in 1564 during a pilgrimage to Jerusalem and was buried on the Greek island of Zakynthos.)

In August 1555, Vesalius published a second edition of *Fabrica* with expanded and revised content, including new physiological observations based on dissection and intervention: laryngeal paralysis following transection of the recurrent laryngeal nerve, collapse of the lung after opening the pleural cavity, artificial respiration via intratracheal intubation, and survival following surgical splenectomy.

Vesalius exemplifies an early modern commitment to grounding medical knowledge in direct observation and hands-on anatomical investigation. His emphasis on dissection and surgical practice challenged divisions between learned medicine and manual surgery, arguing for anatomy as a unifying foundation of medical knowledge, even as institutional separations between physicians, surgeons, and barber-surgeons largely persisted in his lifetime. The enduring resonance of his work across medical and artistic communities is aptly symbolized by an inscription on one of his skeletal images: *Vivitur ingenio, caetera mortis erunt* (genius lives on, all else is mortal).

More than 700 copies of the *Fabrica* still exist, largely in medical libraries or museums. The author has been fortunate to be associated with two university libraries with copies of the *Fabrica* and would encourage readers who are interested in learning more about the *Fabrica* to contact their librarians and archivists to arrange a viewing. Several high-quality scanned copies also can be found online such as via the Royal Library of Belgium website at https://uurl.kbr.be/1044146.

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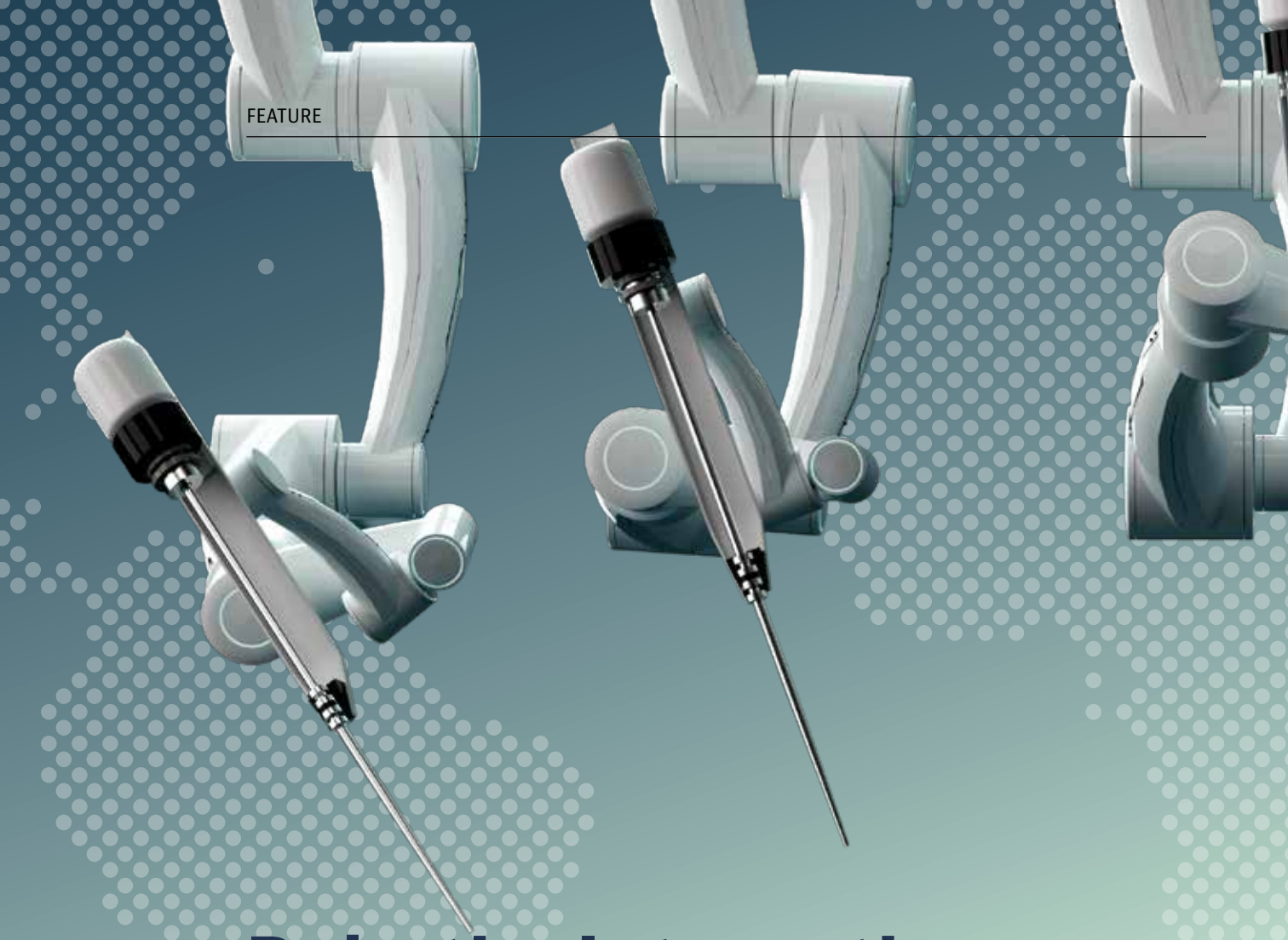
Left: Skeleton figure leans pensively on a pedestal beside a skull—an iconic Renaissance image combining anatomical precision with a contemplative pose.

Right: Positioned in a classical pose against a detailed landscape, the muscle man figure reflects the synthesis of empirical anatomy and artistic tradition that defined Vesalius's work.



Robotics Integration Is Transforming Global Surgical Care

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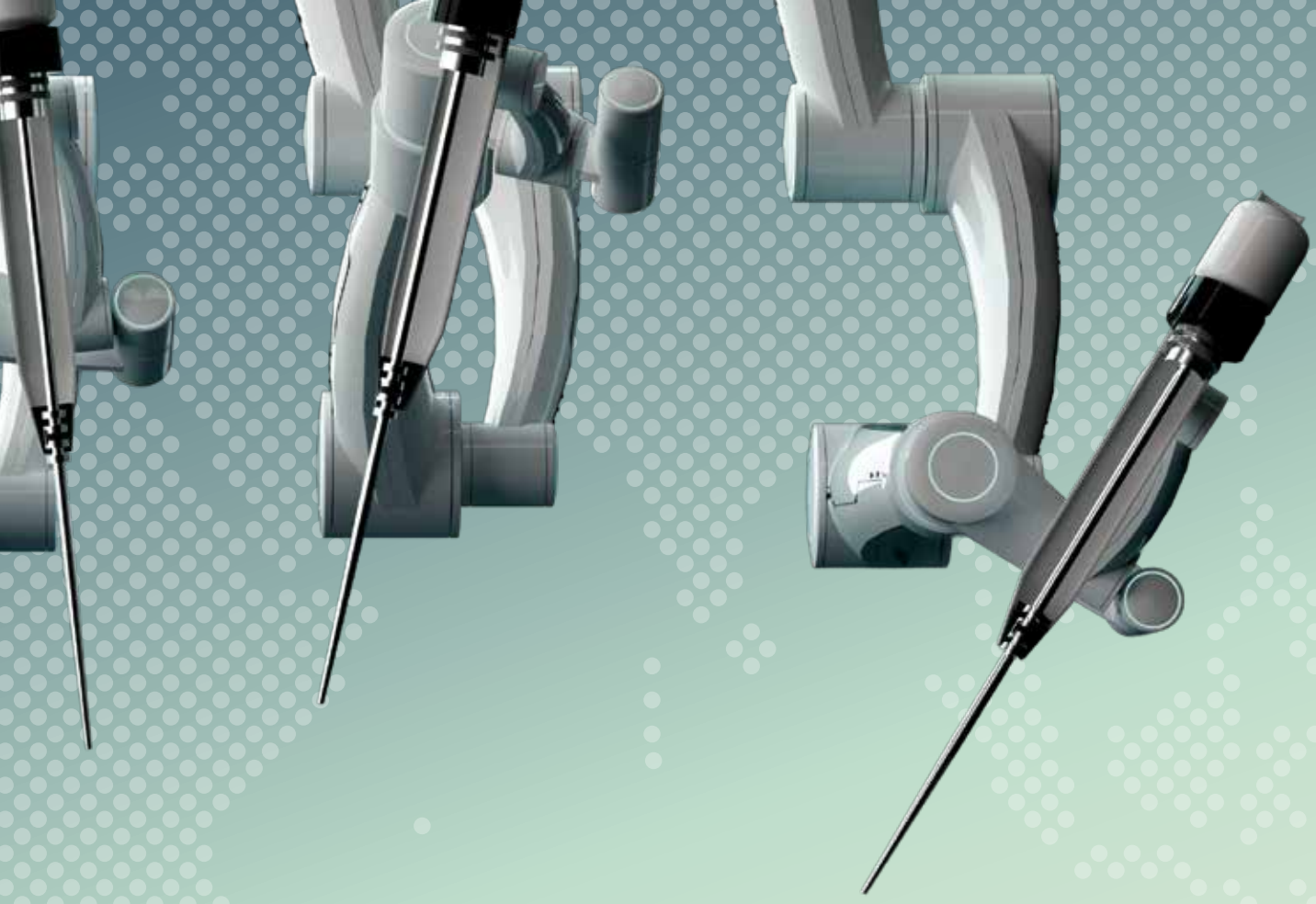


ROBOTIC-ASSISTED SURGERY represents one of the latest advances in surgical practice, offering advantages across specialties including urology, neurosurgery, gynecology, ophthalmology, traumatology, and orthopaedics, as well as cardiothoracic and general surgery.[1]

For certain procedures, when compared to laparoscopic and open surgery, robotic-assisted surgery is associated with reductions in recovery time, postoperative pain, complication rates, blood loss, and length of stay. This technology also allows for greater precision, dexterity, and visualization during procedures, which are particularly useful in complex cases such as those with dense adhesions and significant prior surgical history.

