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Bulletin



READING THE SIGNS

JOURNEY



I can be alongside policymakers for my profession, I can advocate for my peers and be part of the decision making.

Sarvenaz Pourjabbar, MD

Diagnostic Radiology Resident

Member Since October 3, 2013



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FEATURE

10 Reading the Signs

Radiologists can, and should, add value to the care of intimate partner violence patients — in and beyond the reading room.

Cover and feature image (PA radiograph of the left hand in a 41-year-old woman showing a comminuted fracture of the little finger metacarpal bone) courtesy of Bharti Khurana, MD, Brigham and Women's Hospital



OUR MISSION: The *ACR Bulletin* supports the American College of Radiology's Core Purpose by covering topics relevant to the practice of radiology and by connecting the College with members, the wider specialty, and others. By empowering members to advance the practice, science, and professions of radiological care, the *Bulletin* aims to support high-quality patient-centered healthcare.



QUALITY IS OUR IMAGE



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Digital edition and archives of past issues are available at ACR.ORG/BULLETIN.

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E/M Changes in 2021

The ACR remains concerned about the sizable cuts the MPFS Final Rule will impose upon radiologists and other medical providers who do not frequently bill E/M services.

In the 2020 Medicare Physician Fee Schedule (MPFS) Final Rule, published on Nov. 1, 2019, CMS finalized significant changes to evaluation and management (E/M) services that will result in a major redistribution of payments. The ACR, along with many other physician and non-physician providers, is highly concerned about the impact of these policy changes and will continue its efforts to either have CMS modify its proposal or work for Congressional intervention to mitigate these results.

Issued under the guise of “reducing administrative burden, improving payment rates and reflecting current clinical practice,” CMS is building on changes it finalized in the 2019 Medicare Physician Fee Schedule (MPFS) Final Rule that would adopt a new coding structure for

to amount to 8%, while our own analysis puts the number at a minimum of a 9% cut. IR, nuclear medicine, and radiation oncology will all face sizeable reductions. Surgical specialties and non-physician providers, such as physical therapy, will also be hit significantly. Any provider who does not bill for E/M services will be penalized by this policy change.

Analysis conducted by the Moran Company shows that increased valuation of E/M services would cost approximately \$6 billion in a single year alone. The new add-on code, GPC1X, would add at least an additional \$1.6 billion to the price tag of these changes. Due to the fact that the MPFS is based on the concept of “budget neutrality” — meaning that when a service is increased, a cut must take place somewhere else — non-E/M billing radiologists and other providers will have their payments reduced accordingly.

The ACR remains concerned about the sizable cuts this proposal will impose upon radiology and other medical providers who do not frequently bill E/M services, and it has submitted extensive comments to both CMS and its administrator, Seema Verma, asking them to rethink the E/M policy and to defer this issue to Congress due to the enormity of its impact on certain physician specialties. The ACR does not oppose a re-weighting, nor do we undervalue the importance of E/M services by physicians. We do, however, strongly object to the requirement that those who do not bill for these services be obligated to cover the cost of E/M payment increases. This is the argument we will take to Congress.

Ideally, we would like Congress to intervene in this physician payment battle — to ask Congress to allow the increases in the E/M valuations but not penalize non-E/M services. That is a big “ask” of a body that’s in the midst of a partisan election year with countless issues before them. It will require Congress to pay for the changes we’re requesting in the realm of tens of billions of dollars. We must be realistic about our chances to effect this policy, but we cannot stand back without doing everything we can to help shape a reasonable compromise. We will need the help of every member of the ACR as this debate continues. **B**

Ideally, we would like Congress to intervene in this physician payment battle – to ask them to allow the increases in the E/M valuations but not penalize non-E/M services.

the office/outpatient evaluation and management (E/M) codes. Primary care providers have long requested a re-balancing of the payment system to move payments away from specialty and highly technical and surgical services to provider services supporting chronic, complex patients in the office and outpatient setting. This battle used to be called “cognitive versus non-cognitive proceduralist” and has been embedded in the tensions inherent in the MPFS since its inception in the 1990s. CMS after CMS (and Congress after Congress) have all weighed in on this battle. And now, this CMS — with the backing of the White House — has made policy changes that will move significantly in the direction of a sizeable redistribution of payments.

What do these changes to the E/M codes mean to radiology? CMS has estimated the impact to radiology (including both professional and technical components)



ACR CEO William T. Thorwarth Jr., MD, FACR, kicked off the 2019 CMSS Forum in Arlington, Va.

ACR's Thorwarth Opens 2019 CMSS Forum

In November, the 2019 Council of Medical Specialty Societies (CMSS) Specialty Forum brought together specialty society executives, physician leaders, technology experts, and industry partners in Arlington, Va., to examine the role of telehealth, big data, and AI in healthcare. ACR CEO and CMSS Forum Program Chair William T. Thorwarth Jr., MD, FACR, opened the meeting by noting that technology in healthcare must be guided and advanced and that a “combination of humans and machines is the answer.”

Aneesh Chopra, president of CareJourney and former chief technology officer with the U.S. Department of Health and Human Services, agreed. In his address on how open data, application programming interfaces, and payment reform will fuel care delivery improvement, Chopra noted that the healthcare industry needs to find ways to have much more rapid access to information. “We are all sitting on a wealth of data, so let’s open up performance data to help patients navigate their healthcare decisions,” he said.

Data accessibility was a topic also addressed by Michelle Schreiber, MD, director of the Quality Measurement and Value-Based Incentives Group at CMS. According to Schreiber, “We need to make data delivery faster so that it can be actionable in real-time. At the same time, we have to focus on security and make sure patients know that their data is being shared all over the place.”

For more information on the meeting, visit acr.org/CMSS.

Increased Roles of Non-Physician Providers in Diagnostic Imaging Services



Non-physician providers (NPPs) increasingly perform imaging-guided procedures, but their role interpreting imaging has received little attention. In a recent Harvey L. Neiman Health Policy Institute® study published in the *American Journal of Roentgenology*, researchers identified the specific types of diagnostic imaging services rendered by NPPs in the Medicare population and studied state-level variation in the provision of such services.

“Between 1994 and 2015, diagnostic imaging utilization rates for Medicare fee-for-service beneficiaries increased 24%,” says Valeria Makeeva, MD, a radiology resident at Emory University. “During this same period, diagnostic imaging services billed by NPPs increased 14,711%, from 36 to 5,332 services per 100,000 beneficiaries. Despite that increase, NPP-billed diagnostic imaging represented only 0.01% and 1.27% of all such services in 1994 and 2015, respectively.”

Makeeva and her colleagues found that between 1994 and 2015, radiography and fluoroscopy accounted for 94% of NPP-billed imaging services. However, it still represented only 0.01% (1994) and 2.1% (2015) of all Medicare radiography and fluoroscopy services, indicating that despite the increasing roles of NPPs across the U.S., they rarely interpret diagnostic imaging studies.

Read the full study at bit.ly/HPI_AJR.

IMAGING 3.0: Bringing Errors to Light

Radiologists in Massachusetts have implemented a “just culture” model in their department. The model provides a method for investigating why errors happen and a structure for addressing them in a fair and transparent manner. The approach helps employees feel comfortable disclosing errors and allows the team to work together to prevent such errors from happening again. “By implementing just culture and investigating our processes, we’re improving the safety of what we do and enhancing the care we provide,” says Jennifer C. Broder, MD.

Read the full Imaging 3.0® case study at acr.org/ErrorstoLight.





Unless we as a society get comfortable with sharing and analyzing medical data, we're not going to benefit from the presumed benefits. If we want that promised land, we have to share data.

