

Supplement to

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Cardiac Interventions TODAY

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ENGINEERING
SAFER LABS.
WITHOUT COMPROMISE.

The suite of solutions approach to protecting the entire team from scatter radiation.

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The Occupational Wellness Company: The Salus Scientific Story

Moderator Kenneth Rosenfield, MD, talks with Todd Flohr, CEO and Co-Founder of Salus Scientific, on mission, innovation, and the future of occupational health.



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For decades, occupational hazards in fluoroscopy-guided medicine were viewed as part of the job. Heavy lead aprons, chronic orthopedic strain, scatter radiation exposure, fatigue, and long-term wear and tear have a significant impact on physicians, nurses, and technologists who spend their careers caring for patients.

At Salus Scientific, that mindset is being challenged.

Built around the belief that safety should never come at the expense of workflow, Salus Scientific has emerged as one of the fastest-growing voices advocating for occupational wellness in fluoroscopy suites. From the GLiFT™ endoskeleton system to the AeroShield™ enhanced radiation protection device (ERPD), the company's mission is centered on protecting the health care workers inside the lab while optimizing workflow and preserving patient-centered care.

Dr. Kenneth Rosenfield sat down with CEO and Co-Founder Todd Flohr to discuss his background, the company's origins, the growing focus on occupational health, and why the future of interventional medicine must include better protection for health care professionals.

Dr. Rosenfield: Todd, let's start with your background. What led you into health care and ultimately to founding Salus Scientific?

Todd: Health care has been part of my life from the very beginning. I grew up in East Tennessee, and my father was a

physician. Professionally, I spent years working in the medical device industry in cardiovascular sales and leadership roles, which gave me the opportunity to work very closely with physicians and clinical teams in labs all around the country.

What became impossible to ignore was how many occupational hazards were simply being accepted as "normal." You would walk into first-class cath labs filled with incredible technologies designed to protect the patient, but the people delivering the care were often sacrificing their own health in the process.

That disconnect stayed with me.

Dr. Rosenfield: What was the original vision behind Salus Scientific?

Todd: Salus was founded around a very personal problem. One of our founding physicians, Dr. Bill Buchanan, experienced a shoulder injury and developed chronic orthopedic pain from years of wearing heavy lead. He created the original GLiFT™ concept to transfer the weight of lead from the shoulders, neck, and back to the iliac crest. He came to me and said, "I think we could help a lot of people." That desire to help clinicians resonated deeply with me and that was really the start of the company. We even chose a name for the company, Salus, after the Roman mythological goddess of safety, health, and well-being.

What started as a solution for one physician quickly became something much bigger. We realized this wasn't an isolated issue—it was an industry-wide problem affecting entire clinical teams.

Today, we at Salus think about occupational wellness holistically: radiation exposure, orthopedic burden, workflow disruption, fatigue—these are all connected challenges. Our goal is to take a system-based approach to occupational wellness; whether that includes GLiFT™, full-room protection with AeroShield™, live dosimetry, or other solutions. We can approach a lab manager or director and say, "no matter your needs or budget, we have solutions that will work for you."

Dr. Rosenfield: I've personally used GLiFT™ for about 12 months now. Honestly, if not for GLiFT™, I would not still be practicing in



Figure 1. Changing lives, changing tires. Todd Flohr, Kenny Rosenfield, and Mike Lankford, VP Sales at Salus, fixing a flat after a speaking event to medical students at ETSU.

the lab or doing procedures. It's dramatically relieved the stress on my back and neck. Most importantly, it has completely changed my work trajectory, enabling me to continue treating patients. Without GLiFT™, I would not be able to work in the cath lab anymore.

Todd: Hearing stories like that is exactly why we do this. Extending careers, improving quality of life, and allowing clinicians to continue practicing at a high level—that's the mission.

Dr. Rosenfield: Salus' message is "Engineering Safer Labs, Without Compromise." What does that mean to you?

Todd: For years, the industry has forced clinicians into tradeoffs. If you wanted more protection, you often had to sacrifice workflow, patient access, visibility, ergonomics, efficiency, or all of the above! In many cases, the protection systems themselves became literal barriers to adoption because they complicated procedures. We at Salus fundamentally reject the idea that safety and performance have to compete with each other.

So, you'll notice that with anything we develop, and I'll take AeroShield™ as an example, we think of it as a foundation of a house. Each lab is different and thus requires a different setup. We started the design of our AeroShield™ system to be able to accommodate the needs of different specialties, procedures, and rooms. The goal is to minimize the tradeoffs, to keep the solid foundation of the house while also providing the flexibility to customize.

Everything we build starts with one central question: Can this be used in *every* case, *every* day, by *every* operator, without slowing the team down? If the answer is no, adoption will suffer. And protection only matters if it's consistently used.

That philosophy continues to shape every technology we develop.