In addition, robotic-assisted surgery provides significant advantages for specific patient populations, such as those with obesity or complex anatomy, allowing for safer and more tailored interventions. From a surgeon's perspective, robotics systems improve ergonomics and reduce physical fatigue during lengthy operations, positively impacting performance and surgical outcomes.

The Lancet Commission on Global Surgery (LCoGS) highlights the importance of surgery as a component of universal health coverage (UHC)[2] and advocates for strategies to strengthen surgical systems, including implementation of the National Surgical, Obstetric, and Anesthesia Plans. These comprehensive frameworks address gaps in surgical access, workforce training, infrastructure, and financing.

Evidence from LCoGS suggests that deficiencies in surgical, anesthetic, and obstetric (SAO) care contribute to 18 million preventable deaths annually.[2] As robotic surgical systems evolve, their integration into healthcare infrastructure may align with global efforts to strengthen surgical systems and capacity while reducing disparity in access to quality care.

Today, robotic-assisted surgery accounts for 5% of surgeries in the US, 2% in Europe, and less than 1% in the rest of the world, correlating with the proportion of each region's gross domestic product spent on healthcare.[5]

Application Across Surgical Subspecialties

Robotic assistance has been applied across various surgical subspecialties. In 1985, the first surgical robot, the Programmable Universal Machine for Assembly 560 (PUMA 560), was used in neurosurgery for a biopsy procedure.

In urology, robotics platforms are primarily used for laparoscopic radical and partial prostatectomy in the treatment of prostate cancer, as well as for nephrectomy and lymphadenectomy procedures. In orthopaedic surgery, total hip arthroplasty was the first robotic procedure performed, followed by knee arthroplasty. Studies have shown that robotic assistance in orthopaedics improves alignment, facilitates limb lengthening, and enhances patient satisfaction. Fracture fixation in trauma surgery represents a substantial potential for future robotics innovation.

In gynecology, robotics systems are widely used for procedures such as hysterectomies and myomectomies. While in the area of otolaryngology, applications are generally categorized into retro-auricular hairline incisions and transoral robotic surgery, depending on the pathology.

The field of cardiac surgery also has seen growing use of robotics platforms, particularly for minimally invasive procedures such as endoscopic coronary artery bypass grafting and mitral valve repair. One of the earliest robotic cardiac procedures included the closure of an atrial septal defect.

While vascular surgeons are beginning to explore robotic assistance, its use remains off label in the US, and broader application in this specialty is still in the early stages of development. Specialized robotics platforms also have been developed for spinal, ophthalmic, and other nonabdominal surgeries. These platforms continue to evolve, offering various capabilities designed to improve microsurgical precision while maintaining safety and reproducibility.

Global Trends in Robotic Surgery

Initially approved solely for the purpose of visualization and retraction, the da Vinci system became the first to receive US Food and Drug Administration (FDA) approval for general surgery in 2000.[3] To demonstrate its safety, 300 robotic-assisted surgeries were performed in Europe, beginning with a robotic-assisted cholecystectomy in Belgium in 1997.[4]

Today, robotic-assisted surgery accounts for 5% of surgeries in the US, 2% in Europe, and less than 1% in the rest of the world, correlating with the proportion of each region's gross domestic product spent on healthcare.[5] In 2005, a robotic-assisted cystectomy was performed in Egypt, and robotic surgery for achalasia cardia was performed in Argentina, which was the first procedure of its kind performed in the region. India and China were among the first Asian countries to adopt robotic surgery in 2006, with other countries, including Japan, Pakistan, and Indonesia following suit in 2009, 2011, and 2012, respectively. Robotic surgery has gradually spread across the former Soviet states since the 2000s, with Russia adopting the technology in 2007, Poland in 2010, and Kazakhstan in 2018.

In comparison, robotic surgery has seen less adoption in Latin America and Africa. Brazil, Chile, Colombia, Mexico, and Venezuela have had incremental adoption of this technology, while in Africa,

robotic surgery has only been reported in Egypt, South Africa, and Tunisia.

Recently, newer robotics platforms have been developed in China, Germany, India, Italy, South Korea, Switzerland, and the UK.[3] Although most of these platforms are approved only by local regulatory bodies, their availability is expected to reduce costs and promote further integration of robotics into surgical practice. The development and adoption of robotics systems have been limited in low- and middle-income countries (LMICs), where public health priorities often focus on infectious diseases, maternal health, and trauma. Robotic surgery is typically concentrated in private or urban healthcare facilities, exacerbating existing disparities.

From a global health perspective, robotic-assisted surgery aligns with key health priorities, such as the third aim outlined in the United Nations Sustainable Development Goals, which emphasizes good health and well-being and supports efforts to improve access to safe, high-quality surgical care.[2] Robotic surgery can contribute to achieving UHC by increasing access to advanced surgical interventions and reducing perioperative morbidity and mortality.

While the initial investment and operational costs of robotic surgery are substantial, often due to longer OR times and higher equipment-related expenses, some studies suggest that the long-term benefits, such as reduced postoperative complications, shorter hospital stays, and quicker return to work may offset these costs and support overall health system sustainability.[6] However, evidence remains mixed and further research is needed to determine whether these benefits translate to low hospitalization costs for patients. For more information on the cost of robotic surgery, see the cover story in this issue, "Cost of Robotic Surgery Remains Complex Equation."

Training and Capacity Building

Robotic surgery necessitates specialized training and continued practice for surgeons, anesthesiologists, nurses, OR staff, and technical teams. Notably, many LMICs face a shortage of a skilled surgical workforce, not limited to robotic surgery. LCoGS has set a target of achieving a minimum SAO density of 20 per 100,000 population by 2030 for adequate access to surgical care. More than 808,000 SAO healthcare providers need to

be trained by 2030 to reach this density.[2] It is critical to first develop an adequate surgical workforce that provides essential, safe, comprehensive care to support training in minimally invasive surgery.

Following the development of an adequate surgical workforce, future hurdles include a lack of structured fellowships, mentorship, and exposure to minimally invasive surgical techniques. This diminished exposure contributes to the continuing gap in implementing robotic surgery programs. Fortunately, middle-income countries in Latin America and India are developing solutions to the unique hurdles healthcare systems face in resource-limited settings. Brazil has 2,500 da Vinci-trained surgeons and a national accreditation program due to industry partnerships, while surgeons practicing in India may seek out robotic surgery fellowships through a philanthropic platform, the Vattikuti Foundation.

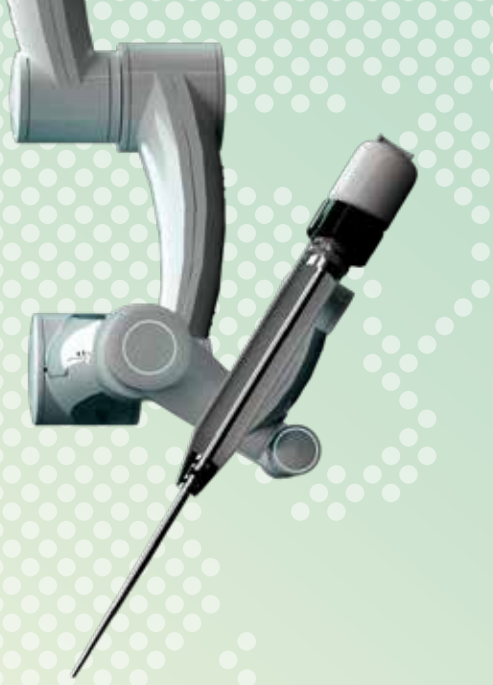
Virtual reality (VR) surgical training and remote-controlled robotics systems are technological solutions that may address some of these training-related hurdles. The Eyesi surgical simulator is a VR training platform that is intended to accelerate surgeon proficiency and reduce operative times. Remote-control systems show promise in expanding access to surgical care and supervised robotic surgery training in underserved regions, potentially reducing travel-related logistical and financial burdens.

Barriers to Widespread Implementation

Additional challenges impeding enhanced adoption of this technology include infrastructure gaps, high costs, and a lack of institutional support. An estimated $1 million–$1.5 million is necessary to implement a robotic platform in the US, with expenditures averaging $4,000 per procedure.[6] These costs encompass the initial purchase, maintenance, and the supply of specialized instruments. Individual institutions routinely bear the financial burden owing to a lack of government funding.

Insurance coverage can also hinder widespread adoption. For instance, while robotic-assisted surgery was introduced in Japan in 2009, many procedures were not covered until 2018.[7]

A prevalent barrier for many healthcare facilities in LMICs and rural settings within high-income countries (HICs) is the inconsistency in basic infrastructural elements, such as reliable power supply, advanced imaging facilities, and high-speed internet connectivity for potential telemedicine applications,



Emerging technologies hold significant promise in making robotic surgery more accessible, particularly in LMICs and rural areas.

posing significant constraints for adopting a unified robotic surgical system and training. Health policy initiatives and industry collaboration may ease some of these challenges.

In many LMICs and rural HICs, access to the technical support necessary to implement and maintain robotics systems is limited. For example, the first robotic surgery platform in Pakistan was rendered dysfunctional soon after installation until an improved platform was installed 2 years later.[8]

Data regarding quality control, cost-effectiveness, and overall outcomes in LMICs are lacking, and extrapolation from the HIC data may not be appropriate for this setting. Addressing these technological gaps is crucial for successfully adopting robotic surgery in these settings.

Legal and Regulatory Framework

The European Union, the FDA, and Japan classify robotics systems as medical devices. At the same time, in other countries, such as Indonesia, this technology is unregulated with healthcare institutions making decisions without legal directives from the government. Regulatory bodies may approve robotic surgery systems, but their application and prerequisite training are left to surgeons, healthcare institutions, and manufacturers.