– Nigam H. Shah, MBBS, PhD, associate director of the Stanford Center for Biomedical Informatics Research, at bit.ly/WSJ_HealthData



New Resources for Lung Cancer Screening

Low-dose CT (LDCT) lung cancer screening (LCS) played a prominent role at the Lung Cancer Screening and Care Conference, sponsored by Go2 Foundation for LCS, which took place Nov. 14–15 in Washington, D.C. The two-day conference revolved around achieving five learning objectives:

- Identify at least three ways to improve patient and provider awareness about LCS in a continuum of care
- Outline at least three approaches to address coverage gaps and decrease barriers for patients eligible for LCS
- Create a strategy to effectively manage patients with both screen-detected and incidentally found nodules and appropriately engage a multidisciplinary evaluation
- Identify at least two new advancements in diagnostics and/or treatment that can contribute to improved patient outcomes
- Identify at least three practical steps that can be taken to improve the participants' LCS and care programs

The ACR helped address these themes with presentations by Debra S. Dyer, MD, FACR, chair of the ACR LCS 2.0 Steering Committee, Mythreyi B. Chatfield, PhD, ACR executive vice president for quality and safety, and Judy Burseson, MHSA, ACR senior director of quality management programs. Topics discussed also included LCS incidental findings management and updates to LungRADS® 1.1. Attendees visiting the ACR table for information learned about participation in the College's LCS Registry and LCS Center Designation.

For more information and to access ACR's LCS resources, visit acr.org/lcs.

You're One Year Closer to FACR

Renew your 2020 membership today and get one year closer to qualifying for the FACR distinction. The FACR is one of the most prestigious recognitions available to members who have been with the College for a minimum of 10 years. Beginning this year, for the first time ever, your 10 years is counted cumulatively, not consecutively.

Adding FACR to your credentials symbolizes exceptional achievement in the fields of diagnostic radiology, IR, nuclear medicine, radiation oncology, and/or medical physics. Only 10% of College members have been awarded this honor.

Renew today at acr.org/renew, and find out more about the Fellow program at acr.org/FACR. FACR applications are due to ACR no later than June 30.



Meeting a Community Need

Watch a new Imaging 3.0® video about how care partners at Sanford Medical Center in Fargo, N.D., led by Martha S. Kearns, MD, collaborated to implement a life-saving LCS program. With a dedicated nurse navigator, the radiologists provide longitudinal care to ensure the thousands of patients who come to the program from throughout the region receive appropriate follow-up care.

Watch the video at bit.ly/FargoLCS. To read the accompanying two case studies, visit acr.org/LungScreeningSolutions and acr.org/ManagingNodules.



Value in Breast Imaging

Registration for the largest breast imaging conference in the world, the Society of Breast Imaging's annual symposium, is now open. During this year's symposium, which will take place

April 4–7, 2020, in Hollywood, Fla., attendees will learn how to improve interpretive accuracy using all modalities, learn about new and important aspects of multidisciplinary care during the mock tumor board, and learn how to navigate new FDA quality requirements.

To register for the meeting, visit SBI-online.org.

CALENDAR

February

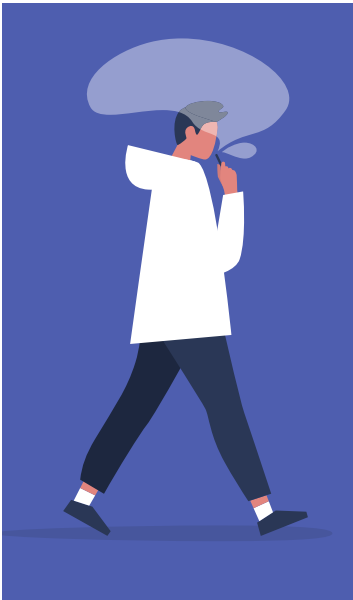
- 3–5 ACR-Dartmouth PET/CT, ACR Education Center, *Reston, Va.*
- 7–9 Musculoskeletal MR of Commonly Imaged Joints, ACR Education Center, *Reston, Va.*
- 10–12 High-Resolution CT of the Chest, ACR Education Center, *Reston, Va.*
- 10–
Mar 6 AIRP® Correlation Course, AFI Silver Theatre and Cultural Center, *Silver Spring, Md.*
- 21–22 Prostate MR, ACR Education Center, *Reston, Va.*
- 24–26 Coronary CT Angiography, ACR Education Center, *Reston, Va.*
- 27–28 Transcatheter Aortic Valve Replacement, ACR Education Center, *Reston, Va.*
- 27 Optimizing CT Imaging for Gastric Tumors, Cosmos Club, *Washington, D.C.*

March

- 2–3 Nuclear Medicine, ACR Education Center, *Reston, Va.*
- 4–6 Pediatric Radiology, ACR Education Center, *Reston, Va.*
- 9–11 Neuroradiology, ACR Education Center, *Reston, Va.*
- 13–15 Cardiac MR, ACR Education Center, *Reston, Va.*
- 16–
Apr 10 AIRP Correlation Course, AFI Silver Theatre and Cultural Center, *Silver Spring, Md.*
- 26 Updates on TI-RADST™, Cosmos Club, *Washington, D.C.*
- 27–29 B Reader Training and Examination, ACR Education Center, *Reston, Va.*

April

- 3–5 Body and Pelvic MR, ACR Education Center, *Reston, Va.*
- 6–9 AIRP Categorical Course: Thoracic and Cardiovascular, AFI Silver Theatre and Cultural Center, *Silver Spring, Md.*
- 15–17 Musculoskeletal MR (Elbow, Wrist/Hand, and Specialized Topics), ACR Education Center, *Reston, Va.*
- 16–19 SBI-ACR Breast Imaging Symposium 2020, Sheraton Denver Downtown Hotel
- 20–21 Breast MR With Guided Biopsy, ACR Education Center, *Reston, Va.*
- 23–25 Breast Imaging Boot Camp With Tomosynthesis, ACR Education Center, *Reston, Va.*
- 30–
May 1 CT Colonography, ACR Education Center, *Reston, Va.*



RSNA Tackles Vaping

Cases of e-cigarette or vaping product use-associated lung injury (EVALI) have been occurring since as early as 2014, but the sudden uptick in the number of diagnoses in 2019 has alarmed many in the medical community. To help shed some light on the issue, the RSNA issued guidance to help imaging professionals. The main purpose of the report, published in *Radiology: Cardiothoracic Imaging*, is to raise awareness around the issue.

“It’s out there killing people, so radiologists need to be aware of this entity,” says Fernando Uliana Kay, MD, PhD, co-author of the report. “At this point, it’s a cloudy situation where you know the correlation between the behavior and the entity, but you don’t know exactly how the pieces are fitting together, or if you have a specific agent that is causing this. It’s still a work in progress. That’s the main factor that might be causing some anxiety or uncertainty for radiologists.” According to the report, “Radiologists will continue to play an important role in understanding and interpreting radiologic findings of lung injury in those with a history of using e-cigarette or vaping products.”

As of late November 2019, roughly 2,300 cases of EVALI have been reported, resulting in 50 deaths. These numbers are only expected to go up as more diagnosticians become more familiar with the disease. Over 9 million adults use e-cigarettes in the U.S.

The epidemic was also covered at RSNA 2019, during which a panel of experts on the subject shared their insights in a special interest session that covered the four main imaging patterns:

- Organizing pneumonia
- Diffuse alveolar damage
- Diffuse alveolar hemorrhage
- Centrilobular nodularity

As more awareness and information is amassed, a better understanding of the epidemic is cultivated — but questions still remain. “This is the first time I’ve seen systematic destruction of the lungs like this,” says Seth J. Kligerman, MD, one of the presenters at RSNA. “And these are just the acute injuries. We don’t know about the long-term consequences of this.” For this reason, he emphasizes it is of utmost importance that radiologists remain vigilant about lung disease patterns that could indicate EVALI.

For more information, visit bit.ly/RSNA_Report2019.



The healthcare environment is changing around us rapidly, and many of these factors suggest the time is truly ripe for increased interaction between radiologists and patients.