Dr. Rosenfield: That's so important, engineering a system that can be used in every case without disrupting workflow. As alluded to previously, occupational health has become a much bigger conversation recently. From a professional societal perspective, Society for Cardiovascular Angiography and Interventions (SCAI) certainly has led the charge and other societies are following suit, and I think awareness has finally caught up with reality. We as clinicians and our staff have quietly dealt with neck and back pain; I myself have had multiple back operations. The recent SCAI survey showed almost two-thirds of interventional cardiologists develop some sort of major orthopedic issue in their careers. We all know why. The data are there, and we can't ignore it anymore. It's now become a workforce sustainability issue, and health care systems are beginning to understand this. Many physicians are retiring early, and nurses and techs are leaving the lab because of occupational health concerns.

Todd: Exactly. When experienced clinicians are going out on disability like you did for several months due to orthopedic injury, everybody loses: Patients lose top-level care, hospitals lose revenue, and teams and trainees lose mentors and leaders. This occupational wellness topic is becoming central to the future of procedural medicine.

Dr. Rosenfield: I wanted to talk briefly about something I participated in that I think captures you and the Salus mission perfectly. You invited me to speak at an educational symposium in late April at Eastern Tennessee State University (ETSU), Radiologic Science Program (Figure 1). There were over 90 attendees, including students, faculty, physicians, and administration. I gave a talk about radiation safety in the lab, and you sponsored the event and even donated GLiFTs™ to five graduates. Your father was in the audience as well. What did that event mean to you?

Todd: It was a great event and thank you for speaking. I grew up in Eastern Tennessee and that community played a major role in shaping my values and early career. My father has done so much for patients and the community there, so seeing him in the audience meant a lot to me. As someone who grew up with a dad as a dedicated physician, I understand the importance of preserving that workforce. If we can help younger physicians think differently about protecting

themselves early in their careers, that has the potential to impact decades of health and longevity. And being able to promote this in my home ground was very rewarding.

Dr. Rosenfield: I'll just touch on one more topic. Salus emphasizes high quality and integrity frequently in their messaging and brand. Why is that so important in radiation protection solutions?

Todd: Because trust matters. When someone puts on protective equipment or installs a protection system in their lab, they are trusting that it will perform exactly as is intended every single day. That responsibility is enormous. At Salus, we believe quality cannot be compromised for speed or cost-cutting, and marketing claims must be accurate and 100% credible. We focus heavily on engineering, validation, material science, and long-term durability because health care workers deserve products they can truly rely on.

Dr. Rosenfield: Looking ahead, what do you hope the future of the fluoroscopy suite looks like?

Todd: I firmly believe the future lab is one where protecting health care professionals is simply built into the

environment and not treated as an afterthought. The next generation of labs should simultaneously reduce radiation exposure, reduce orthopedic burden, improve ergonomics, preserve workflow, and support long-term clinician wellness. I hope we reach a point where younger health care professionals entering medicine no longer accept chronic pain, excessive fatigue, or injury as "part of the job." We can do better than that...we owe it to our health care workers. At Salus Scientific, as industry partners, we intend to be the leaders in that change.

Dr. Rosenfield: Thanks for your time. Speaking on behalf of my colleagues in the lab and as one of those health care providers who has experienced the health consequences of occupational exposure, I am very excited to see the Salus protective solutions disseminated to labs around the country and the world. ■

Disclosures

Dr. Rosenfield: Scientific advisory board, Philips, Radiation, and Salus Scientific; equity or stock options in Radiation and Salus Scientific.

Spartanburg Regional and Salus Lab™: Building the Future of Radiation Safety Programs

One organization's goal to develop and refine their radiation safety program with integrated solutions from Salus Scientific.

By Brian Brown, MD

"Radiation safety extends well beyond the procedure room," says Dana Gilbert, Manager, Cardiac Cath/EP Lab at Spartanburg Regional Healthcare System in Spartanburg, South Carolina. As health systems continue to prioritize occupational wellness, regulatory readiness, and operational efficiency, there is growing recognition that successful radiation protection programs require more than protective equipment alone—they require a comprehensive strategy.

Salus Lab™ was developed to support this broader vision by helping health care organizations centralize key elements of their radiation safety program, including protective garment management, staff education, compliance documentation, and long-term program oversight. By bringing these components together, institutions can strengthen consistency, improve accountability, and simplify day-to-day program management.



Figure 1. Left to right, Dr. Brian Brown, Josh Barone (Charge Nurse EP), Dana Gilbert (Manager, CCL), and Chuck Clark (Charge Nurse, CCL).

SALUS LAB™: KNOW WHAT YOU HAVE. TRUST WHAT YOU ARE USING.

- Digital inventory management
- Inspection and compliance documentation
- Utilization insights across the department
- Streamlined replacement planning
- Maternity loaners
- Recall readiness and quality assurance
- Subscription model with built-in savings, warranties, and predictable budgeting

Spartanburg Regional Healthcare System in Spartanburg, South Carolina, is collaborating with Salus Scientific as the organization continues to develop and refine this integrated approach. Through this partnership, both teams are identifying opportunities to streamline radiation safety workflows while supporting clinicians, administrators, and radiation safety leaders with practical tools designed for real-world clinical environments.