While the companies that manufacture these devices provide some quality assurance and benefits for approved uses, robotics systems are also used for unapproved indications. Policymakers in several industrialized nations seek to implement more stringent oversight of emerging technology, especially given its increasing autonomous capabilities. Autonomous surgical robots have demonstrated proficiency in phlebotomy, bowel anastomosis, and knee replacement surgery, among other procedures.[9] These applications remain in the experimental phase for now but risks to patient safety and other concerns must be considered to preempt misuse.

One proposal is to define six levels of autonomy to distinguish various categories of medical devices and establish unique risks and, thereby, regulations required for each. Another consideration is requiring specialized robotics training for surgeons before performing robotic surgery on patients. As surgical robots continue to reside within a legal and regulatory gray area, the benefits and drawbacks of additional regulations that may hinder scientific advancement are unclear.

Financial Support and Funding Initiatives

Historically, surgery has been significantly underfunded within the broader context of global health, receiving limited attention compared to other health concerns such as maternal and child health and infectious diseases.

A significant step was taken in 2020, when policymakers directed the US Agency for International Development (USAID) funding toward global surgery programs, signaling a financial commitment to addressing surgical disparities and responding to a growing public health need. This move reflects a pivotal shift in funding priorities and firmly establishes surgery as a key component of global health agendas.

However, comprehensive estimates of these financial investments are challenging to quantify, as funding allocations often flow through multiple channels. A systematic analysis

Equitable access remains a significant concern worldwide as robotics systems are predominantly concentrated in high-income, urban settings, widening the global healthcare gap.

indicated that multilateral organizations like the World Health Organization and USAID collectively disbursed approximately 31% of total health development assistance worldwide, including nonsurgical disciplines.[10] Shifting funding priorities may lead to significant impact on the accessibility of surgical services, and could hinder innovative advancements, including broader access to robotic surgery platforms.

Emerging Innovations and Advancement

Emerging technologies hold significant promise in making robotic surgery more accessible, particularly in LMICs and rural areas.

Efforts are underway to develop more affordable and modular robotics systems, such as India's locally developed SSi Mantra platform, explicitly designed to reduce acquisition and operational costs compared with existing platforms.[3] Integrating artificial intelligence (AI) into robotic surgical systems, such as the SSi Mantra platform, offers opportunities to support intraoperative decision-making, precision, and overall surgical performance, ultimately aiming to reduce complications and improve patient outcomes. AI-driven algorithms can support surgeons by providing real-time analytics and guidance, which is valuable in resource-constrained settings.

Telesurgery and remote tele-proctoring technologies offer promising solutions to bridge geographical and logistical barriers by enabling experienced surgeons to operate remotely and mentor and train surgeons with limited robotics experience, thereby extending robotic surgical expertise to underserved regions. However, successfully implementing this technology requires robust telecommunication networks, stable sources of electricity, and technical support to realize their full potential. These innovations represent advancements toward achieving equitable, scalable, high-quality surgical care worldwide.

Ethical Considerations

Equitable access remains a significant concern worldwide as robotics systems are predominantly concentrated in high-income, urban settings, widening the global healthcare gap. Bridging this divide requires intentional efforts in equitable distribution of this technology and expanded infrastructure development. Health systems also must critically assess the cost-effectiveness of robotics platforms, as their high acquisition and maintenance costs may not be justifiable in all contexts.

In deciding between robotic-assisted surgery and conventional surgical options, patient autonomy and informed consent are important considerations. Patients should be informed about the nature of robotic assistance, including potential risks, benefits, alternatives, and the surgeon's experience, to ensure ethical, transparent, and patient-centered care. Misconceptions regarding robotic surgery should be clarified, as many patients may mistakenly assume this approach to be superior to traditional surgical approaches in all indications.

Financial incentives may encourage inappropriate use of robotic surgery in instances where it is not indicated and offers minimal advantages. Prioritizing the acquisition of robotics systems in regions without access to laparoscopic surgery and other vital resources may represent an inappropriate use of financial resources, leading to suboptimal patient outcomes. Ethical and sustainable adoption of robotics systems requires evaluation of local needs and capabilities to ensure this technology serves

patients and does not come at the cost of broader surgical access.

Robotic-assisted surgery is an advancement in modern medicine and minimally invasive surgery, offering improved surgical precision, patient outcomes, and ergonomics. However, global implementation and adoption remain variable, with significant infrastructure, training, and funding barriers, especially in low-resource settings. Efforts to close these gaps through capacity building, regulatory frameworks, and emerging technologies such as AI and telesurgery may address some of these barriers. Investment in robotic surgery in the global surgery context must be considered in light of existing unmet needs to ensure optimal population-level outcomes. B

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TEAM COURSE

Standardizes Early Trauma Response Across Borders, Settings

Mayur Narayan, MD, MPH, MBA, MHPE, FACS
Divya Kewalramani, MD
Olivia Grierson

Traumatic injury remains one of the world's most formidable public health challenges, primarily because it typically occurs far from trauma centers.

WITH THIS GAP IN CARE IN MIND, the ACS developed the Trauma Evaluation and Management (TEAM)™ course in 2016 to equip novice trauma providers and healthcare professional students with a structured, hands-on introduction to the initial evaluation and early management of trauma-related injuries.

The recent launch of the TEAM 4th Edition helped advance this training with uncommon speed—from planning tables to packed skills labs—through coordinated launches in the US, India, Pakistan, Italy, Brazil, Colombia, Rwanda, and Ethiopia. Additional training is scheduled this year.

Notably, new adopters of the TEAM course often tout how accessible—and transformative—the content is in describing the fundamental principles of early stage trauma care, particularly during the "golden hour" (the hour after injury). Unfortunately, most novice providers and students encounter trauma care training in fragments—an anatomy lecture here, a shift shadowing the care team in the emergency room there—without a coherent framework to tie it all together.

The TEAM course features a structured, team-based approach that anchors learners in an algorithmic injury assessment (with early hemorrhage control at the forefront), reinforces safe, efficient handoffs and closed-loop communication, and immerses participants in realistic scenarios that reward calm, ordered thinking over improvisation. As a result, the TEAM course not only provides trauma care knowledge, it also helps bolster the confidence and readiness of medical students, interns, nurses, and other healthcare personnel.

Bridging Theory and Action

Among a vast array of countries and care settings, basic trauma care is delivered unevenly. In many hospitals, especially in low-resource environments, the golden hour is often managed by novice clinicians and healthcare students who have not been instructed on the basics of trauma care in a formal setting. Patients might assume a fully trained member of the trauma team is caring for them, while the reality is some providers are unsure of next steps following the initial assessment.

Dr. Mayur Narayan and residents celebrate the launch of the TEAM 4th Edition while attending the 14th Annual Conference of ISTAC in Lucknow UP, India.

The TEAM course is based on the same principles that underpin the ACS's flagship trauma course—Advanced Trauma Life Support® (ATLS®).

The ATLS course originated from a tragic 1976 plane crash in which the family of orthopaedic surgeon Jim Styner, MD, FACS, was severely injured, revealing inadequate trauma care in rural hospitals. Working with colleagues, Dr. Styner helped develop a standardized approach to trauma care that was introduced in 1978 and formalized as the ATLS program in 1980. Its enduring principles—prioritize

Launching a global educational program requires more than strong content. To be successful, the program necessitates collaboration and attention to logistics, quality, and sustainability.

life threats ("treat first what kills first"), use the xABCDE primary survey based on guidance from ATLS 11 (the latest edition), avoid doing harm while restoring physiology ("damage control" thinking), and communicate in a closed loop, with a common, reproducible language for the golden hour—now span continents.

Whereas ATLS is an extensive, comprehensive curriculum designed for healthcare professionals directly involved in trauma resuscitation (physicians, surgeons, emergency and critical care clinicians, and advanced practice providers), TEAM provides an adaptable, less rigid structure that can be tailored to the needs of the learners with a shared, hands-on framework for rapid evaluation and early management.

TEAM Brazil was launched in August 2025 at Hospital das Clínicas da Faculdade de Medicina da USP at the HCX Fmusp Sim Center in São Paolo.

From Vision to Execution

Launching a global educational program requires more than strong content. To be successful, the program necessitates collaboration and attention to logistics, quality, and sustainability. The implementation playbook emphasizes:

Local champions. When TEAM launched, faculty leads in India, Italy, Brazil, and Pakistan adapted cases, recruited instructors, and secured venues—often across multiple institutions in a city or region. A local champion is essential for successful implementation of the course because they provide sustained, credible leadership. These leaders possess contextual knowledge to adapt TEAM to local needs and are able to navigate institutional barriers and maintain momentum after initial training ends.

Champions serve as trusted peers who can effectively recruit participants, integrate training into daily practice, and ensure skills translate to improved patient care. Their ongoing presence enables

continuous quality improvement, troubleshooting, and reinforcement that transforms a one-time course into lasting change. Without a local champion, even excellent training programs typically fail to achieve sustainable impact.

Contextualization without compromise. Contextualizing trauma training to the local environment is critical for relevance and adoption, as providers are more likely to retain and apply skills when scenarios reflect the injury patterns, resources, and clinical settings they encounter. Adapting case examples to include common local mechanisms of injury (such as motorcycle crashes, agricultural injuries, or violence injury patterns specific to the region), available equipment, and realistic resource constraints makes the training practical rather than aspirational.

This localization can be achieved without compromising educational quality by maintaining core principles and evidence-based protocols while adjusting the delivery methods, examples, and problem-solving strategies to match local capacity. The TEAM course preserves the fundamental trauma management competencies—initial control of exsanguinating hemorrhage, airway, breathing, circulation, and systematic assessment—while ensuring participants leave confident in their ability to implement these skills with the tools and support systems available in their actual practice environment.