— RSNA President Valerie P. Jackson, MD, FACR, at bit.ly/RB_VPJ

By Ezequiel Silva III, MD, FACR, Chair



The Element of Surprise

Radiologists must support proposals that end surprise billing without threatening physician practices.

One of our greatest assets as radiologists is the ability to fairly contract with insurance companies for the services we provide. One of the greatest threats to that ability is the issue of surprise billing. Accordingly, it is imperative that radiologists understand the policy solutions being discussed.

Also referred to as balance billing, surprise billing occurs when a patient receives an unexpectedly high bill for an out-of-network (OON) service performed at an in-network facility (for instance, a bill from an OON physician who provided services such as emergency care, anesthesia, or imaging at an in-network facility). While there is widespread agreement that this problem should be stopped and that patients should not be in the middle of disputes between physicians and insurers, there is disagreement on how to achieve that goal.

The issue affects those with private health insurance, not Medicare. Private health insurance is regulated at the state level, and several states have passed legislation to address surprise billing. State laws do not cover Employee Retirement Income Security Act (ERISA) plans. These plans are regulated by the U.S. Department of Labor and, hence, under federal jurisdiction. Since ERISA plans are a large fraction of the private insurance market, a federal solution is needed to remedy this problem.

Much of the debate centers on the amount to be paid by the insurer to the physician when an unanticipated OON circumstance occurs. The patient will be held to their normal in-network cost-sharing amount, with the rest of the bill reimbursed by the insurer. If the median in-network rate were adopted as the new mechanism to value a service — as has been suggested by some in Congress — a new payment ceiling would be established. It is critical to understand that this benchmarking approach would impact in-network rates, which would not be fully transparent to the public. A practice with a contracted rate above the median would have to accept a rate cut or they would be forced OON (and still take a rate cut). Why would a payor reimburse a higher in-network amount when they can cancel the contract and pay the new lower OON rate? Also, note that groups who wish to remain in-network will be reimbursed below the median rate,

since there is always a discount associated with being in-network. Importantly, price-fixing ignores considerations such as quality of care and patient complexity. With their reimbursement now fixed, it also disincentivizes groups from making investments in quality improvement. Such meaningful reductions in reimbursement would reasonably be expected to impact service levels, potentially limiting patients' access to care.

Physicians favor an interim payment for OON services, with the option for an independent dispute resolution (IDR) process to settle any differences. Such a plan would curb surprise billing while also preserving access to care. Use of IDR — essentially arbitration — protects good faith negotiations. The IDR process would include guardrails, such as a previously contracted rate, to guide the determination of a fair and appropriate payment amount. Baseball-style arbitration is a part of some states' IDR process. With this style, each party submits a single monetary amount and the arbitrator chooses one of the two amounts without modification. This incentivizes both sides to be reasonable in their submission. The threshold amount above which IDR is permitted is important. If the threshold amount is too high, such as \$750 in some proposals, or bundling of claims to meet the threshold is disallowed, then radiology services could be ineligible for the IDR process.

Another important consideration is transparency. There is patient frustration with the lack of transparency surrounding the network their insurer provides. Insurers should be required to update their network directories regularly and make those directories available online. Network adequacy requirements should be appropriately enforced. In addition, it is reasonable for patients, when possible, to be notified beforehand when OON services may occur.

Surprise billing is a real problem for some patients. The optics — patients receiving excessive bills that threaten their financial security — are unfavorable and have been latched onto by the media and policymakers. The belief among policymakers is that surprise billing needs to end, and physicians and insurers will not solve the problem on their own. Hence, they will do it for us. Against that backdrop, we must be fully engaged and supportive of proposals that end surprise billing without threatening physician practices and the patients they serve. **B**

Dr. Silva would like to acknowledge the role of Richard E. Heller III, MD, MBA, vice president of clinical services at Radiology Partners, in the development of this column.

Opening Doors

Involvement in your specialty can improve communication, build ties between communities, and help convey your value.

The American Academy of Pediatrics (AAP), founded in 1930 and boasting 68,000 members, is a leader in pediatric healthcare advocacy. Its Section on Radiology, in particular, stands out as a model for its relationship between a subspecialty and its larger specialty. The section, founded in 1979, is dedicated to improving the care of infants, children, and adolescents, and its primary mission is to educate general pediatricians and pediatric subspecialists about radiology in their practice.

Hansel J. Otero, MD, director of international pediatric radiology education and outreach at Children's Hospital of Philadelphia, and Sarah Sarvis Milla, MD, professor in the pediatric radiology and neuroradiology department at Emory University and staff radiologist at Children's Healthcare of Atlanta's Egleston Children's Hospital, spoke with the *Bulletin* about their work with the AAP, what's unique about that work, and why it's so important for radiologists to be involved in their larger specialty community.

How can pediatric radiologists support the AAP's work to educate general pediatricians and pediatric subspecialties about the role of radiology?

HO: Every pediatric radiologist could and probably should join the AAP's Section on Radiology (bit.ly/S_O_R) to help us inform the conversation around imaging in pediatrics. There are multiple avenues for education; we have virtual tools, the AAP annual educational conference, material that goes out to every pediatrician (which covers a radiology-specific topic every year or so), and a series of pediatric journals that, in addition to research, publish state-of-the-art reviews and timely editorials. But more input is always better and, by joining the group, our pediatric radiologist colleagues can help us decide on the agenda or propose topics.

SSM: Many pediatric radiologists already help educate local and hospital-based pediatricians about the appropriate ordering of imaging studies, including the ACR Appropriateness Criteria® (AC). Having said that, only 20–30% of pediatricians polled at the AAP's 2016 National Conference and Exhibition knew about the ACs for pediatric imaging. We need to make sure that

the pediatric radiology community is communicating effectively with our colleagues who need to understand what studies to order and when.

How can your efforts to highlight radiology within the larger specialty serve as an example for other specialties who want to prove their value?

HO: When you engage your colleagues and they experience the value you bring firsthand, then they are the ones telling the rest of the community how important you are for the team; they are the ones doing the advocacy for you. I think that every radiology subspecialty should have similar involvement with their referring physicians, so that they are the ones helping shape practice and convey the value that they bring.

Why should residents consider pediatric radiology as a specialty?

SSM: Pediatric radiologists love to answer this question. First, our patients: we are an active part of a team helping to diagnose and treat children in distress — which always feels like important work to be doing. Second, our field: our specialty allows us to continue multi-modality imaging — plain radiographs, US, fluoroscopy, CT/MRI, nuclear — yet also supports subspecializations like neuroradiology and MSK. Third, our colleagues: pediatric radiologists work with kind, thoughtful pediatricians and pediatric subspecialists who are extremely dedicated, as well as excellent communicators.

HO: With the exception of emergency radiology, pediatric radiology is one of the only subspecialties where you can still have more than one interest. I think that variety is always welcome when it comes to how we practice. In addition, pediatric radiology is one of the few subspecialties that involves direct patient contact. Finally, and most importantly, pediatricians are the most committed clinicians. We all share a common goal of wanting the best care for children. That common goal prevents the escalation of many interdepartmental disputes because at the end of the day, all that matters is what's good for the children.

How is the ACR's Commission on Pediatric Radiology helping to establish the value of the subspecialty within the larger healthcare system?

HO: The Commission works as a liaison between the ACR and pediatricians. As members of the Commission, we bring the concerns of pediatricians — how to perform studies more appropriately, how to reduce the amount of radiation, or how to do certain practices more safely. The Commission on Pediatric Radiology and the Society for Pediatric Radiology ([see sidebar](http://www.pedrad.org)) are our doors to the rest of the radiology community, and the AAP is the door to the rest of the pediatric community. **B**



The Society for Pediatric Radiology is committed to its mission to foster excellence in pediatric healthcare through imaging and image-guided therapy. Through the Society's educational offerings, journal, and collaboration with other organizations, SPR brings attention to the important role of pediatric radiologists in the overall care of the pediatric patient. To learn more, visit www.pedrad.org.