As health care organizations face increasing demands around staff safety, equipment management, and

quality initiatives, integrated solutions such as Salus Lab™ have the potential to reduce administrative burden while providing greater visibility into the overall health of a radiation safety program.

This collaboration represents an important step toward a more connected model of occupational wellness, one that combines technology, clinical expertise, and operational best practices to better support the professionals who care for patients every day.

Future publications will share additional insights and lessons learned as the collaboration progresses, highlighting how integrated radiation safety programs can help health care organizations strengthen culture, improve efficiency, and advance protection for the entire care team. ■



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Disclosures: Scientific advisory board member for and owns equity or stock options in Salus Scientific.

Carrying the Weight: How GLiFT™ Saved My Occupational Health in the Lab

Offloading the weight of traditional lead while maintaining effective radiation attenuation, GLiFT™ is one part of the global solution for total suite protection.

By Kenneth Rosenfield, MD, MHCDS

Hheavy lead aprons. Long cases. Awkward positions. Repetitive strain. Chronic neck pain. Chronic back pain and fatigue. Lumbar injuries. Orthopedic surgery. In more than 35 years in the lab, I've had them all. My four back surgeries topped it off (Figure 1)!

A 2025 Society for Cardiovascular Angiography and Interventions (SCAI) survey highlighted the significant occupational toll of working in the cath lab, finding that two-thirds (66%) of respondents reported musculoskeletal (MSK) pain associated with wearing heavy lead aprons during procedures.¹ Chronic orthopedic injuries, particularly involving the spine, neck, and back, remain common among interventionalists and staff exposed to years of

scatter radiation environments and prolonged use of heavy lead aprons. These aprons are intended to be “protective,” but they end up being the source of countless occupational health issues. The findings from this SCAI survey and other similar referendums reinforce a growing need for better radiation protection strategies, ones that reduce exposure without creating a separate ergonomic burden.

Unfortunately, these tradeoffs have become so normalized in fluoroscopy-guided medicine that I—and many of my colleagues—have seen them as unavoidable consequences of treating patients, but this does not need to be the case. A growing number of physicians and staff are beginning to challenge that very painful compromise. It's time for a change—and that change entails creating innovative shielding systems and altering the ergonomics of wearing heavy aprons.

At the center of that transformation is the GLiFT™ system (Salus Scientific), a novel radiation protection platform designed not only to shield health care professionals from scatter radiation, but also to fundamentally rethink how protective weight is carried in the lab. For me personally, the GLiFT™ system has become an essential tool for “career preservation.” I simply could not continue to do interventions without GLiFT™.

SOLVING A PROBLEM THE INDUSTRY HAD JUST ACCEPTED—AND MAYBE EVEN IGNORED

Traditional lead apparel places substantial weight directly on the shoulders, neck, and spine. Over years of procedural work, that cumulative stress often becomes debilitating. The goal at Salus is simple but ambitious: reduce orthopedic strain without compromising procedural workflow, mobility, or radiation protection.

Enter GLiFT™, short for “Gravity-Longitudinal Individualized Force Transfer,” which was developed to

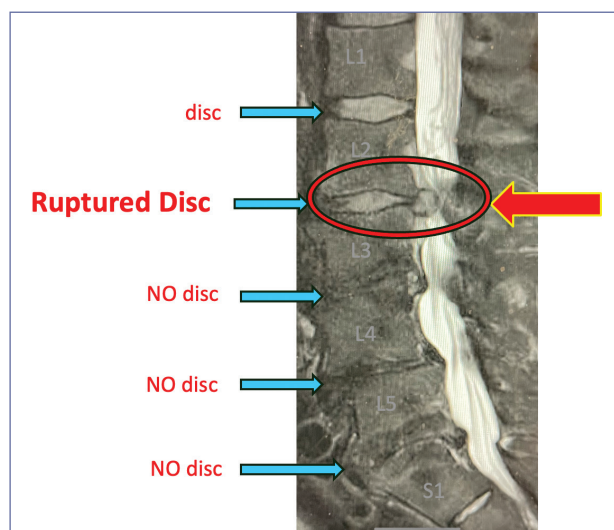


Figure 1. Effects of wearing a heavy lead apron for over 35 years of practice. The red circle shows a ruptured disc with no space for the spinal column or cerebrospinal fluid (red arrow), resulting in pain, multiple spinal procedures, and 24 weeks away from the cath lab.