Low-barrier setup. At present, the ACS does not charge a fee for TEAM courses being offered outside of the US and Canada, (and a very nominal fee of $5 per learner in the US and Canada) removing the primary financial barriers that could otherwise prevent many novice providers from accessing lifesaving education. Course fees create inequitable access where those who need training most—providers in under-resourced facilities with high trauma burdens—are typically least able to afford it, perpetuating disparities in trauma care quality and outcomes.

Olivia Grierson, Program Manager, ACS Trauma Education, presents the TEAM 4th Edition program to nursing students and medical students at Shri Ram Murti Smarak Institute of Medical Sciences in Bareilly UP, India.

Representatives from ISTAC/King George Medical University receive the TEAM manual as a gift in Lucknow UP, India.

By eliminating cost as a barrier, a free course enables widespread dissemination across entire regions and allows institutions to train all relevant staff rather than select individuals. Providing a cost-free course also demonstrates a commitment to capacity-building rather than profit, which increases local buy-in, trust, and the likelihood that trained providers will subsequently teach others and expand the program's reach organically.

Limited instructors also have proved to be a barrier in the dissemination of trauma education and to bridge this gap, the TEAM model allows any ATLS-verified student or instructor to teach a TEAM course, and any ATLS-verified instructor to serve as the TEAM course director.

Rapid feedback loops. Brief pre- and post-assessments and structured debriefs generate real-time

Global Momentum for TEAM 4th Edition

US Military: The Alpha Surgical Company, 1st Medical Battalion participated in a TEAM course as part of their monthly Battalion Day exercise in spring 2025. Approximately 250 sailors and Navy officers, including corpsmen, nurses, physician assistants, and physicians successfully completed the course. The positive feedback indicated that the course provided a "level playing field" to build upon as the Battalion prepares for combat casualty care.

India: TEAM India was launched in November 2024 at TRAUMA 2024, the 14th Annual Conference of the Indian Society for Trauma & Acute Care (ISTAC) held at King George's Medical University in Lucknow, India. Local champions, including Sandeep Tewari, MD, chief of trauma at King George's Medical University, Madhur Uniyal, MD, from All India Institute of Medical Sciences Rishikesh, and Sandeep Sahu, MD, from Sanjay Gandhi Postgraduate Institute of Medical Sciences, led the launch.

Pakistan: TEAM Pakistan was launched in February 2025 at the Shaheed Mohtarma Benazir Bhutto Institute (SMBB-IT) in Karachi, Pakistan. Local champions, including Sabir Memon, MD, SMBB-IT executive director, and Qurratulain Tahir, MD, consultant general surgeon and administrator in charge of the emergency department, led the launch.

Italy: TEAM Italy was launched in June 2025 at the University of Catanzaro in Italy. Local champions included ACS Italy Chapter President Guiseppe Nigri, MD, FACS, Società Italiana di Chirurgia d'Urgenza e del Trauma President Andrea Mingoli, MD, FACS, Antonia Rizzuto, MD, Federico Longhini, MD, Biagio Ravo, MD, FACS, Giovanna Sgarzini, MD, and Diego Mariani, MD.

Brazil: TEAM Brazil was launched in August 2025 at the Hospital das Clínicas da Faculdade de Medicina da USP at the HCX Fmusp (Sim Center). Local champions included Brazilian Committee on Trauma Chair Rodrigo Vaz Ferreira, MD, PhD, FACS, Vice Chair Juliana Mynssen, MD, FACS, and Newton Djin Mori, MD, FACS, surgeon at Hospital das Clínicas da Faculdade de Medicina FMUSP and a major contributor to the development of earlier editions of the TEAM course.

improvements to station flow, timing, and case mix. Simple metrics (i.e., knowledge items, confidence scales, observed primary survey adherence) allow faculty to reiterate key points and track gains over successive cohorts.

Learner Feedback

Evaluation data and open-ended feedback from students and faculty from early adopters of the TEAM course were uniformly positive. Learners described feeling "less overwhelmed," "more purposeful," and "able to organize the chaos." Faculty noticed cleaner team communication and more disciplined primary surveys in subsequent clinical encounters. Follow-up sessions were requested, and members of the ACS Committee on Trauma are planning a return to India later this year to launch TEAM in additional medical schools and build instructor capacity.

Other institutions began exploring where TEAM could live longitudinally—as part of a medical school curriculum, incorporated into early residency program training, and/or as part of hospital or clinic staff development.

Next Steps

The next phase of the TEAM course rollout will focus on infrastructure and scale.

The heart of TEAM is not a binder or a slide deck—it is a community of educators committed to giving learners a safe, structured on-ramp to trauma care. The successful 4th edition launches in the US, India, Pakistan, Italy, and Brazil demonstrated that the model travels well. With modest resources, clearly defined roles, and a focus on fundamentals, schools can offer a course that students appreciate, faculty value, and healthcare systems embrace.

If you are interested in implementing the TEAM course or would like additional information, contact traumaeducation@facs.org, or visit the ACS TEAM page on *facs.org*.

Dr. Mayur Narayan *is the trauma medical director, chief of the Division of Acute Care Surgery, and program director of the Acute Care Surgery Fellowship at Rutgers Robert Wood Johnson Medical School in New Brunswick, NJ. He also serves as executive director of the Rutgers Acute Care Surgery Research Lab and is the primary author of TEAM 4th Edition.*

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This arrangement with the ABS and ACCME is phase one; the ACS is also working on autotransfer protocols with other surgical boards. Stay tuned!

facs.org/mycme

Dr. Randi Smith

Trauma Recovery Can Be Supported by "Food as Medicine" Interventions

Randi N. Smith, MD, MPH, FACS
Keneeshia Williams, MD, FACS
Amber Hannah, MD
Christine Castater, MD, MBA, FACS

VIOLENCE CONTINUES to be a major contributor to global morbidity and mortality, disproportionately affecting individuals from socioeconomically disadvantaged backgrounds. Increasingly, research points to the profound influence of social drivers of health, such as poverty, unstable housing, and food insecurity, on trauma outcomes and recovery.[1,2]

Food insecurity, defined by the US Department of Agriculture (USDA) as limited or uncertain access to sufficient and nutritious food, is an especially critical and highly modifiable factor that can adversely affect wound healing, immune response, medication adherence, and long-term recovery after injury.[2,3] Food insecurity also has been associated with increased incidence of gun violence.[2]

This article aims to elevate awareness of food insecurity as a critical yet often overlooked determinant of trauma recovery and reinjury prevention. By advocating for the integration of food-based interventions into trauma care pathways, we highlight an attainable opportunity to improve outcomes for injured patients.

Link Between Food Insecurity and Violence

In 2023, nearly 47,000 firearm-related deaths occurred in the US, according to the Centers for Disease Control and Prevention. That same year, 13.5% of American households experienced food insecurity with the highest rates concentrated in southern states.[1]

The populations most affected by food insecurity and firearm violence overlap significantly. Emerging evidence underscores this connection. Research has

shown a significantly positive correlation between food insecurity and firearm injury and mortality, respectively.[2,3]

High food insecurity is independently associated with patients having more severe injuries, Level I trauma activations, and having higher risk of death from firearm-related injuries.[2] To put this in perspective, for each 1% increase in food insecurity, firearm injury rates increase by an estimated 56 cases per 100,000.[2] This association remains on a granular level in our cities and even specific zip codes.[3]

National data corroborate the findings of our local community in Atlanta, Georgia, yet our center's demographics add more context. At Grady Hospital, Atlanta's only Level I trauma center and one of the busiest trauma centers in the nation, patients reported experiencing food insecurity four times as often as the general Atlanta public.[4]

Of the 1,700 patients studied by Smith and colleagues, firearm injury was highest in five major ZIP codes of the city, with three of the five demonstrating the highest food insecurity rates and two out of five without vehicular access.[4]

Not only is firearm injury associated with violent injury, but these injuries are occurring in the most vulnerable populations, both stratified by their local communities—especially those with high stress and low-income levels.[4] The relationship between the social drivers of food insecurity is complex, but highlights the need for validated tools to identify when food insecurity is significant in our patient populations. Thus, our understanding of the intersection between violence and food insecurity must be matched by the prevalence and precision of screening, especially in victims of firearm injury.

Consequences of Food Insecurity

Food insecurity impacts social constructs while also having profound consequences for both healthcare systems and patients. The psychosocial and physical health effects of food insecurity often begin in childhood.

Food insecurity directly affects healthcare because it is associated with more frequent emergency department visits, delayed care, and decreased access to prescription drugs.

Poor nutrition in early life can lead to impaired cognitive development, anxiety, and poor academic performance. When food insecurity persists into adulthood, it is tied to an increased likelihood of hypertension, prediabetes, functional limitations, and impaired immune function.[5]

Mental health also is significantly and negatively impacted. Studies show both poor mental health assessment scores and elevated depression rates in individuals experiencing food insecurity.

Food insecurity directly affects healthcare because it is associated with more frequent emergency department visits, delayed care, and decreased access to prescription drugs.[6] These trends are likely related to higher rates of financial hardship by this patient population prior to engaging with the medical system.

Ehsan and colleagues further characterized the impact of food insecurity on trauma patients, noting longer hospital stays and an increase in subsequent medical complications at 1 month and 3 months postoperatively.

Screening for Food Insecurity in Trauma Patients

Screening for social drivers of health is not only necessary, it is required. The Centers for Medicare & Medicaid Services mandates that healthcare systems screen for food insecurity, interpersonal safety, housing instability, transportation needs,

and difficulties with utilities to accommodate basic patient needs. Screening for all social drivers can be difficult, but screening for food insecurity remains particularly challenging. Although multiple validated food insecurity screening tools exist, the Hunger Vital Signs is widely known and accepted.

There is robust literature describing the assessment of food insecurity in pediatric emergency department settings, but significantly less in adult populations. In hospitals that use a complete social determinants screener, however, food insecurity is most often screened (88.2%), and there are programs in place once needs are identified (83.8%).[7]

Studies that have trialed adult emergency department screening show that patients are receptive to receiving assistance but follow-through with interventions such as food vouchers is limited.[8] There also is no consistency in the setting of screening or the administrator of the screening.