READING THE SIGNS

Identifying victims of intimate partner violence can hinge on radiologists' awareness.

“Sadly, you may see patients who die as a result of intimate partner violence (IPV),” says

Annie Lewis-O'Connor, NP, PhD, founder and director of the Coordinated Approach to Resilience and Empowerment Clinic at Brigham and Women's Hospital in Boston. “Recognizing the signs of abuse and sharing your findings with other clinicians can change a life — maybe save a life.”

Raising awareness of what the Centers for Disease Control and Prevention (CDC) calls “a serious and preventable public health problem” should be the goal of all clinicians, Lewis-O'Connor says. Relying on the expertise of radiologists to help identify patients who present with injuries commonly associated with IPV can be a powerful tool when reaching out to women and men in abusive relationships.

IPV is defined by the Violence Prevention arm of the CDC as “abuse or aggression that occurs in a close relationship,” past or present. While IPV encompasses abuse beyond physical injury — including sexual assault, stalking, and psychological aggression (using verbal or non-verbal communication to harm or gain control over another) — radiologists are in a unique position to identify the signs (and patterns) of physical injuries that may suggest IPV.^{1,2}

Unbiased Witnesses

While considerable research has focused on abuse cases of children and the elderly — leading to increased training and prevention efforts — relatively little literature focuses on how radiologists can play a larger role in helping IPV patients.

“Radiologists are trained to simply report traumatic findings from the current examination without making any active effort to highlight any possibility of this life-threatening issue,” says Bharti Khurana, MD, radiology fellowship director for emergency MSK radiology at Brigham and Women’s Hospital and assistant professor at Harvard Medical School.

Fostering awareness of IPV and familiarizing radiologists with the most common imaging findings of abuse can aid in proper diagnosis and better patient care. Radiologists are often able to form unbiased conclusions based solely on imaging, without having direct contact with the victim or the abuser.²

“There is much to be done in terms of raising awareness among radiologists and physicians in general about IPV,” says Elizabeth George, MD, neuroradiology fellow at University of California, San Francisco, and one of the authors of a defining IPV study while chief radiology resident at Brigham and Women’s Hospital. There is a need for more multidisciplinary research to integrate clinical and imaging data — and to create robust systems for the identification and ongoing care of IPV victims, she says.³

“It is being increasingly recognized that radiologists have a significant role to play in the identification of IPV,” George says. “We have access to a wealth of information in the form of current and prior imaging,” she notes. “Equipped with this objective data, we can work closely with referring physicians and healthcare clinicians as an unbiased witness to improve patient care.”

Telling Injuries

“Radiologists are only starting to understand the spectrum of imaging findings in IPV,” George notes. “IPV-related findings have not yet been part of radiologists’ training.” Victims of IPV receive more imaging studies and have a higher frequency of potential violence-related imaging findings when compared with control subjects of the same gender and age range.³ “A lot of the injuries are usually distal on the body, often signally defensive injuries,” Lewis-O’Connor says. “If you are being punched, you are going to put your hand up to protect yourself. If you are being kicked in the abdomen, you are going to pull your legs up. These injuries are red flags for me.”

“The face is considered a target area, especially mid-face contusions and periorbital fractures. In the presence of defensive injuries, such as forearm or hand fractures or contusions, the likelihood of these injuries due to violence becomes high,” Khurana says. “By recognizing the high imaging utilization, location, and imaging patterns specific to IPV — as well as old injuries of different body parts on prior studies and injuries inconsistent to the history — the radiologist can generate an objective report,” she says.

“We are already trained to identify these injuries in isolation,” George notes. “Understanding the pattern of associated and prior injuries — and being mindful of them until it becomes routine — will help us put IPV detection into practice.”

Radiologists can, and should, add value to the care of IPV patients — in and beyond the reading room. “What might at first glance seem to be an accidental injury, on careful review of additional and prior findings, could be indicative of ongoing nonaccidental trauma,” George says. By developing expertise in IPV recognition, having discussions

“Any type of injury can happen because of IPV. But if there are specific findings that we can give the probability for, we can increase radiologists’ role — and give them the confidence to make the invisible visible.”

— Bharti Khurana, MD



By the Numbers



On average, about **20 people per minute** are physically abused by an intimate partner in the U.S. During one year, this equates to more than 10 million women and men.



Nearly **one in five women** and **one in seven men** report having experienced severe physical violence from an intimate partner in their lifetime.

IPV victims undergo **more imaging studies** and have a higher frequency of potential violence-related imaging findings when compared with age- and sex-matched control subjects.



IPV victims are more likely to report a range of **negative mental and physical health outcomes** that are both acute and chronic in nature. These include conditions affecting the heart, muscles and bones, and the digestive, reproductive, and nervous systems.



According to the CDC, the cost of direct medical and mental healthcare services for IPV victims is more than \$4 billion annually.

Full list of “By the Numbers” references available in the digital edition at acr.org/Bulletin

with referring providers, and understanding the coordinated care that follows, radiologists can further the goal of patient-centered care and make a life-changing difference for their patients.

Untidy Circumstances

Motivation and diligence will not go unchallenged, however. IPV continues to be profoundly underdiagnosed, mainly due to a lack of early detection which can result from the reluctance of victims to report it to healthcare providers. Screening with IPV in mind can lead to the detection of characteristic injuries or patterns that may inform a conversation that prevents future violence.⁴

The burden of identifying IPV is not the sole responsibility of radiologists, but falls on the healthcare team when a study shows injuries consistent with IPV, says Lewis-O'Connor. While conducting a team huddle, it may become clear that imaging results don't match up with the patient's history. Plus, radiologists may find healing injuries the referring provider didn't know were there.

When IPV is suspected, all members of the healthcare team must be extremely mindful of a patient's situation — even when they have the patient's best interests in mind. Only a handful of states in the country allow or require reporting of IPV, Lewis-O'Connor says. You can ask patients questions related to their situation — and ask if they want help. In the majority of states, law enforcement can't be called unless the patient requests it. Allow the patient to self-determine, provide choices, and respect their decisions.

While many lives are lost to IPV each year nationwide, Lewis-O'Connor says, pursuing a suspected case could ultimately make things worse for the victim once they leave a healthcare setting. Thus, providing a safe space in a non-judgmental manner allows patients to engage in the future.

Many cases of IPV go unreported by victims because of feelings of guilt, shame, or fear of reprisal — especially against their children, who are also at risk. The overwhelming majority of IPV patients are women, and Lewis-O'Connor notes that she has seen many come in soon after having a child.

Concerns of patients are real — “What happens if there's not enough evidence to arrest an abuser, but the abuser finds out it was reported?” she asks. “What if the victim fears for her child or depends on the abuser for housing, food, or money?” Considering reporting is complicated and some find it more harmful than good, she says, you have to be careful when explaining options to patients and listen without prescribing. “It's not as tidy as everybody would like it to be,” she says.

To put that into perspective, Lewis-O'Connor says that during her career she has had two patients die of breast cancer and three murdered as a result of IPV. Knowing that the worst *can* happen may prompt healthcare providers to share findings with other clinicians and hospital social workers, she says, so that potential victims are offered timely assistance.

Promising Inroads

While identifying victims of abuse is arguably the biggest challenge in combatting IPV, opportunities exist to connect with patients.

Researchers at Massachusetts General Hospital (MGH) have explored integrating IPV screening when women present for breast imaging or annual mammograms. Women are given a questionnaire posing questions such as, “Do you feel safe at home?” or “Do you feel safe in your relationship?”