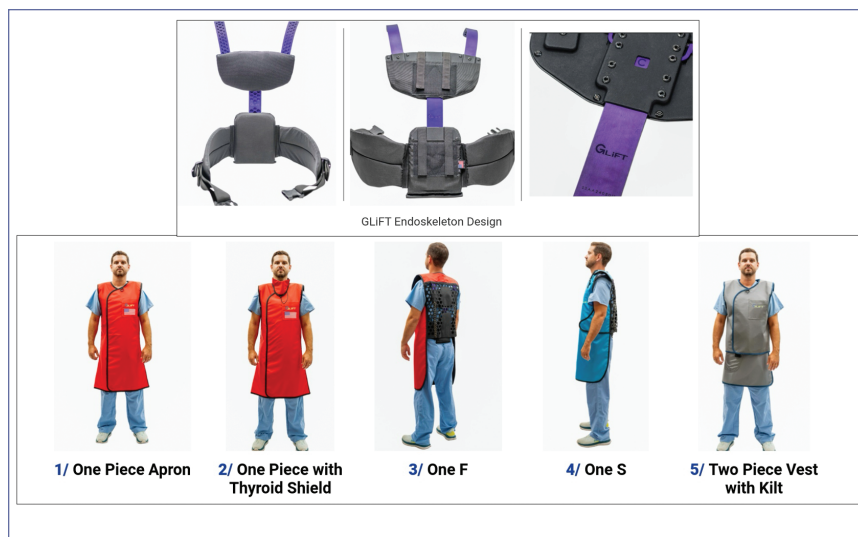


Figure 2. GLiFT™ endoskeleton design and available apron configurations.



Figure 3. Physicians wearing the GLiFT™ at the Fellows Cadaver Lab at New Cardiovascular Horizons in May 2026.

directly address the burden of load bearing. Instead of allowing the weight of radiation protection to compress the spine and shoulders, the system incorporates a patented exoskeleton to transfer load to the iliac crest through an orthopedic force-transfer principle (Figure 2).

What makes GLiFT™ different is that it wasn't designed as a gimmick or an accessory. It was designed to solve a very real problem that has shortened careers and physically damaged operators like me for years. Inside each GLiFT™ system and all their personal protection garments, Salus uses a long-proven core material, a very high-quality formulation that hasn't changed in over 15 years, giving me the peace of mind that I'm fully protected from the scatter radiation. At the same time, the redistribution of weight is game-changing.

FROM CONCEPT TO CLINICAL REALITY

The system's creators, an orthopedic surgeon (Dr. Richard Moore) and an interventional cardiologist (Dr. Bill Buchanan) recognized that, while radiation protection standards had improved over the years, orthopedic wellness had lagged behind. Operators and staff still routinely carried 15 to 25 lb of protective weight on their upper spine for hours each day. To address this issue, they envisioned a system that redirects weight to the hips, mirroring principles already proven in backpacking and load bearing in other high-strain professions. Rather than carrying the weight of the lead on the shoulders like conventional aprons, the GLiFT™ system integrates an internal support structure that transfers all the weight to the hips.

For me, donning GLiFT™ the first time was like a eureka moment! You notice the difference immediately...no strain on my shoulders and back—what a new feeling! In practice, I can only last 30 to 60 minutes wearing traditional lead aprons, but wearing GLiFT™, I can go 8 to 10 hours and perform 3- to 4-hour cases without fatigue or pain in my back or neck. It has literally enabled me to extend my career.

EVIDENCE BEYOND COMFORT

Many ergonomic products rely heavily on anecdotal feedback alone. For GLiFT™, Salus has committed to generating formal biomechanical data. A pilot study conducted at the University of North Carolina Wilmington evaluated muscle activity while physicians wore the system during simulated procedural positions. Investigators recorded reduction in trapezius muscle activation, particularly during extreme ergonomic positions such as left radial access cases. The study demonstrated a significant reduction of muscle strain and highlighted the potential orthopedic benefits of force-transfer technology in the fluoroscopy suite.²

For clinicians already struggling with chronic pain, the concept resonates deeply. Radiation protection is essential, but orthopedic protection matters too. Physicians cannot continue taking care of patients if their own body is breaking down or if they are distracted by ongoing back or neck pain. Or, as happened to me, if you are out of the lab for 24 weeks of a single year because of sequential back surgeries.

A SHIFT IN CULTURE

I am extremely passionate about both orthopedic relief and protection from scatter radiation. We have

normalized pain in this profession. Colleagues joke about bad backs and neck surgeries like they're badges of honor; this should not be the case—nor does it need to be any longer. Fortunately, the conversation around occupational wellness is finally shifting from acceptance to prevention. The next generation of operators should not be required to choose between protecting themselves against scatter radiation versus protecting against orthopedic injury.

Today's interventionalists are finally getting increasingly vocal about radiation exposure, fatigue, burnout, and MSK injury. It's time for change. Younger physicians entering practice are also asking different questions, not just about procedural success rates but about career sustainability. This attitude reflects a broader realization that occupational wellness is not separate from patient care, it is essential to it.

If we want experienced operators performing at a high level for decades, we need to protect them. This is ultimately about preserving careers, preserving expertise, and preserving the people who take care of patients every day (Figure 3).

I WOULDN'T BE ABLE TO PRACTICE WITHOUT GLIFT™

To me, GLIFT™ sits at the center of this evolving conversation. It is one tool that is a component of the global solution for cath lab protection. AeroShield™ is another tool (see page 10). Until such complete protection is available and for cases that require apron use, GLIFT™ is a life saver. This system has enabled me to continue practicing interventional cardiology and vascular intervention

"If you are early in your career, you should get on the GLIFT™ bandwagon now. If I had been using GLIFT™ 20 or 25 years ago, I would have avoided back surgery altogether. My back would be much healthier, and I would have avoided the associated chronic pain. Physicians, nurses, and technologists in their early or mid-career should be insisting that their institution provide GLIFT™ for them in the interest of occupational wellness and preservation of the workforce."