These challenges beget the question: how and when can vulnerable populations, such as trauma patients, be effectively screened to not just identify need but ethically and successfully provide resources once food insecurity is identified?

Food as Medicine: A Model for Trauma Recovery

A growing body of literature supports the clinical integration of food-as-medicine initiatives to improve outcomes in high-risk populations.

In a randomized clinical trial, researchers demonstrated that an intensive food-as-medicine program, providing medically tailored meals and nutrition counseling, led to improved biometric health indicators as well as reduced inpatient admissions and emergency department visits among patients with chronic disease.[9] These findings underscore the potential for nutrition interventions to not only improve health status but also reduce healthcare use.

Evidence also suggests that nutrition-based interventions can be highly engaging, particularly within safety-net settings. Researchers evaluated a food-as-medicine pilot program at a large safety-net hospital in the southeastern US, showing that the program successfully engaged racially and socioeconomically diverse participants, many of whom experienced high levels of food insecurity and chronic illness.[10] Participants reported improvements in dietary habits and appreciated the culturally tailored, community-based approach to nutrition support.

Beyond clinical and educational settings, community-based interventions also are gaining traction. One such intervention is the Healthy Food Centers program, launched by Allegheny Health Network in western Pennsylvania, which empowers patients and addresses root causes of poor health with food insecurity interventions such as "produce prescriptions," cooking classes, and one-on-one nutrition support.[11]

Similarly, another study reported that during the COVID-19 pandemic, federally qualified health centers successfully implemented produce-prescription programs and group medical visits to deliver nutrition support despite strained societal and clinical conditions.[12]

Importantly, the framing of food as medicine continues to evolve. Food is not merely a therapeutic intervention, it also is deeply tied to identity, culture, autonomy, and dignity. Effective food interventions must go beyond clinical metrics to consider the broader social context in which patients live and heal. The Food as Medicine initiative at our hospital has

Hunger Vital Signs Screening Tool

1. **Within the past 12 months, we worried about whether our food would run out before we got money to buy more.**
2. **Within the past 12 months, the food we bought just didn't last, and we didn't have money to get more.**

Trauma surgeons, who frequently serve as early points of contact for medically and socially complex injured patients, are uniquely positioned to screen for food insecurity and connect patients with resources.

made strides to make food a necessity in holistic care. Institutional buy-in on the importance of mitigating food insecurity has provided a framework for trauma recovery. Linking hospital-based violence intervention programs with Food as Medicine initiatives, for example, creates a synergistic model that addresses food insecurity as a critical social driver of health while simultaneously promoting safety, healing, and long-term well-being. For instance, our hospital-based violence intervention program provides supermarket gift cards to those noting food security struggles, halting one of the many factors that can be a barrier to their road to recovery. Highlighting the importance of food safety is a necessity for trauma patients and other at-risk demographics.

Trauma surgeons, who frequently serve as early points of contact for medically and socially complex injured patients, are uniquely positioned to screen for food insecurity and connect patients with resources. While screening is mandated for our patients, our system is imperfect and deserves review. Optimizing this system helps us broaden our scope of practice in caring for patients. We urge surgeons to advocate for institutional support and increased resources to sustain and expand Food as Medicine programs for nontraditional populations such as those who are violently injured.

Disclaimer

The thoughts and opinions expressed in this column are solely those of the authors and do not necessarily reflect those of the ACS.

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Dr. Stephen Gondek

ASSET Course Advances Trauma Care in Sub-Saharan Africa

Stephen P. Gondek, MD, MPH, FACS
Leahcaren Oundoh, MD
Allan Peetz, MD, MPH, FACS
Richard Davis, MD, FACS

The ACS Advanced Surgical Skills for Exposure in Trauma (ASSET®) course, held for the first time in sub-Saharan Africa in July 2025, was a pivotal first step toward sustainable trauma care and local surgeon educator development.

THIS WAS MORE THAN A training session—it was the start of a long-term strategy to strengthen trauma care capacity and create a sustainable pipeline of surgical educators in that area of the world.

Why ASSET Matters in Africa

Trauma is a leading cause of death globally, and the burden is particularly heavy in East Africa. According to the World Health Organization, traumatic injuries are consistently a top 10 cause of death and disability-adjusted life years in the region. Surgeons have limited access to resources and few opportunities for structured trauma operative training; yet, they must care for patients with complex injuries. The ASSET course addresses this educational gap by teaching critical exposure techniques for managing vascular and visceral injuries—skills that can mean the difference between life and death.

The Nairobi Surgical Skills Centre (NSSC) hosted the ASSET course, led by Rich Davis, MD, FACS, in partnership with Vanderbilt Surgery's Global Health Program and AIC Kijabe Hospital in Kenya. Supporting faculty members included Lydia Lam, MD, FACS, Peep Talving, MD, FACS, Christopher Dodgion, MD, MSPH, MBA, FACS, and Stephen P. Gondek, MD, MPH, FACS.

The NSSC is a premier facility for surgical education in East Africa that provides an ideal venue for cadaver-based training. Participants included senior surgical residents and junior faculty from across Kenya and neighboring countries, creating a dynamic, multidisciplinary learning environment.

2-Day Course with Purpose

The course was structured over 2 days: Day 1 delivered the standard ASSET curriculum to a cohort of senior residents and early career faculty, while Day 2 transitioned selected participants into instructor candidates, giving them hands-on teaching experience under faculty supervision. A total of 16 surgeons and surgeons in training were able to complete the

Faculty and participants gathered at the Nairobi Surgical Skills Centre for the inaugural ASSET course.

What Is ASSET?

Program
ACS Advanced Surgical Skills for Exposure in Trauma (ASSET®)

Purpose
Train surgeons to achieve rapid, safe exposure of major blood vessels and organs during trauma surgery

Training method
Cadaver-based, hands-on instruction

Focus
Techniques rarely encountered in elective surgery but are lifesaving in trauma

Why it's critical
Provides essential skills for surgeons working in regions with high trauma burden and limited subspecialty support, helping improve survival and outcomes

course, and two new instructors were trained.

This approach reflects a guiding principle: sustainability through local ownership. Rather than a one-off event, the course was designed as the first step in a multiyear plan to establish a self-sustaining ASSET program in East Africa.

The ultimate goal is ambitious yet achievable: by spring 2026, a follow-up course will return to the region to elevate these instructor candidates to course directors, enabling the program to run entirely with local leadership. This model—train, mentor, transition—ensures that ASSET becomes embedded in the region's surgical education ecosystem rather than dependent on external faculty.

Lessons Learned and Early Impact

Feedback from participants was overwhelmingly positive. Many cited the cadaver-based format as a rare and invaluable opportunity to practice complex exposures in a controlled environment. Faculty noted the enthusiasm and technical aptitude of learners, reinforcing the belief that local surgeons are ready to lead this effort.

"The ASSET course transformed the way I approach trauma surgery by bridging the gap between theory and real-world application," shared participant

ASSET is more than a course—it's a commitment to equity in surgical education.

Leahcaren Oundoh, MD. "It strengthened my confidence in vascular exposure and organ-specific approaches, and I now feel comfortable operating in the abdominal, thoracic, pelvic, and neck compartments since the training—skills I've already applied successfully in several trauma cases."

Key takeaways for future iterations of this structured course include early engagement with institutional partners to streamline logistics and cadaver procurement; clear pathways for instructor development, including mentorship and remote support between courses; and integration with national surgical societies to align ASSET with broader workforce development goals.

While international course production did present unique challenges, an experienced group of faculty, engaged students, and a robust curriculum made for an effective delivery of the content.

This initiative reflects the commitment of the ACS and its Committee on Trauma to global healthcare equity and surgical education. ASSET is more than a course—it's a commitment to equity in surgical education. By investing in local capacity, the ACS and its collaborators are helping to close the gap in trauma care outcomes between high-resource and resource-limited settings throughout the world. The ripple effect is profound: every surgeon trained in ASSET becomes a multiplier, training other surgeons in their area and improving care for countless patients across the region.

Looking Ahead

The next locally led ASSET course is planned for this year, with specific instructor candidates advancing as course directors. Until then, faculty and candidates will remain connected through virtual mentorship and shared resources, ensuring momentum continues.

"Trauma is truly an undertreated disease in this part of the world," said Dr. Davis. "ASSET training is only one part of the puzzle. We also need improvement in prehospital care, systems, and the capacity of the hospitals themselves. The spark to make these improvements will come from these young African surgeons themselves. It's a joy to help them develop their interest in the field of trauma surgery."

Instructor candidates lead exposure techniques under the supervision of Drs. Lydia Lam and Peep Talving.

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Dr. Jeffrey Matthews

Dr. John Olson Jr.

New Training Pathway Charts Future for Surgeon-Scientists

Jeffrey B. Matthews, MD, FACS
John A. Olson Jr., MD, PHD, FACS

The Blue Ribbon Committee II (BRC II), a joint initiative by the ACS, American Surgical Association, and American Board of Surgery, examined critical issues related to surgical education and published key recommendations in October 2024.*

ONE RECOMMENDATION in particular was aimed at strengthening the pipeline of surgeon-scientists.[†] This recommendation was proposed by the BRC II Research Subcommittee, chaired by Jeffrey B. Matthews, MD, FACS (coauthor of this article), and Mary T. Hawn, MD, MPH, FACS.

Pilot Begins This Match Cycle

As a result, a pilot project to establish a formal surgeon-scientist training pathway (SSTP) within surgical residencies will launch in the 2026–2027 Match cycle; interested program administrators from all surgical subspecialties are encouraged to enlist in this effort.

The contributions of surgeon-scientists to the betterment of humanity are legion. However, despite significant evolution in the way scientific research is conducted, the process of developing surgeon-scientists has remained static for decades. Today, aspiring young physician-scientists may view the technical demands of surgical training to be incompatible with a research-oriented career. Indeed, many exceptional candidates are actively discouraged by medical school advisors from even considering surgery as a field.