If women indicate not feeling safe at home, they are referred to the institution's Helping Abuse and Violence End Now (HAVEN) program that is located on campus or provided with contact information for offsite HAVEN centers.⁵

While this type of patient self-reporting can have positive outcomes, providers need more guidance on IPV, according to Khurana. Screening questions can motivate a patient to disclose information, but if a patient decides not to, a provider might not raise their own concerns about IPV. "Right now we are essentially depending on patients' self-reporting," she says. "Even if a patient does not disclose IPV, services and safe numbers can be provided as part of universal education," adds Lewis-O'Connor.

If a past injury shows up on new imaging, a greater awareness of IPV might prompt a radiologist to raise questions about abuse. However, Khurana believes that expecting radiologists to seek out IPV findings and then raise concerns with the appropriate clinician or healthcare support staff is not realistic without some kind of systemic help.

Learning Patterns

Along with a team of multispecialty physicians from Brigham, MGH, Harvard School of Public Health, and other institutions, Khurana is now leading an effort to use machine learning to narrow findings that suggest the probability of IPV injuries and integrate those findings into radiology reporting systems.

"Our goal is to create a fully integrated, multidimensional clinical decision support tool that uses patterns derived from expert analysis of historical radiological and clinical data, classification models, and statistical evidence to classify injuries for their likelihood of being due to IPV," she says. Clinicians would be automatically alerted if a patient's injuries have low- or high-risk probability of IPV.

Providers may overlook the signs of IPV because of their unconscious bias toward a victim's or abuser's physical appearance, education level, or socioeconomic background. Research acknowledges that some healthcare providers can be hesitant to suggest IPV, often for fear of offending patients or their partners. The automated prediction of IPV based on historical radiological and clinical data could avoid such bias and help validate radiologists' concerns.⁶

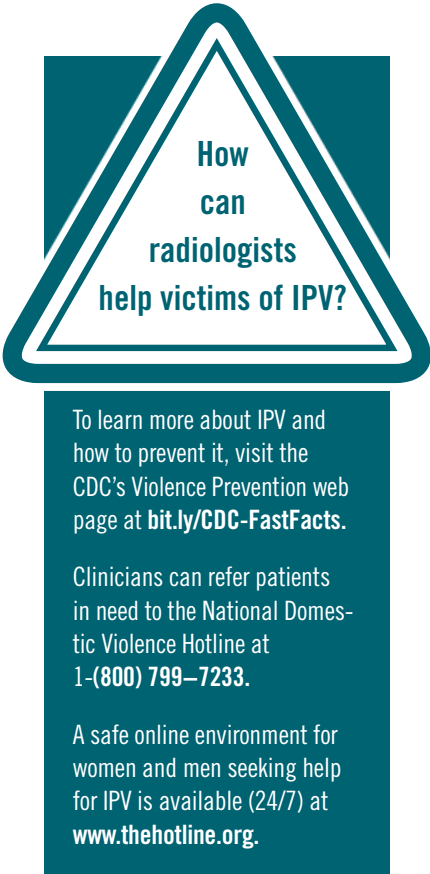
Khurana hopes her work with data scientists will lead to an alert system for radiologists based on patients' imaging history. Using machine learning to recognize signs of IPV on current and prior images, the alert would provide a visualization of risk factors, empowering healthcare providers to open a dialogue with potentially at-risk patients. Once validated, Khurana hopes to make the algorithm accessible through ACR's Data Science Institute™ and integrate outputs into radiology reports.

"In addition, our multidisciplinary team plans to design conversational guides using medical images for training social workers and clinicians to approach patients identified as high-risk for IPV," she says. Visually pointing out an injury on imaging studies to a victim may encourage them to talk about their situation.

Further research and training is needed to create awareness of IPV among radiologists who might be the first physician to suspect violence when presented with serial imaging studies. "We as a specialty should lead this work, educate ourselves, and increase awareness among our colleagues," George says. "To make a meaningful impact in the multidisciplinary care of these patients, radiologists must work together with clinical colleagues in integrated groups."

"IPV is so common, but these patients often get missed," Khurana says. "Any type of injury can happen because of IPV. But if there are specific findings that we can give the probability for, we can increase radiologists' role — and give them the confidence to make the invisible visible." **B**

By Chad Hudnall, senior writer, ACR Press



How
can
radiologists
help victims of IPV?

To learn more about IPV and how to prevent it, visit the CDC's Violence Prevention web page at bit.ly/CDC-FastFacts.

Clinicians can refer patients in need to the National Domestic Violence Hotline at 1-(800) 799-7233.

A safe online environment for women and men seeking help for IPV is available (24/7) at www.thehotline.org.

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Finding My Calling

A technologist talks about patient- and family-centered care, the importance of working closely with radiologists, and rural imaging on the ground.

▲ L-R: Erica Babinski, RT(R)(M)(CT) (BD), Jenna Tatum, RT(R)(CT), and Jessie McQuinn, RT(R)(CT)(M), are mammography technologists at Harrison County Community Hospital.

As the American Society of Radiologic Technologists' 100th anniversary approaches, the *Bulletin* is showcasing RTs going above and beyond for their patients and colleagues.

Why Rural?

Looking back on my upbringing, education, principles, and values, I know that I was not meant to bloom in a large hospital. Working in the rural setting simply feels like a calling. The Harrison County Community Hospital (HCCH) is a thriving, 19-bed critical access hospital. We are located almost exactly halfway between Des Moines, Iowa, and Kansas City, Mo. We are a community hospital serving the district community, treating many individuals from childhood through adulthood.

To serve our patients in this setting, we need to be knowledgeable in many different areas. This has allowed me to specialize in multiple modalities. I love that in one day I could perform mammograms, work with patients receiving a CT or MRI, and then jump over to do a bone densitometry procedure.

We Focus on Patients

I also value the opportunities I have to provide care that is truly centered on the patient and family. RTs are in an ideal position to identify and support patients who may be lost in the shuffle of healthcare. I strive daily to break the cycle for these patients.

We must also be mindful that while imaging is part of our daily grind, these procedures are not the patient's normal. Though a chest radiograph is our most common exam, it is not common for a patient. And imaging also comes with a side of anxiety, both about the procedure and about what the results could mean. Though a patient may arrive with a cough, we may not know that they have a family history of lung cancer and are fearing the worst. Meanwhile, the patient who was already struggling financially has a broken wrist and cannot work to support their family. Patients struggle with so many different things that they hide. Sometimes just taking an extra minute or two to listen makes all the difference.

It's the Little Things

RTs may also be able to identify pain points for their patients, even if they aren't directly related to imaging. For example, we established a coat closet program for patients who come in without a warm coat during the winter. Items are donated by employees of the hospital. Our maintenance crew will even go start a patient's car so it's warm for them in the winter, jump start their car, or fix a tire. Small things can make a big impact.

We also make patient follow-up and communication part of our patient-care routine. We had one patient who came to our facility for her yearly mammogram, and it demonstrated an abnormality so the radiologist recommended she follow up in six months. As part of our normal routine, we sent the patient a reminder to have her six-month exam. After this exam, the radiologists requested a biopsy, which came back malignant. After her successful treatment, the patient sent us a beautifully written letter, expressing that our care and concern every time she had her exams encouraged her to follow up here at HCCH. She told us that we saved her life by ensuring she obtained the follow-up exam. This simple part of our usual process helps us ensure patients do not fall through the cracks.

Rural Misconceptions

The larger facilities generally have resources that rural hospitals do not. However, forward-thinking rural facilities can still offer our patients access to services and technology as up-to-date as the metropolitan hospitals. A great relationship with administration and the hospital board is crucial to staying current with technology and increasing revenue and services. Acquiring our own CT

scanner in 1996 gave us the ability to better care for our patients in an emergent manner, rather than relying on a mobile CT. Since then, we have had great opportunities, working closely with our vendors to obtain and maintain technology in this ever-changing world of diagnostic imaging.