—KENNETH ROSENFELD, MD, MHCDS



Figure 4. Photo of myself in the cath lab donning my GLIFT™.

at the level I expect of myself (Figure 4). I would not be practicing without it. ■

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AeroShield™ Elite: Passive Protection Without Compromise

Delivering meaningful scatter radiation protection for the entire team with seamless workflow integration in the fluoroscopy suite.

By William Gray, MD

With both an aging population and the advent of technologies to treat more complex disease, fluoroscopy-guided procedures have increased in recent years and with it an increase in radiation exposure for lab personnel. Physicians and staff have had to make a difficult tradeoff: protection from scatter radiation versus procedural performance. Traditional shielding systems often provide incomplete coverage, require constant repositioning, and frequently interfere with workflow, patient access, and communication among the care team. In many labs, there is significant variability in radiation safety practices, and this lack of consistency means protection becomes highly dependent on individual behavior.

A new category of Enhanced Radiation Protection Devices (ERPDs) is aiming to change that paradigm, among them the AeroShield™ Elite system from Salus Scientific, which was developed with a simple but ambitious goal: deliver meaningful best-in-class scatter radiation dose reduction while integrating seamlessly into the fluoroscopy suite operations. Rather than relying on staff to constantly adjust shielding or change procedural behavior, AeroShield™ was engineered as a passive protection platform, designed to work continuously in the background without disrupting workflow.

Early formative clinical experience from Tallahassee Memorial Healthcare demonstrates that the combination of low scatter dose and effortless workflow integration may be the AeroShield™ system's most important innovation.

RETHINKING RADIATION PROTECTION

Occupational exposure to scatter radiation remains one of the most persistent challenges in interventional medicine. Chronic exposure has been associated with increased risks of malignancy, cataracts, and orthopedic injury related to heavy lead apparel. Although under-table drapes and ceiling-mounted shields remain standard in many labs, adoption and effectiveness can vary significantly based on positioning, operator technique, and room setup.

AeroShield™ approached this challenge by developing an inflatable table-mounted ERPD designed to create a protec-

tive barrier around the procedural field while preserving visibility, patient access, team movement, and freedom to move the C-arm into extreme angles without interference or damage to either. The system was intentionally designed to be passive, requiring minimal interaction once deployed.

"The vision was protection without compromise," said William Dixon, MD, interventional cardiologist at Tallahassee Memorial. "We've seen technologies that have protected well but got in the way, or that were easy to use but didn't provide enough meaningful protection. AeroShield™ was designed to eliminate that tradeoff, and after using it in our lab over the last 4 months, there is no tradeoff."

Dr. Dixon noted that one of the most important aspects of the system is consistency. "If protection depends on someone remembering to move a shield every few minutes, compliance naturally varies," he said. "Passive

AEROSHIELD™ ALIGNS WITH ALARA+

AeroShield™ aligns with the broader shift in fluoroscopy suite safety. In March 2026, nine leading medical societies, including SCAI, ACC, and HRS, called for the adoption of ALARA+, "as low and as light as reasonably achievable," expanding the traditional ALARA principle beyond radiation dose along to include orthopedic strain, workflow design, and whole-team protection.¹

That evolution is important because occupational safety can no longer depend solely on asking clinicians and staff to wear heavier lead, reposition shields perfectly, or absorb workflow penalties in the name of protection.

ALARA+ reframes the standard: Safety should be built into the lab environment, equipment, and daily procedural workflow.

ACC, American College of Cardiology; HRS, Heart Rhythm Society; SCAI, Society for Cardiovascular Angiography & Interventions.

protection changes the equation because the protection is simply there throughout each case, for the entire case.”

EARLY FORMATIVE STUDY EXPERIENCE

Initial formative study experience at Tallahassee Memorial evaluated both scatter radiation reduction (from traditional shielding) and workflow integration during real-world procedures. According to investigators, the system demonstrated encouraging reductions in measured dose around the room, while maintaining procedural efficiency and patient access (Figure 1 and Survey Insights Sidebar).²

But while the dosimetry data were important, clinicians repeatedly emphasized another finding: the absence of workflow disruption.

“The biggest compliment we can give a technology is that we stop thinking about it,” said Thaer Musa, interventional cardiologist at Tallahassee Memorial Healthcare. “After a very short learning curve, AeroShield™ simply has become part of the room. Within one or two cases, most of us, physicians and staff, were completely comfortable.”

SURVEY INSIGHTS ON AEROSHIELD™ FROM TALLAHASSEE MEMORIAL*:

- **Procedural versatility**—used in 100% of study cases consecutively
- 94%—no time lost in **preprocedure prep** (patient loading/draping)
- 94%—no time lost in room **turnover efficiency** (patient unloading/cleaning of system)
- 94% reported no impact on **patient access/communication**
- 100% likely to continue to use AeroShield™ **in its current form**

*19 surveys of MDs, RTs, and RNs.