Traditionally, surgical residents who are interested in basic, translational, and health services research careers take a 1- to 2-year hiatus in the middle of residency for a mentored laboratory experience, during which time clinical activity is minimal. Residents then rejoin the demanding final clinical years of training where little engagement in research is feasible.

It is generally agreed that a 2-year mentored laboratory experience is no longer adequate preparation given today's complex research landscape and highly competitive funding environment. Moreover, this "start-stop" approach does not teach the trainee the key time management skill of integrating investigative work and clinical practice. With their first academic post still 4–6 years away (after fellowship), research-oriented trainees find themselves at a significant disadvantage amidst rapidly evolving scientific questions and methods.

Several research-intensive departments of surgery have sought innovative ways to better cultivate research-oriented residents in an effort to more formally integrate clinical and research experiences throughout the continuum of residency training. Some programs provide trainees blocks of time during the clinical residency to pursue mentored research and schedule time for them to remain engaged clinically during the academic development period.

The new SSTP pilot leverages the collective efforts for maximal impact: sharing best practices, creating common expectations for trainees and programs, and increasing awareness of the continued viability of a surgeon-scientist career.

This joint approach is analogous to existing physician-scientist training pathways in internal medicine and pediatrics. The process involves creating a separate, matchable "track" for aspiring surgeon-scientists to enter directly from medical school. This track leverages the National Resident Matching Program "reversion" mechanism where any unfilled slot in the surgeon-scientist track would automatically revert to the regular categorical track so that program positions are not at risk.

The envisioned SSTP track provides a more robust longitudinal "post-doc" fellowship experience, in addition to the traditional 2-year professional development options. The program is designed to better position surgeon-scientists to compete for subsequent independent funding such as National Institutes of Health K-type or R-type awards or extramural funding. Though yet unproven, the rationale behind this approach is to better prepare trainees for success as surgeon-scientists.

Programs are expected to provide a well-developed training infrastructure, mentors, institutional commitment, and a high-quality research environment. Mentors for

Proposed Timeline for Integrated Clinical and Research Training

Years 1-3 Early Clinical Training	Years 4-5 Research Phase	Years 6-7 Final Clinical Training
· Solidify mentorship team · Participate in lab meetings · Develop/submit F32 proposal · Complete Responsible Conduct of Research training	· Full-time research · Optional masters or PhD · Continued mentorship engagement	· Resume clinical training while sustaining research effort · Departmental support for research continuity and grant submission (K08, K99/R00 or R01)

trainees would include a multidisciplinary team, such as a scientific mentor, surgical mentor, programmatic leadership, and research advisory council.

5+2 Model

A categorical general surgery SSTP would follow a 5+2 structure, with 5 years of clinical training and 2 years of research time. Unlike current 5+2 models, the structure also would allow for continued research involvement during clinical training, especially during the final years so trainees remain engaged in research activities in tandem with their clinical education. This model also allows for individual paths based on the need for an additional research year, specialization, fellowship, and faculty role preparation.

A key innovation of the pilot project is the intention to better integrate these designated surgical residents into the broader community of physician-scientists and surgeon-scientists. Participants in the SSTP track will be expected to engage through institutional offices for physician-scientist development, as well as participate in focused sessions at national meetings such as the ACS Clinical Congress, Academic Surgical Congress, and American Society for Clinical Investigation/Alliance for Academic Internal Medicine/Burroughs Wellcome Fund Physician-Scientist Pathways Workshop.

Salary support will be provided through departmental or hospital funding with some limited clinical call obligations. Institutional training grants and individual career development awards are encouraged to provide additional sustainable funding avenues.

Participant data also will be collected to evaluate the success of the pilot. Key performance indicators will include published articles, career paths (including retention in the program), board pass rates, fellowship matches, types of jobs obtained, and ability to secure independent funding.

Join the Pilot

As noted, the formal launch of this SSTP track is planned for the 2026-2027 Match cycle. The BRC II invites all interested institutions to participate in the pilot. Profiles of participating programs will be made available online and promotion to medical schools will be part of the pilot. Learn more at *facs.org/sstp*. Contact SSTP@facs.org for additional information.

Disclaimer

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ACS AMERICAN COLLEGE OF SURGEONS

Black Surgeons "Bind Up the Nation's Wounds" in US Civil War

Jacob R. Stover, MD

More than 2 million Americans served in the American Civil War. Among them were 14 individuals who were part of the groundbreaking cadre of Black surgeons who served in the Union Army.

THESE SURGEONS were not only trailblazers in military history but also in the areas of medicine and civil rights. Two physicians in particular exemplified the journey and impact of these pioneers: First Lieutenant Alexander T. Augusta, MD, and Major Anderson R. Abbott, MD.

They first met in Canada, before the war, where Dr. Augusta was a practicing physician, having immigrated there after being denied an education in the US. He served as Dr. Abbott's teacher as he became the first Black Canadian-born physician.[1]

As the American Civil War started to escalate, Dr. Augusta lobbied for his commission over several months in 1863, first with the US Department of War and then with President Abraham Lincoln himself, begging for the opportunity to serve his country.[2]

Prior to the Emancipation Proclamation, Black Americans were not permitted to serve during the Civil War as soldiers, let alone physicians. His tenacity would pay off, however, and Dr. Augusta was commissioned as a surgeon in the US Army, becoming the first Black officer in US history.[1]

Confronting Discrimination

Initially assigned to Camp Stanton in Maryland, Dr. Augusta faced immediate scrutiny by his White colleagues and was transferred to the contraband camp located in Camp Baker in Washington, DC, to oversee its hospital known as Freedmen's Hospital.

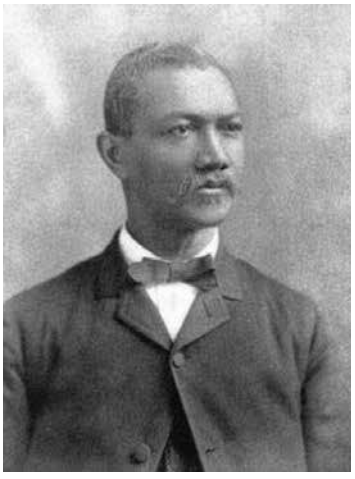
"Contraband" was a term given to slaves who escaped to Union lines, where they formed or were placed in refugee camps called contraband camps and were provided basic amenities and support by the Union government, including healthcare.

Under Dr. Augusta's leadership as the first Black hospital administrator, Freedmen's Hospital served as a nexus for Black surgeons, and it was there he was joined by Dr. Abbott and several other Black surgeons to tend to the camp's growing population.[1-3]

Their tasks ranged from treating wounds sustained while fleeing Confederate forces and managing outbreaks to training members of the camp to act as nurses and orderlies.[1,2] Given their unique position in the Union Army, it is no surprise that their activities extended beyond healthcare to include civil rights during their time at Freedmen's.

Both surgeons found themselves embroiled in the push for civil rights and equality while in DC, despite facing scrutiny, discrimination, and violence. Almost 100 years prior to Rosa Parks, Dr. Augusta, dressed in his Army uniform, was forced off a city streetcar into the rain when he refused to relinquish his seat and move to the uncovered section for Black passengers.

After arriving at his meeting both late and soaking wet, he reached out to his allies within the government, including Senator Charles Sumner of Massachusetts.



First Lieutenant Alexander T. Augusta, MD

Both surgeons found themselves embroiled in the push for civil rights and equality while in DC, despite facing scrutiny, discrimination, and violence.

The lives of Drs. Alexander Augusta and Anderson Abbott embodied both the challenges and significance of Black surgeons in the American Civil War.

Major Anderson R. Abbott, MD

Within a year, legislation was passed desegregating all DC streetcars in 1865, an early step in the civil rights movement.

Another watershed moment in the quest for civil rights: achieving pay equity for Black soldiers. Dr. Abbott and several other Black soldiers successfully lobbied the US Congress to provide equal pay for all in 1864.[2]

Despite these victories and sharing the same uniform, many White doctors and nurses continued to refuse to work with Black surgeons. Both Drs. Augusta and Abbott faced race-related violence during their time at Freedmen's: Dr. Augusta was attacked by a mob that required armed guards to escape, and Dr. Abbott was assaulted one night while walking through town.[2,4] Nevertheless they stayed in DC, treating patients and advocating for equality.

The two surgeons leveraged their trailblazing status within the capital to network with important politicians, including Senator Sumner, who were instrumental in aiding their efforts. The physicians even gained the attention of President Lincoln, who invited

Dr. Alexander Augusta was the first Black officer-rank soldier buried at Arlington National Cemetery.

them to an evening reception at the White House.

In their finest dress uniforms, laced with gold braid and bullion, both men struck an impressive image. Here were two highly educated Black American officers in uniform, conversing with the most powerful figures in the country. They were reportedly the talk of the evening amongst partygoers, but not all the conversation was positive.

One perplexed onlooker was Robert Todd Lincoln, the son of President Lincoln, who asked his father if he was to "allow this innovation" of Black officers in the White House. President Lincoln simply replied: "Why not?"

Dr. Abbott would go on to develop a close relationship with the Lincolns during his tenure at Freedmen's Hospital, and he helped care for the President after he was mortally wounded in April 1965.[3,4]

Enduring Influence

Following the war, Dr. Abbott returned to Canada, where he lived a polymath's life, writing and speaking on many subjects, in addition to practicing medicine as the first Black coroner for Kent County, Ontario, in 1874. He returned to the US briefly to help surgeon Daniel Hale Williams, MD, establish Provident Hospital, in Chicago, Illinois, before returning to Canada, where he died in 1913.