Relationships Matter

Relationships with your local providers are pivotal to the patients. This camaraderie, mutual trust, and support provide patients with continuity of care. It ensures great communication and positive patient outcomes. At smaller hospitals, the imaging department plays a big role in diagnosis. As RTs, we are well-respected in our field and trusted to make some tough calls when necessary. This is because we have had the opportunity to earn respect from the physicians and providers we work with daily.

Having a strong relationship with our radiologists has always been one of my top priorities. The RT/radiologist relationship is such an important one, especially in rural areas. The RT must relay accurate, detailed information from the patient to the radiologist for the best diagnostic capabilities possible. Mutual respect and open lines of communication between RTs and radiologists are vital for the safety and care of the patient. In the rural setting, we do not have the advantage of having the radiologists in the facility every day. Hence, it is crucial that the RT has the ability and ease of contacting the physicians.

Rural radiology can be done well, and I am proud to say that our department at HCCH exemplifies that — from start to finish. The dedication to improving patient care, the cohesiveness of the RTs, and the steadfast relationships with hospital leadership and radiologists are what define the success of a rural radiology department. To be a leader in this particular subset of radiology is a privilege and honor that I don't take for granted. **B**

Erica Babinski, RT(R)(M)(CT)(BD), is the director of radiology at Harrison County Community Hospital. She would like to acknowledge the role of Amy K. Patel, MD, in the development of this article.

In Close Collaboration

Fostering good relationships between radiologists and RTs is critical to ensuring patient safety and providing quality radiologic services. RTs serve as the primary liaison between radiologists, patients, and imaging equipment. The American Society of Radiologic Technologists, first founded in 1920, will celebrate its centennial at its 2020 Educational Symposium and Annual Governance and House of Delegates Meeting, June 24–28, at the Albuquerque Convention Center. Learn more about the event at asrt.org.



Listen and Respond

The College has made strides in providing support for radiologists practicing in military and VA facilities.



Robert S. Pyatt Jr., MD, FACR, is pictured at the WellSpan Rhonda Brake Shreiner Women's Center in Chambersburg.

In 1940, James T. Case, MD, of Santa Barbara, Calif., long prominent in the field of radiology, wrote, “A great opportunity and a duty confront American radiologists at this time when a tremendous change menaces the political and economic face of the earth. At last the United States has awakened to the need of preparing for national defense, and as a specialist group whose services will be required in a large and definite way, it is our privilege to foresee, aided by the experience of the last great war, the widening field of military roentgenology, both in preparation for defense and in view of possible need for offensive warfare. The problems are alike.”¹

Case's words still ring true today, according to Robert S. Pyatt Jr., MD, FACR, chair of the ACR Commission on General, Small, Emergency and/or Rural Practice (GSER). Pyatt, who conducted his internship and radiology residency training at the Walter Reed National Military Medical Center (formerly known as National Naval Medical Center) in Bethesda, Md., says, “Radiologists with military experience are dependable, reliable, focused — they know what needs to get done and they get it done.”

Pyatt, who believes that the key attributes of military

experience can enhance a radiology career, played a significant role in the formation of the ACR subcommittees for military, teleradiology, VA, and critical access hospitals. Pyatt, who was awarded the Gold Medal, Radiologist of the Year Award by the Pennsylvania Radiological Society at its annual meeting in 2019, is also chair of the ACR Committee for Fellowship Credentials (CFC) and, in that role, has been instrumental in expanding that honor to deserving and eligible military members. *The Bulletin* caught up with Pyatt, currently the co-founder and president of Chambersburg Imaging Associates in South Central Pennsylvania, to discuss his work in responding to the needs of military radiologists within the College.

Why was it important for the ACR to have a VA Subcommittee?

The VA health system takes care of millions of veterans — it's one of the biggest health systems in the U.S. But despite their numbers, these members didn't have a unique voice in the ACR. By building the subcommittee — which includes VA radiologists from all over the country — they can now work together on quality, safety, and

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Did You Know?

The ACR offers a 50% discount on national dues to active-duty U.S. military, USPHS, and VA members. In addition, active-duty military, VA, and USPHS members receive exclusive discounts on education products and CME-bearing activities. To verify your membership status and eligibility, contact membership@acr.org.

Being an Advocate

Getting involved in her community brought one radiologist fulfillment in her work.

Early on in her career **Jenny T. Bencardino, MD**, chief of musculoskeletal radiology at the University of Pennsylvania, was already involved in her community. But when a pressing issue came to the fore, she knew it was time to step up her work. Bencardino spoke with **Ragni Jindal, MD**, a radiology resident at NYU Winthrop Hospital, about how being a volunteer outside of work influenced her professional life and helped her handle burnout.

How did you decide where to focus your advocacy work?

My awakening as a diversity advocate was roused by the recent revival of the women's rights movement across the U.S. For me, it meant getting actively involved with the passing of the Raise the Age legislation in N.Y., which raised the age of criminal responsibility to 18. I felt a personal connection to the issue because of work I was already doing with a sports instruction program for the kids at Westbury Juvenile Detention Center. At the time, two of my tennis players at the juvenile detention center were about to cross the age threshold to be transferred into adult prison. I knew these boys and girls personally, and I was driven to do all that I could to offer them the future they deserve.

What challenges did you come across?

I had never undertaken such a project before, so that was a challenge in itself. The best thing I did was realize that I couldn't do it alone. I reached out to friends, PR experts, senators — anyone who could help tell this story to the legislature. Together we connected with the media, set up press conferences, organized public demonstrations, and met with on-the-fence senators. That's when I really started gathering momentum and support for the legislation.

How has your work in advocacy affected your professional life?

When I first got involved, I was feeling drained and underappreciated at work. My involvement in this



◀ L-R: Volunteers Yahaya Musa, Jenny T. Bencardino, MD, and Reginald M. Rousseau, MD, are pictured at the Westbury Juvenile Detention Center.

community project was a tremendous help in my personal struggle against burnout. For me, service is one way of making you aware of your worth. As radiologists, we can sometimes pin our identity and value on our profession. While I certainly am proud to be a physician, I realized that my sense of worth could not come only from my work. Reaching out to causes I believe in establishes another avenue of fulfillment and support.

How do you combat burnout as an individual and in your practice?

Radiologists report some of the highest rates of burnout and dissatisfaction across all medical specialties. Wellness programs are one resource (*see sidebar*). However, the healing effects of community service and advocacy work often go unnoticed. During my tenure at NYU previous to my Penn position, a community service committee was formed dedicated to collecting donations of food, toys, and clothing for the underprivileged. As more emphasis was placed on service at the institution level, faculty engagement in community service skyrocketed. Most agree that institutions need to support their medical staff in staving off burnout — I believe part of this is encouragement for advocacy work outside the reading room. Faculty members can set an example of being engaged in community work. Community service has helped many of us realize that bringing good to other people's lives breeds good in our own lives. In practice, advocacy work has helped address burnout and increased job satisfaction and fulfillment, as individual radiologists and as a team. **B**

This article is the first of a three-part Bulletin series. Readers will accompany Ragni Jindal, MD, as she highlights inspirational stories from radiologists around the country.



The ACR Radiology Well-Being Program is comprised of a validated well-being self-assessment, a toolkit of resources for recovery, and an educational curriculum for strategies to promote improved well-being. Access the program at [acr.org/Member-Resources/Well-Being](https://www.acr.org/Member-Resources/Well-Being).

Patient-Centered Optimization

Physicists at Duke University lead efforts to optimize imaging quality and dose using actual patient cases.

For many people, the idea of patient-centered care conjures thoughts of providing warm blankets and delivering exam results directly to patients. At Duke University Health System, the radiology team has taken patient-centered care to another level — optimizing image quality and radiation dose through a retrospective and quantitative review of actual patient cases.

Ehsan Samei, PhD, professor of radiology and the chief imaging physicist for Duke University Health System, and his team are leading an ongoing project to quantify the radiation dose and image quality of every radiology exam performed at Duke's three hospitals and outpatient imaging clinics. Samei and his team, known as the Duke Clinical Imaging Physics Group (CIPG), started developing the approach in 2012 for modalities that use ionizing radiation.