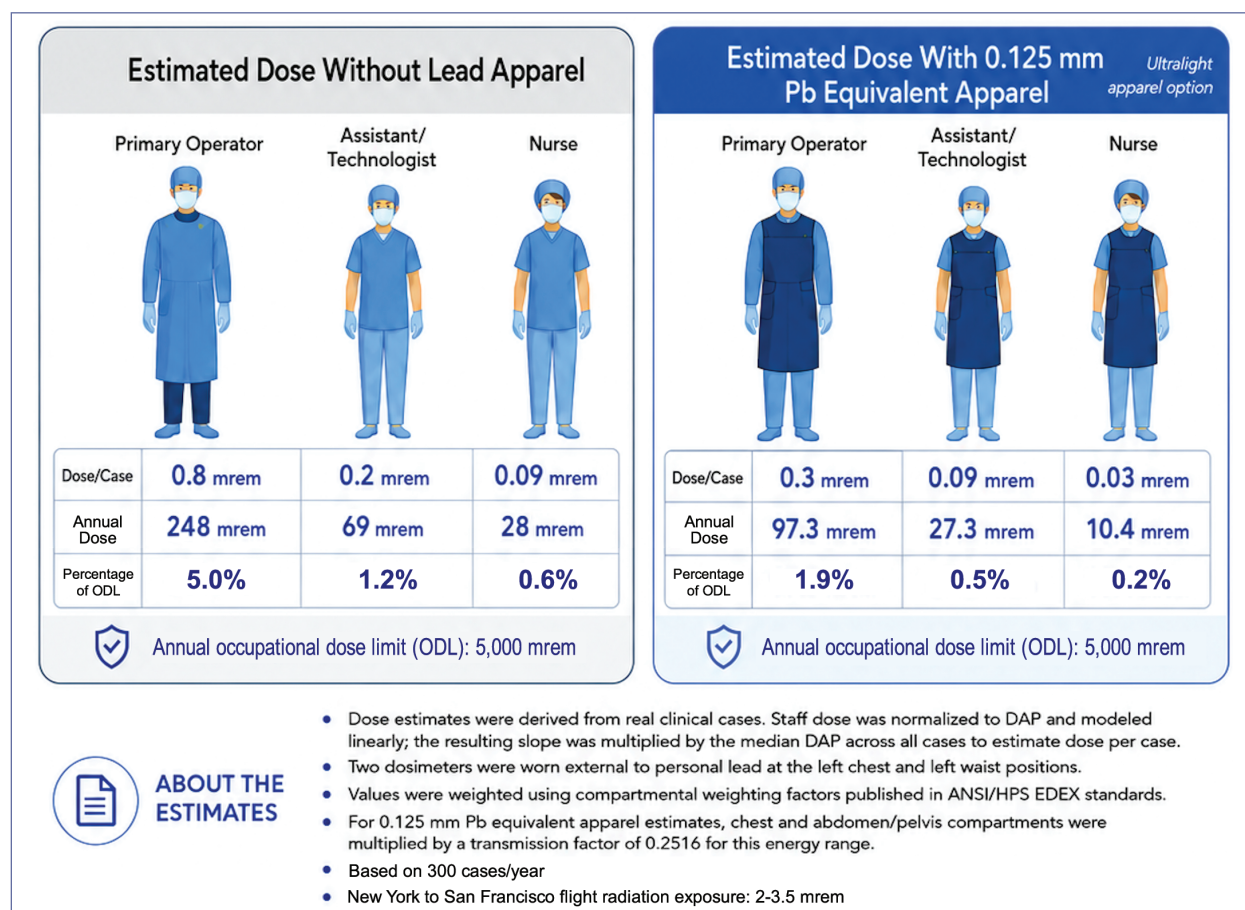


Figure 1. Scatter radiation protection performance around the lab with AeroShield™ (measured outside the lead and estimated with 0.125-mm light lead), including dose per procedure (normalized by dose area product), and annual exposure based on 300 cases.

Dr. Dixon added, “one of the things we noticed is that we’ve continued to use AeroShield™ in 100% of our cases, even after the Salus clinical team left after our study was complete. That’s a testament to full adoption.”

A TEAM-BASED SOLUTION

One of the recurring themes from the Tallahassee experience was the system’s impact beyond the primary operator. Traditional shielding strategies often focus primarily on physician exposure, while other members of the care team may remain less protected depending on room positioning and movement.

AeroShield™ was designed to create a broader zone of passive protection throughout the procedural environment. For the radiologic technologists working with the system daily, that broader protection came without introducing operational complexity.

“It integrated into our room setup much easier than expected,” said Izabelle Pool, radiologic technologist at Tallahassee Memorial. “You’re not constantly adjusting it or thinking about it at all during the procedure. It just has become part of your natural workflow.”