Dr. Augusta would eventually be transferred from Freedmen's, with Dr. Abbott assuming the mantle of leadership prior to the war's end.[2] Dr. Augusta would achieve the rank of lieutenant colonel before mustering out from the Army in 1866, and he returned to Freedmen's Hospital as the first Black medical faculty member in any US medical college at the newly established Howard University in Washington, DC.

He served selflessly during his tenure, volunteering to forgo his salary when necessary to keep the school open. With his death in 1890, Dr. Augusta achieved one more first: he was the first Black officer buried at Arlington National Cemetery.[1]

The lives of Drs. Alexander Augusta and Anderson Abbott embodied both the challenges and significance of Black surgeons in the American Civil War, and in many ways, they paved the way for future physicians and patients, helping ensure a "new birth of freedom" for the US that is still felt today.

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Rural Hospital Rethinks Pain Management to Protect Seniors from Delirium

Jasdeep Sethi
Zarrah Ling
Lazlow Green
Michael Lisi, MD, FACS

A 68-year-old patient arrived with her family to Collingwood General & Marine Hospital (CGMH) in Ontario, Canada, for a long-expected hip surgery—her family anticipated an easy recovery.

INSTEAD, THE PATIENT WAS BEDBOUND for 3 days in the hospital after the procedure; she was agitated and screaming at her nurses.

The patient was experiencing postoperative delirium, a complication after surgery that causes a temporary loss of awareness affecting thousands of older surgical patients every year. The condition is precipitated by a combination of factors, including the use of pain medications given during hospital admission as well as a patient's cognitive baseline going into surgery. Postoperative delirium can derail rehabilitation, increase the risk of falls, and even lead to death.

Fortunately, surgeons at CGMH are sounding the alarm about this acute condition with strategies that address the problem at its root.

Growing Problem in Rural Hospitals

CGMH is an 84-bed hospital serving 73,000 residents living in the south Georgian Bay community. The hospital offers general surgery, an intensive care unit, and several medical and surgical specialty services.

The surgical team conducted a medication audit reviewing every case of delirium that occurred after surgery at CGMH between 2021 and 2025. Among the 64 patients who developed delirium in this time period, the average age was 82, and the youngest was 56.

The audit identified medications that were used, patients who were at highest risk, and how healthcare provider prescribing behavior may have contributed to the problem.

"We are seeing a greater trend of patients experiencing delirium following their surgery," said Michael Lisi, MD, FACS, chief of staff at CGMH. "Although there are multiple factors that precipitate this condition, we can optimize the right determinants in order to reduce the risk."

In these patients, delirium occurs far more often than after elective procedures and reflects the combined effects of acute injury, surgery, and pre-existing vulnerability—factors commonly encountered in rural hospital admissions.

Typical Patient: Older, Frailer, and Recovering from Hip Surgery

Delirium became increasingly recognized and studied from the late 1970s through the 1990s as diagnostic criteria and clinical awareness improved. It is now well established that delirium is a frequent complication after orthopaedic surgery, particularly following hip fracture repair in older adults. In these patients, delirium occurs far more often than after elective procedures and reflects the combined effects of acute injury, surgery, and pre-existing vulnerability—factors commonly encountered in rural hospital admissions.

"Patients who are older and frail are the ones we have to watch out for," explained Dr. Lisi. "They often come in with dementia, poor kidney function, or chronic illnesses that make them more sensitive to medications and anaesthesia."

As expected, the study showed 58% of the cohort had pre-existing dementia, and 20% had chronic kidney disease, both conditions known to reduce the brain's ability to tolerate surgical stress and sedative medications.

Medication Classes Administered Pre-Delirium

Medication Class	Number of Orders
Opiate agonists	324
Benzodiazepines	51
Prokinetics	44
Analgesic and antipyretic opiate agonists	34
Antidepressants	15
Ethanolamine derivatives	11
Anxiolytic	3
Antipsychotics	2
Antipsychotic; anti-emetic	2
Anticonvulsants	2
General anesthetic	2
Other/unspecified	3

Hard Look at Clinician Prescribing Habits

The most striking finding involved medication use even before delirium began, including benzodiazepines, prokinetics, analgesic and antipyretic opiate agonists, antidepressants, and others.

Hospital records also revealed:

- More than 320 opioid doses were administered before onset of delirium.
- More than 50 benzodiazepine orders were documented.
- Hydromorphone was prescribed frequently, often every 1–3 hours.
- Lorazepam was the most commonly used benzodiazepine, sometimes at high doses.

Opioids and benzodiazepines are standard agents that are prescribed in postoperative care, especially for pain and agitation. But in older adults, these medications carry well-established risks. Both drug classes can cause sedation, disrupt sleep–wake cycles, and interfere with the brain's delicate neurotransmitter systems—creating the perfect environment for delirium to develop.

Typically, healthcare providers are aware of these risks, however in smaller hospitals like CGMH, the default approach is to treat the pain with the necessary medications as it presents.

Ramifications of Postoperative Delirium

While most patients recovered from postoperative delirium, the consequences were often serious. Ten patients died or were transitioned to end-of-life care during the same admission. In nine out of 10 of those patients, there was an existing history of dementia or history of alcohol misuse, two proven predictors of poor delirium outcomes.

Delirium is not simply a transient problem while the patient is in the hospital. This condition may reduce cognitive baseline for these patients even after discharge.

Lessons Learned from Rural Hospitals

Among rural communities, including Collingwood, Meaford, and Owen Sound (in southern Ontario, Canada), surgical patients undergoing significant operations, including hip replacements and emergency surgeries, often require careful selection and monitoring.

While larger tertiary centers often have geriatric teams, including dedicated delirium specialists and sophisticated monitoring tools, smaller hospitals

Delirium is not simply a transient problem while the patient is in the hospital. This condition may reduce cognitive baseline for these patients even after discharge.

rarely have access to these resources. Instead, in these settings, delirium prevention is predicated on simple but resource-intensive strategies:

- Monitoring hydration, pain, and sensory needs
- Frequent mobilization
- Avoiding unnecessary psychoactive medications
- Minimizing night-time disturbances
- Preoperative screening for cognitive impairment

"Preventing delirium in our patients requires a collaborative effort with health staff at every level," said Dr. Lisi.

Shifting Culture from Sedation to Prevention

The audit at CGMH has inspired conversations about improving prescribing habits among clinicians. The findings support what major geriatric guidelines have long recommended: opioids and benzodiazepines should be used cautiously in consideration of a patient's age, frailty, and comorbidities to help avoid placing them at higher risk of delirium.

CGMH administrators are now exploring the following options:

- Reviewing policies for opioid and benzodiazepines medications
- Improving documentation and early recognition of delirium postoperatively
- Developing pain control protocols that minimize the reliance on benzodiazepines
- Offering preoperative cognitive screening for all older adults
- Standardized delirium prevention checklists for nursing staff

There is a new culture shift at CGMH, one that is proactive and driven by data to reduce delirium rates and hospital length of stay.

"This is not just an academic exercise," said Dr. Lisi. "These are real patients whose lives are disrupted by a preventable condition. If we can reduce delirium, even by a small percentage, that is a win for families, staff, and the health system."

The patient mentioned earlier in this article eventually recovered and was safely discharged home, but her daughter said the experience has changed the family's perspective about surgery.

With an aging patient population and challenges related to resource availability in rural and regional health centers, CGMH's medication audit suggests that postoperative delirium is preventable and can be mitigated with collaboration between families, healthcare providers, and supportive healthcare system policy.

Jasdeep Sethi *is a medical intern at Flinders Medical Centre in Adelaide, Australia. His academic interests include general surgery and improving healthcare systems through quality improvement initiatives.*

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ACS AMERICAN COLLEGE OF SURGEONS

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TOP 10

Most-Read *Bulletin* Articles Published in 2025

1

US Healthcare System Is in Crisis

February

2

New 2025 CPT Coding Presents Key Changes for General Surgery, Related Specialties

January

3

Surgeon Shortage Calls for Action

July-August

4

Is Minimally Invasive Surgery at an Inflection Point?

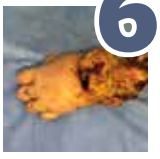
October

5

Surgeons Rethink Abdominal Trauma Playbook

June

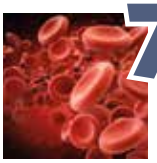
6



Surgeons Handle New and Alarming Pathology—Xylazine Wounds

October

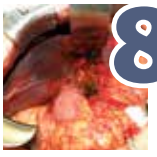
7



Improving Access to Prehospital Blood May Save 10,000 Lives a Year

March

8



Critical View of Safety Minimizes Risk of Bile Duct Injury

May

9

RETHINK SAFETY

Alarming Rise of Workplace Violence Forces Healthcare Workers to Rethink Safety

June

10

Moral Injury: It's More Than Burnout, and It's Taking a Toll on Surgeons

December

Top 2025 *JACS* Articles Signal Patterns of Research Impact

EACH YEAR, the *Journal of the American College of Surgeons (JACS)* publishes a diverse body of work that reflects the priorities, innovations, and challenges shaping surgical care. In 2025, articles published in *JACS* continued to draw strong engagement from readers, further establishing the journal as a forum for forward-looking research.

"For 120 years, the *Journal of the American College of Surgeons* has stood as a pillar of excellence in surgical scholarship. Our mission is rooted in a powerful origin story—one envisioned by our founder, Dr. Franklin Martin, in 1905: to deliver exceptional science for the practicing surgeon in The House of Surgery®. That commitment endures today. This collection of our most-read and most-discussed articles this past year reflects the very best of contemporary surgical science, spanning disciplines yet unified by relevance to surgical practice," said Thomas K. Varghese Jr., MD, MS, MBA, FACS, *JACS* Editor-in-Chief.

In regard to readership and citation, articles that are most frequently accessed often highlight topics of immediate clinical relevance, emerging technologies, or areas of debate within the surgical community. Highly cited articles, in contrast, tend to reflect work that is shaping ongoing research and informing guidelines. Together, these metrics offer insight into near-term interest and longer-term academic impact.