Pushing the Envelope

Before CIPG began focusing on patient-centered dose and image quality optimization, Duke's radiology department did what many groups do and estimated what the radiation dose should be for patient exams. The team was meeting accreditation requirements with no problem, but the physicists knew they could do better.

"You can be accredited and your protocols can all make sense, but you can still find yourself exposing

patients to doses that are too high or too low for a particular exam," says Jay A. Baker, MD, FACR, professor in the department of radiology and vice chair of clinical affairs at Duke University Medical Center. "Dr. Samei and his group wanted to push the envelope to figure out exactly how much dose is necessary to produce images at a high enough quality to answer the specific clinical questions. It's really about using the right amount of dose for the right patient for the right study."

Samei and his team are embedded within Duke's radiology department, so the dose and quality optimization project developed organically through conversations among physicists, radiologists, RTs, and other department members. The radiologists were on board with more meticulously quantifying dose and quality when Samei explained that doing so could lead to more precise and consistent care.

"It's like counting calories: if you don't put the calorie quantities on the menu, you don't really know how many calories you've consumed; you can make a reasonable guess, but you don't really know," Samei says. "What we did with our project is essentially put numbers next to those 'calories,' or, in this case, our exam dose and quality. So we know what the dose is, and we know what the image quality is for each exam and, therefore, we can be more informed about the way we approach, monitor, and optimize imaging."

While radiology groups have been attuned to dose for years, measuring image or exam quality as part of those efforts is relatively new, says Donald P. Frush, MD, FACR. "To develop a performance quality program that considers both dose and quality is really a quantum leap above what most anyone else has right now," says Frush, who is now professor of radiology and medical director of operations at Lucile Packard Children's Hospital at Stanford.

Analyzing Actual Cases

To achieve this level of dose and quality optimization, Samei and his team knew they needed to measure radiation dose and image quality on actual patient cases — not just test cases conducted with phantoms. "Traditionally in radiology, we use phantoms, which are essentially single-sized plastic objects, to ascertain some of the aspects of dose and image quality," Samei explains. "The challenge is that a phantom image doesn't have the same properties as a patient image, so your estimation of dose and image quality is a bit removed from what is actually happening to the patients in your clinic. The hallmark of our work is that we're looking at actual patient cases."

The Duke team looked for a commercial product to

"To develop a performance quality program that considers both dose and quality is really a quantum leap above what most anyone else has right now."

— Donald P. Frush, MD, FACR



analyze patient cases, but they couldn't find what they needed. Instead, they worked with Duke's IT team to develop an in-house system that sends every case to a central server, which ascertains radiation dose and image quality information for each image through an automatic process. In addition to dose exposure level, the system analyzes image resolution, noise, contrast, and other measures.

"These attributes are not just things that physicists cooked up; we actually interviewed our radiologists and asked them, 'So when you say an image is bad or an image is good, what do you mean?'" Samei explains. "Then we put numbers to their responses. With the numbers, we can measure the quality and dose, we can target it, and we can optimize it. Without the numbers, you cannot do any of those things. In the same way that you can't really come up with a diet if you cannot quantify calories and servings."

While the system reviews all of the cases, the radiologists can also manually flag noteworthy cases as they read them. These cases might contain suboptimal artifacts, or they might be highly optimal cases that the radiologists want to hold up as ideal examples. The radiologists and physicists discuss these cases along with system-identified outliers during regular meetings, which RTs, clinicians, and other stakeholders also attend.

Implementing Improvements

When the system or the radiologists identify a suboptimal case based on the quality and dose score, the physics team reviews the entire imaging chain — from the time an exam was ordered to the time the radiologist read the study and reported their findings — to determine why that particular study was an outlier. It's a different approach to medical physics, which usually involves just qualifying imaging equipment, Samei says. "We look at the imaging equipment, how the RT used the equipment, what protocol was used, what dose was used, what position the patient was in — everything up the imaging chain," he says. "It's like a forensic investigation to find out what went wrong."

In one instance, the physicists noticed a discrepancy in the dose and quality of two different classes of CT scanners that the hospital uses. For one class, the dose was increasing as the patient size increased (which is normal), but for the other class, the dose was not changing with patient size. "The smaller patients were getting beautiful image quality and the larger patients were getting not so beautiful images," Samei explains. "We saw this pattern, and we scratched our heads. It turned out that for the class of cases where the dose was not changing, the setting of the scanner had to be changed. After we fixed the setting, everything was working as it should, and we could verify that improvement in our results."

While correcting the scanner class discrepancy



"With medical images, we should be capturing the exact information that we need — nothing more and nothing less."

— Ehsan Samei, PhD

involved a simple setting change, other issues require more in-depth adjustments to protocols and patient positioning. In these cases, the CIPG team develops potential solutions to the issues and tests them on phantoms before recommending them for practice. "We still acquire phantom data, but as one of the pieces of the puzzle, not the whole thing," says Samei, who shares tested solutions with the radiologists, RTs, and other team members for discussion and implementation.

Expanding the Project

With the system initially working for modalities that use ionizing radiation, Samei and his team intend to gradually expand it to non-radiation-based modalities, including US and MRI. "With those modalities, radiation dose is not a concern. But we still care about the image quality, scan parameters, dose of the contrast medium, and, of course, about the imaging condition and performing the exam exactly to meet the need of the individual patient," Samei says. "We think the system we have in place can help ensure quality in these areas, as well."

"I would like to see a situation where I don't have to wonder whether the CT scan at one institution or another provides the same information; that is an obligation that we have to every patient who entrusts us with their care," Samei says. "We need to start deploying comprehensive monitoring systems, such as the one we have employed here, to look at the consistency and quantification of care, as consistency and quantification are hallmarks of high-quality evidence-based medicine. With medical images, we should be capturing the exact information that we need — nothing more and nothing less." **B**

By Jenny Jones, Imaging 3.0® managing editor, ACR Press



Want to join the conversation about how radiologists can lead quality improvement projects for improved image ordering? Let us know your thoughts on Twitter at [#imaging3](https://twitter.com/imaging3).

Preparing for AI in Practice

Are you prepared for integrating AI into clinical practice and adapting to the impact on efficiency?

The time is right for all radiologists to develop the skills that will be in demand when image classification “goes to the machines.”

First, I’ll propose two steps geared toward preparing yourself to critically evaluate the purchase and clinical implementation of a machine learning (ML) tool. The third step is intended to keep you flexible when ML tools increase our efficiency as diagnostic radiologists to the point where we’re able to start focusing on other tasks. Finally, I’ll close with a few recommendations for those who want to leverage their expertise as clinical radiologists to engage in active development of clinical ML tools.

STEP 1: Develop a Solid Foundation in Biostatistics

The ML world is filled with discussion of various metrics for assessing the diagnostic performance of an ML model. Many of these metrics refer to the overall performance of the model on a relatively large dataset. While you might be able to extrapolate good performance to the “average” case encountered in that dataset, much more information is required before performance can be extrapolated to individual cases from another institution, a different model of scanner, or even particularly challenging cases from within the original dataset, often referred to as “edge cases.”

You’ll want to become familiar with standard metrics of diagnostic performance, such as accuracy, sensitivity, specificity, and positive (or negative) predictive value — including differences in the dependence of these metrics on the prevalence of the “positive” condition. You’ll also want to learn more about receiver operating characteristic (ROC) analysis and the area-under-the-curve (AUC) metric. ROC curves and AUC values are not calculated at a particular operating point of the model, but over the entire range of operating points, which can be misleading when trying to understand how a model would perform in practice.