“There’s always concern anytime something new comes into the lab,” said Chris Buzzard, Director of Invasive Cardiology Service Line at Tallahassee. “People worry about losing access to the patient or slowing the room down. But after the first few cases, most of these concerns disappeared.”

Eric Henry, a nurse in the lab, noted the psychological value of enhanced protection. “When we feel safer every single case, it really changes the atmosphere in the room,” he said. “We want to know that occupational safety is being prioritized, and we are so thankful that Tallahassee Memorial has put that front and center for us.”



“Everyone wants and needs an advanced radiation protection system. They all have their benefits and limitations; however, the rub has been that the currently available systems are not good enough to justify their cost. The AeroShield™ system is affordable, and I don’t foresee the same limitations the others have.”

—Prashant Kaul, MD

Director of Interventional Cardiology | Piedmont Healthcare



“I didn’t know it was there after a couple of cases. I just worked as I normally would. When the Salus clinical team left after our study was complete, we continued to use it in 100% of our cases. That’s a testament to full adoption.”

—Bill Dixon, MD

Interventional Cardiology | Tallahassee Memorial Healthcare
Co-Host | Blue Collar ICs Podcast



PASSIVE PROTECTION AND FULL ADOPTION

The concept of “passive protection” has become increasingly important in discussions around occupational safety. Many technologies demonstrate strong performance under ideal conditions but rely heavily on perfect usage patterns to achieve those results consistently.

As we look to the future of global safety in the fluoroscopy suite ERPDs will be defined not only by attenuation metrics, but by systems capable of achieving near-universal use with minimal compromise of the procedure, the workflow, or movement of the x-ray imaging system. In the early bench testing and initial clinical use, AeroShield™ appears to be one technology that integrates into the lab well, thus increasing its use and attendant staff protection. ■

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Disclosures: None.



“For me, the combination of a protection system being used in every case for every team member got me excited about implementing this in our labs and potentially system-wide. We purchased our first AeroShield™ units, and when we get budget approval for more, we will order more.”

—Christopher Buzzard

Director of Invasive Cardiology |
Tallahassee Memorial HealthCare



“When we feel safer every single case, it really changes the atmosphere in the room. We want to know that occupational safety is being prioritized, and with AeroShield™, we are so thankful that Tallahassee Memorial has put that front and center for us.”

—Eric Henry, RN

Tallahassee Memorial HealthCare



ALARA+: Moving Beyond Lead Removal Toward Risk Reduction

Momentum is building to not only reduce exposure and lead but to thoughtfully and responsibly remove occupational risk for every procedure, every day.

By Kevin Croce, MD, PhD, and Brandon Wright, MS

For decades, radiation safety in interventional medicine has been guided by a simple but powerful principle: ALARA, as low as reasonably achievable. The concept remains foundational today. Although this concept remains foundational, advances in imaging technology and enhanced radiation protection devices (ERPDs) invite us to broaden our perspective.

Perhaps the next evolution of occupational safety is not about removing lead. Instead, it is about removing risk.

Across interventional cardiology, radiology, vascular surgery, electrophysiology, and structural heart programs, there is increasing discussion around practicing without traditional lead garments. ERPDs and modern dose-reduction technologies have generated excitement about what the future fluoroscopy suite may look like.

Momentum is clearly building. In June 2026, Arizona enacted Senate Bill 1121, modernizing radiation safety standards by allowing hospitals and surgical centers to determine whether lead garments are necessary in procedure rooms equipped with ERPDs. That momentum was further reinforced on July 14, 2026, with the publication of a landmark multisociety expert consensus statement on occupational radiation safety.¹⁻³ Importantly, the document supports evidence-based integration of ERPDs within a comprehensive radiation safety program. In many ways, the document reflects the philosophy of ALARA+: embracing innovation while maintaining multiple layers of protection and reducing occupational risk.

This evolution is overdue. The orthopedic burden associated with lead remains substantial. Physicians, nurses, and technologists frequently experience chronic neck, shoulder, back, and hip pain that can affect career longevity, quality of life, and workforce sustainability.

At the same time, innovation must be paired with caution. ERPDs should not be viewed as universal replacements for lead garments until their performance has been validated across different procedures, imaging geometries, room configurations, and operator positions. Scatter radiation is dynamic, varying with patient size, beam angulation, detector position, field size, table position, and staff

location. Performance demonstrated in one clinical setting cannot automatically be assumed in another.

Rather than asking whether we can eliminate lead today, we should ask how we can most effectively reduce overall occupational risk. That is the foundation of ALARA+: combining best practices, procedural awareness, improved shielding, and emerging technologies to reduce both radiation exposure and orthopedic burden without introducing risk.

THERE IS NO SILVER BULLET

Radiation safety has always depended on layered protection. Lead garments, ceiling-suspended shields, table skirts, distance optimization, thoughtful positioning, and fluoroscopy dose management all contribute to reducing occupational exposure. Individually, none is perfect. Together, they provide a comprehensive system of protection that has protected health care professionals through millions of procedures.