In addition, alternative metrics—or altmetrics—capture a broader view of how surgical research resonates beyond traditional academic citations. By tracking attention across social media, news outlets, policy documents, and other online platforms, altmetrics highlight articles that are contributing to public discourse and interdisciplinary conversations.

Presented here is a snapshot of the most-cited articles, most-accessed articles, and articles with the highest altmetrics in *JACS* during 2025. Collectively, these articles underscore important themes in surgery, including advances in artificial intelligence; data-driven decision-making; system preparedness, quality, outcomes, and value in surgical care; education and workforce issues; trauma and time-sensitive care; cancer epidemiology; and the refinement of operative techniques. They reflect not only what surgeons are reading, but also what they are discussing, citing, and building upon as surgery continues to advance.

"I am deeply grateful to the authors who entrusted their work to *JACS,* to our extraordinary peer reviewers and editorial board for their rigor and dedication, and to our exceptional editorial team whose daily efforts continually elevate the journal," said Dr. Varghese. "It is the honor of my life to follow in the giant footsteps of my predecessors as the eighth Editor-in-Chief, and I look forward—with great optimism—to the transformative science ahead."

A complimentary online subscription to *JACS* is a benefit of ACS membership. Visit *JACS* online at *journalacs.org.*

JACS JOURNAL OF THE AMERICAN COLLEGE OF SURGEONS

Most Cited

American College of Surgeons Cancer Program Annual Report from 2021 Participant User File

Limited or Lasting: Is Preoperative Weight Loss as Part of Prehabilitation Maintained after Open Ventral Hernia Repair?

Evaluating the Effectiveness and Long-Term Outcomes of Roux-en-Y Gastric Bypass vs. Gastric Sleeve Bariatric Surgery in Obese and Diabetic Patients: Systematic Review

Enhancing Accuracy of Operative Reports with Automated Artificial Intelligence Analysis of Surgical Video

Social Vulnerability and Receipt of Guideline-Concordant Care Among Patients with Colorectal Cancer

Most Read on *journalacs.org*

First-in-Human Side-to-Side Duodenoileal Bipartition for Weight Loss and Type 2 Diabetes with the Swallowable Biofragmentable Magnetic Anastomosis System

Analysis of Surgeon and Program Characteristics Associated with Success on American Board of Surgery Examination Outcomes

Precision in Stroke Care: Novel Model for Predicting Functional Independence in Urgent Carotid Intervention Patients

Epidemiology and Outcomes Associated with New Persistent Opioid Use After Transabdominal Surgery

Efficacy of Intraoperative vs. Preoperative Indocyanine Green Administration for Near-Infrared Cholangiography During Laparoscopic Cholecystectomy: An Open-Label, Noninferiority, Randomized Controlled Trial

Top Altmetrics

Longitudinal Trends in Efficiency and Complexity of Surgical Procedures: Analysis of 1.7 Million Operations Between 2019 and 2023

Association of State Helmet Laws with Helmet Use and Injury Outcomes in Motorcycle Crashes

New-Onset Geriatric Syndromes Among Patients Undergoing Major Operation: Impact on Clinical Outcomes and Quality of Life

Secondary Undertriage of Severely Injured Trauma Patients Across the US

Cost-Effectiveness of Nonoperative Management vs. Upfront Laparoscopic Appendectomy for Pediatric Uncomplicated Appendicitis for 1 Year

SESAP 19 Launches with Advanced Modules, New Mobile App

THE LATEST EDITION of the Surgical Education and Self-Assessment Program (SESAP®) debuted at Clinical Congress 2025 in Chicago, Illinois, and answers the call from practicing surgeons for essential general surgery content plus advanced topics addressing more complex case management.

The synchronous launch of SESAP 19 and SESAP 19 Advanced at the beginning of the 3-year, online edition allows for more flexibility for self-directed study across the full program period.

"SESAP 19 and SESAP 19 Advanced build on the established legacy of this preeminent education program aimed at promoting excellence and expertise through personalized education founded on contemporary conceptual frameworks," said Ajit K. Sachdeva, MD, FACS, who recently transitioned out of his role as Senior Vice President, Education, and now is Senior Vice President, ACS Academy of Master Surgeon Educators. "It is the only ACS education program that offers opportunities to earn Education Credits of Excellence. An important addition to these programs is the release of a mobile app designed to support point-of-care learning."

Seamless Experience at Your Fingertips

To meet the evolving landscape of surgical education, special emphasis has been placed on enhancing the use of SESAP on the go. Now available in the Apple App Store and on Google Play, the ACS SESAP 19 mobile application can be downloaded on tablets and smartphones, allowing for easy online access to all the modules and features available in the web-based version of the program. For learners who like to pace their SESAP study over time, mobile app notifications can be integrated with the SESAP Small Bites feature to send SESAP 19 and SESAP 19 Advanced questions via mobile device every 1 or 2 weeks, depending on personal preference.

The mobile app is included with all packages and available at no additional cost for all existing and new SESAP 19 and SESAP 19 Advanced subscribers.

Higher Level of Learning

Now in its third edition, SESAP Advanced aims to extend surgical knowledge to promote mastery of complex and nuanced surgical decision-making, bridging surgical science and new technology and guidelines with optimal surgical patient care, according to ACS Board Chair Lena M. Napolitano, MD, FACS, who also is the Associate Program Director for SESAP 19 and SESAP 19 Advanced.

This latest edition also features an expanded version of the popular Controversial Items section for each SESAP 19 Advanced module.

"These are the kind of questions that are the crux of any surgeon's lounge discussion: What would you do? The topics focus on areas where practice recommendations are unsettled," said Lorrie A. Langdale, MD, FACS, Program Director for SESAP 19 and SESAP 19 Advanced.

Dr. Napolitano agreed, adding, "Controversial Items contain detailed explanations about advanced surgical problems that do not have a single correct

answer, thereby promoting critical thinking and best practices, particularly in situations where different approaches may be equally valid."

All New Peer-Reviewed Content by ACS Fellows

SESAP remains the gold standard in online general surgery education, because all the material is completely new for each edition and authored by expert surgeons. Led by Drs. Langdale and Napolitano, 57 ACS Fellows undertook a rigorous writing, peer-review, and selection process. Authors represent a range of clinical and academic environments, general surgery and surgical specialties, and practices from every region of the US.

"We retained seasoned authors and recruited new experts in various fields to construct the kind of clinically relevant questions and detailed critiques that support excellence in surgical practice through up-to-date information and management guidelines," said Dr. Langdale.

SESAP 19 includes 640 case scenarios covering nine modules of general surgery with multiple-choice questions that include explanations of why each answer is correct or incorrect, along with references and links to PubMed abstracts. Topic areas include:

- Abdomen
- Alimentary tract
- Breast
- Emergency general surgery
- Endocrine
- Legal, ethics, quality, and safety
- Perioperative care
- Surgical critical care
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SESAP 19 Advanced offers 329 additional questions exploring more nuanced and specialized topics. Hundreds of embedded media enrich self-study throughout the modules.

Personalized Learning and Packages

Peer comparisons for each answer option allow surgeons to see how others responded in real time. Those who want additional practice can create custom quizzes to randomize questions across content areas and to focus only on questions that each individual initially answered incorrectly. Modules can be reset and completed multiple times to aid in learning and retention. Various other features, including highlighting, bookmarks, 500 flashcards, and a flashcard customization tool also allow participants to enhance and reinforce learning. Additionally, residents can send Progress Reports directly from SESAP to program directors.

Flexible packages and personalized features make staying up to date easier than ever. Surgeons are able to focus on SESAP 19 only, select from 15 modules, or purchase all SESAP 19 and SESAP 19 Advanced modules together for a 50% savings.

Participants can earn up to 160 *AMA PRA Category 1 Credits*™ with SESAP 19, and SESAP 19 Advanced offers an additional 104 *AMA PRA Category 1 Credits*™.

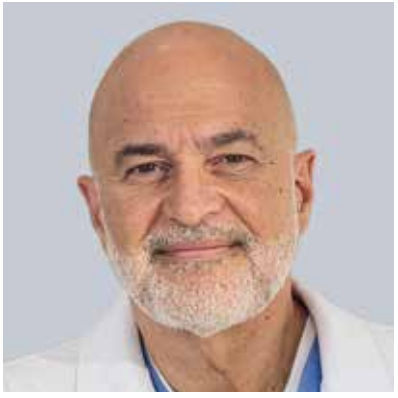
For more information, contact the SESAP team at 312-202-5419 or sesap@facs.org, or visit *facs.org/sesap.* B

Member News

Etesami Leads Organ Transplantation at CHLA

Kambiz Etesami, MD, FACS, is chief of the Division of Abdominal Organ Transplantation at Children's Hospital Los Angeles (CHLA). In this role, Dr. Etesami will oversee CHLA's liver, kidney, and pancreatic islet transplant programs. He also serves in the Abdominal Transplant Division at the Keck School of Medicine of the University of Southern California in Los Angeles. Previously, Dr. Etesami was director of CHLA Abdominal Organ Transplantation and surgical director of the liver and kidney transplant programs.

Bacha Is Surgeon-in-Chief in New York



Emile A. Bacha, MD, FACS, is surgeon-in-chief at NewYork-Presbyterian/Columbia University Irving Medical Center and chair of surgery at Columbia University Vagelos College of Physicians and Surgeons, both in New York. Since 2010, he has served as chief of the Division of Cardiac, Thoracic, and Vascular Surgery at NewYork-Presbyterian/Columbia University Irving Medical Center and director of congenital and pediatric cardiac surgery at the NewYork-Presbyterian Congenital Heart Center. He also is an adjunct professor of cardiothoracic surgery at Weill Cornell Medicine. A leader in pediatric and adult congenital cardiac surgery, Dr. Bacha is the current president of The American Association for Thoracic Surgery.

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.

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