For screening tasks — whether or not the results are intended to be reviewed by a radiologist prior to affecting the clinical workflow — it is usually appropriate to trade off some degree of specificity (the ability to confidently rule out negative cases) in favor of higher sensitivity (the ability to identify the target pathology). However, for assisted diagnosis tasks, one may prefer higher specificity

or positive predictive value, particularly if the model output could be challenging for a human to interpret.

STEP 2: Familiarize Yourself With ML Terminology

In addition to understanding statistics, it is important to understand the basic terminology of data science and ML, so you’ll be ready to ask the right questions when evaluating a potential ML tool for clinical implementation. ML tasks typically require a large amount of data for “training” the model, which is the process of adjusting the parameters (or weights) in the mathematical formula for the model to achieve the desired outcome. Training is typically performed with a separate “validation” dataset for intermediate evaluation of the model’s performance and subsequent adjusting of other model characteristics, called “hyperparameters.”

Notoriously, ML models can “overfit” to training data or validation data, so a separate or “held-out” testing dataset — to which the model and the person(s) training it is never exposed — is also required for the final test of a model’s performance. If a model overfits to the training or validation data, it is likely identifying confounding patterns in the data not directly related to the target pathology, such as a particular RT’s radiopaque laterality marker on chest radiographs or the noise pattern on the CT scanner from a given hospital’s emergency department or ICU.

You may also want to familiarize yourself with the different types of ML algorithms that are out there and the types of tasks on which they typically perform well. Broadly speaking, ML algorithms are categorized into “supervised learning” — where the algorithm is trained on labeled data — and “unsupervised learning” — where the training data is not labeled. Most healthcare ML models are based on supervised algorithms.

In the realm of image analysis, you’ll typically hear more about deep learning and various convolutional neural networks architectures, such as ResNet for classification and U-net for segmentation. For text-based applications or natural language processing, you’ll encounter recurrent neural networks and Bayesian networks. For tabular data, you may also come across decision trees and random forests. Having a basic familiarity with this terminology may be helpful in evaluating the suitability of a given algorithm for its intended task.

STEP 3: Broaden Your Clinical Skillset

After preparing to assess potential ML tools for clinical implementation, imagine yourself in a radiology department in the future. Your department has multiple ML



The ACR AI-LAB™ offers a hands-on approach to educate radiologists on AI and demystify the process as algorithms are developed, trained and validated. View the free webinar “ACR AI-LAB: Bringing AI to Routine Clinical Practice” at bit.ly/AI_Lab to learn more.

tools in place and you're finally seeing the gains in efficiency that have been promised since you were a resident. How will you spend the time you've gained as a result?

There may be some increase in volume that arises due to improvements in workflow efficiency, but eventually the gains in interpretive efficiency will probably outpace the increase in volume. When that happens, the job of a diagnostic radiologist will necessarily change. There is a perhaps more urgent pressure to adapt our jobs to the long-promised (or threatened, depending on your perspective) shift to quality-based reimbursement. The most urgent and logical use of extra time afforded by

technological gains in interpretive efficiency is to focus on ways to improve the quality of care we deliver to patients and colleagues.

STEP 4: Dig Deeper

For those who want to engage actively in the development of ML technologies for radiology and medical imaging, I recommend starting with a solid foundation in informatics, so you can better understand how these technologies might be implemented within the medical imaging workflow. The National Imaging Informatics Course and Curriculum, co-sponsored by the RSNA and the Society for Imaging

Informatics in Medicine, is a great place to start. Many radiology training programs offer standalone or integrated clinical informatics fellowships, providing more comprehensive training in imaging informatics.

Finally, if you want to try your hand at building and training an ML model, try out the ACR AI-LAB™ (see sidebar on page 20). It's a great way to get involved in ML development without having to learn how to code. There's no better way to learn than by getting your hands dirty. **B**

Walter F. Wiggins, MD, PhD, is a neuroradiology fellow at Duke University Hospital.

Listen and Respond

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advocacy. So VA radiologists have a unified voice, which helps facilitate two-way communication and activities between them and the ACR.

How is the ACR adapting to accommodate military radiologists?

Military radiologists often move around, and it's really hard for them to be active in their state chapters. That's an issue that has prevented some from applying for ACR fellowship. We've now made it clear that the CFC has a channel that military radiologists can go through, bypassing their state chapters, as many do not have long enough established contact to develop a state chapter relationship—therefore their applications are exempt from chapter review.

Now that the ACR has a military radiologist group—the Military Radiology Subcommittee of the GSER Network Committee—we're much more responsive to military radiology issues like quality, safety, mass casualties, emergency radiology, and teleradiology. These radiologists have a lot of experience with issues that are of value to private practice and academic radiologists. We also have several issues in common. The same guidelines that are useful to private practice—such as screening mammography—also apply to the care and treatment of military families, so we need the input of military radiologists to make our system better.

What is unique about working within the VA?

I was very blessed to work with a number of extremely talented radiologists when I did my training. The Vietnam War had just ended, and there were many radiologists who were deferred from fighting and allowed to continue their training and education in fellowships. These radiologists, who served as faculty, used all of their new subspecialty talents—obtained at leading medical centers in the U.S. at that time—and education to train those of us who were residents at Bethesda Naval Hospital (now known as Walter Reed).

Because of how the military works, you're relied on as a healthcare provider. There were certain evenings, weekends, and holidays when I had to be the Officer of the Day—the commander for the entire base—and deal with all types of issues. I'd receive a phone call that said, "Congressman X is coming in with a heart attack." All the prominent figures in Washington, D.C. politics would go to Walter Reed Army Hospital or the National Naval Medical Center for their care because of the tighter security and privacy. **B**

ENDNOTE

1. Case JT. Military radiology. *Radiology*. 1940;35(5): 634–635.



JOB LISTINGS

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California – Pomona Valley Imaging Medical Group is seeking an IR with experience in vascular IR, oncology, trauma imaging, and intervention. Work in diagnostic radiology and other specialties is expected. Successful candidates will help expand the practice and contribute to the diagnostic workload and community relationship-building. A Certificate of Added Qualification is strongly preferred for this position.

Contact: Submit curriculum vitae and letter of interest to Lightfoote@msn.com.

Mississippi – A full-time general radiologist is needed in Meridian for a two-year partnership track position. The position offers a competitive salary/benefits package with a potential \$100,000 sign-on bonus and stipend. Call/holiday/vacation are shared equally. The position involves nighthawk coverage from 10:00 p.m.–7:00 a.m. every day of the week. Mammography experience with an interest in mammography and/or fellowship training would be beneficial but is not required.

Contact: Email applications to wgw@meridian-imagingpa.com.

Why is it important for radiologists to study healthcare disparities?



“Health equity is achieved through a compassionate commitment to an awareness of our differences and inspiring actions to bridge these gaps. This requires a system-wide effort, from leadership-driven priorities to the revitalization of industry standards and best practices. One way to explore personalized care delivery is by engaging with local or national advocacy groups and encouraging open discussion. Sometimes the best way to learn is by simply listening, as patients often know what they need. To improve fair access to care, factors such as social, economic, geographic, and physical barriers must be actively addressed. In doing so, leadership will see greater treatment adherence, shorter lengths of stay, fewer readmissions and ER visits, improved follow-up, and enhanced healthcare outcomes — all leading to increased patient satisfaction.”

— Johnathon Stephens, MD, radiology resident at the University of Illinois



“Equity in radiology care delivery can be a messy subject. The first step is to admit that your own practice struggles with equity issues — they all do. Next, ask yourself and your team a lot of questions. How well do you deal with barriers related to language or cultural competency? What about the needs of people with disabilities? Do you have resources for patients for whom the cost of imaging is burdensome, like price transparency, negotiated self-pay rates, or payment plans? Have you committed to diversity and inclusion among your staff? Focus on those barriers that are most within your control to reduce. Then, leverage your influence to improve equitable care delivery where you have less direct control. Finally, rinse and repeat.”

— Nabile M. Safdar, MD, MPH, vice chair for imaging informatics at Emory University

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