The same philosophy should guide adoption of newer technologies.

The automotive industry offers a useful analogy. When airbags were introduced, they represented a major advance in safety, but they did not replace seat belts. Instead, they added another layer of protection. The safest approach was using both together.

Similarly, ERPDs may significantly reduce occupational exposure and eventually reduce reliance on traditional lead garments. Today, however, they should be currently viewed as additional layers of protection rather than wholesale replacements for proven safeguards.

The ultimate goal should be risk reduction.

REMOVING LEAD IS NOT THE SAME AS REMOVING RISK

Reducing reliance on lead garments does not automatically improve safety. Removing an established layer of protection without sufficient validation safety and without real-time monitoring of operator dose could simply exchange orthopedic burden for uncontrolled radiation exposure.

Importantly, this is not a binary choice between full lead and no lead. Emerging technologies may allow health care professionals to safely reduce the weight they carry through lighter-weight garments, lower lead equivalencies, or alternative protective configurations while maintaining multiple layers of protection. For many institutions, this may represent a more practical and responsible near-term strategy than complete lead elimination.

Innovation should be embraced, but it should also be evaluated under real-world clinical conditions rather than idealized scenarios.

WHO SHOULD DECIDE?

Decisions regarding lead reduction or lead removal should never be driven solely by marketing claims, anecdotal experiences, or isolated studies. They should be collaborative, evidence-based, and continuously monitored.

Health care professionals should work alongside their Radiation Safety Officer, radiation safety committee, medical physics team, hospital leadership, and applicable state regulatory authorities to determine what is appropriate for their specific clinical environment.

Radiation protection is ultimately a shared responsibility. Changes in practice should be aligned with institutional policies, regulatory requirements, and focused on the long-term safety of health care workers.

THE IMPORTANCE OF MEANINGFUL TESTING

As ERPD technologies continue to mature, how performance is measured and reported becomes increasingly important. Today, radiation reduction data are often generated using different methodologies, procedural geometries, endpoints, detector locations, and reporting practices, making meaningful comparisons between systems difficult. The field would benefit from standardized data testing and reporting that includes consistent staff positions, measurement heights, procedural categories, room geometry, dosimeter placement and normalization techniques.

One valuable approach is normalizing occupational dose measurements by dose area product (DAP). Because DAP reflects the total radiation energy delivered during a procedure, expressing occupational dose relative to DAP helps account for differences in case complexity and radiation output, allowing more meaningful comparisons across studies and technologies.

Equally important is transparent reporting of the number of cases, DAP range, procedural geometry, staff position definitions, dosimeter location, whether lead or reduced lead garments were worn, and the type of dosimetry used. These details improve reproducibility and enable physicians, administrators, radiation safety teams, and purchasing committees to make informed, apples-to-apples comparisons.

Standardization benefits everyone. It promotes transparency, rewards innovation, and allows purchasing decisions to be based on meaningful evidence rather than marketing narratives.

EVERY CASE. EVERY DAY.

The future of occupational wellness will not be defined by a single device or a single philosophy. It will be defined by an unwavering commitment to protecting health care professionals during every procedure, every day.

That means continuing to optimize fluoroscopy practices, improving shielding technologies, reducing orthopedic burden wherever possible, collecting better clinical evidence, and demanding transparency in how performance is measured and reported.

Most importantly, it means recognizing that innovation and caution are not opposing forces. We can embrace new technologies while remaining committed to proven safety principles. We can pursue a future with less lead while acknowledging that we may not be fully there today for all cases and all environments.

That is the promise of ALARA+: not simply reducing exposure and not simply removing lead, but thoughtfully, responsibly, and relentlessly removing occupational risk for every procedure, every day. ■

1. Rizik DG, Sutton NR, Lansky AJ, et al. SCAI/ASE/HRS/SIR/SVS expert consensus statement on enhanced radiation protection: time for mandatory and urgent action. *JACC Cardiovasc Interv*. Published online July 14, 2026. doi: 10.1016/j.jcin.2026.06.011
2. Rizik DG, Sutton NR, Lansky AJ, et al. SCAI/ASE/HRS/SIR/SVS expert consensus statement on enhanced radiation protection: time for mandatory and urgent action. *J Vasc Interv Radiol*. Published online July 14, 2026. doi: 10.1016/j.jvir.2026.108927
3. Rizik DG, Sutton NR, Lansky AJ, et al. SCAI/ASE/HRS/SIR/SVS expert consensus statement on enhanced radiation protection: time for mandatory and urgent action. *J Soc Cardiovasc Angiogr Interv*. Published online July 14, 2026. doi: 10.1016/j.jscai.2026.105455



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Cardiac Interventions

TODAY

At Salus Scientific, we believe protecting the care team should never require trade-offs. Today's fluoroscopy environments demand solutions that reduce radiation exposure, minimize orthopedic strain, and integrate seamlessly into workflow.

Our consultative approach helps labs implement a comprehensive radiation protection strategy—from personal protection to advanced scatter protection, real-time monitoring, and intelligent inventory control.



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