



# Radiology on the Front Lines

*Radiologists in the armed forces are providing invaluable imaging service in Afghanistan.*

**A**ccording to its website, the U.S. Navy's mission is to "maintain, train, and equip combat-ready Naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas." But who takes care of those services members who are enrolled in the services — individuals whose very profession endangers them each day?

A mix of interest in public service, legacy, and patriotism led radiologists Ronald J. Boucher, MD, chair of radiology at the Naval Medical Center in San Diego, and Stephen L. Ferrara, MD, director of radiology residency at the Naval Medical Center in San Diego, to enroll in the U.S. Navy. "I always felt some sort of connection to the services because my dad is a veteran of the Korean War," says Ferrara. "But I didn't see it as a career for myself, per se. Then, in January 1991, during the first Gulf War, there was a surge of patriotism. It occurred to me that this would be a good opportunity to give back."

Image above: Ronald A. Boucher, MD, performs a FAST ultrasound with colleagues at a military hospital in Kandahar.

Alternatively, Boucher began his military career, enlisted in the Navy, and then earned his officer commission through the U.S. Marine Corps. “I was in the Marines and really wanted to serve in the Navy and Marine Corps as a physician,” he explains. “I also found that radiology as a medical specialty interested me because it was very technologically advanced. Additionally, the Navy does a good job promoting and ensuring that we have the best technologies available. That was very attractive to me,” he adds. “Having been deployed, I now feel even more strongly about [my decision to serve].”

Ferrara agrees. “To be true to my reasons for joining, I had made a pledge to serve combat soldiers. That was a big reason why I volunteered to go to Afghanistan after the outbreak of war — I wanted to participate and serve in a combat environment.” Boucher’s decision was solidified when he delivered a presentation at the 2010 ARRS Annual Meeting. After receiving a standing ovation, “It really sent a message home,” he says. “Many members didn’t realize the degree of impact radiology has on an individual’s life.”

During the summer of 2009, Ferrara was sent to Kandahar, Afghanistan, as a General Medical Officer for the U.S. military. Shortly after, in October 2009, Boucher was also deployed to Kandahar by the U.S. Navy. There, the pair worked in a U.S.-led Multinational Medical Unit (MMU) Role 3 hospital.

At the MMU, Boucher and Ferrara cared for all U.S. forces (including Army, Navy, Air Force, and Marines), as well as all coalition forces (including the Afghan National Army and Afghan National Police). Additionally, they did a great deal of humanitarian work caring for the local Afghan population, particularly women and children. The humanitarian aid they provided encompassed radiologic procedures using ultrasound, x-ray, and CT, as well as both surgical and medical care for conditions that don’t require surgical therapy, such as pneumonia and gastrointestinal disease.

“Many of the civilians were injured by Taliban forces, but we uniformly cared for them just as if they were Americans or coalition members,” Ferrara says. “We also cared for the Taliban themselves. Detainees were a routine part of the patient population, in fact.” This work not only provided a sense of personal fulfillment but also deep insights into imaging’s role in battlefield care.

## Vital Service for Soldiers

It’s no secret that, with new technology and tools, radiology is an ever-changing specialty. These advances have not only affected health care at home, but also on the battlefield, making imaging a vital service during war. “Radiology on the front lines provides a means to dramatically reduce the morbidity and mortality of a wounded service member,” says Boucher.

“For example, an injured soldier is medevac’d [medically evacuated] from the field with massive internal and external injuries,”

Boucher says. “The radiologist performs a rapid bedside ultrasound during the initial resuscitative effort (i.e., a Focused Assessment for Sonography in Trauma or ‘FAST’ scan) to determine if there is an internal organ injury or hemorrhage. In the past, this diagnosis required more invasive techniques.” These findings then help the trauma team to determine if a patient needs to go to the operating room or if he or she is stable enough for a CT scan and full trauma exam.

Boucher explains, “In Afghanistan, I was one of two radiologists in a medical ‘tent’ hospital — one of three hospitals of its type in the country.” About 200 medical personnel at the Kandahar MMU served the imaging needs for 30,000 ground troops and supporting staff in the region, adds Boucher. As a result, “You don’t have the luxury of every type of subspecialist,” says Ferrara. “You practice outside of your norm and need to be comfortable with that.”

Because of this one-of-a-kind situation, both Boucher and Ferrara believe it takes a certain personality to provide care in combat. “First, you have to be able to communicate with multiple providers,” says Boucher. Since this is a multinational effort, U.S. services work alongside Canadian, Dutch, Danish, British, Australian, and German [doctors]. Even if these coalition members speak English, for many, it’s probably not their first language, explains Boucher. “If you have an introverted personality, it’s difficult [to provide wartime care],” he adds.

Ferrara adds that practicality is another important trait for those service members on the battlefield. “You don’t have every luxury you do at home,” he says. “You have to remember what the purpose is — to save lives. You can’t get hung up on incidental findings. You have to move quickly and see what is going to cause the patient the most harm. You even do radiologic triage, summing up all radiology findings and telling the trauma team those findings in the order that will make the biggest impact on survival.”

## Impact of Interventional Radiology

Although combat zone radiologists must be prepared to read all imaging modalities or organ systems, subspecialists are still valuable. Ferrara’s focus, for example, proved particularly useful in Kandahar, as he was one of six interventional radiologists (IR) in the Navy. “An opportunity [for Dr. Ferrara] to apply his specialized IR skills was readily apparent,” says Boucher. “Many traumas included severe pelvic-crush injuries and spine injuries, often with neurological devastation and limb-threatening extremity trauma. Theater commanders rapidly recognized the value of having this skill set on the battlefield and made IR a permanent deployed specialty in Afghanistan.”

“People are [also] at very high risk for pulmonary embolism, which can be fatal,” says Ferrara. “We started putting removable IVC filters into patients right on the battlefield.” Previously, this procedure was not performed until a patient was transported to Germany or the United States. “The [conditions] are much worse [on the battlefield] because the destructive force of weapons dwarf anything in the civilian sector,” explains Ferrara. “The ability to perform a relatively simple angiographic procedure can

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## Radiology in Action

*The following is an excerpt from Boucher's personal blog, "Memoirs of a Radiologist in a Wartime Theater," written on Feb. 11, 2010:*

We dart as quickly as we can to the hospital, about one mile away. Drenched in sweat, we beat the ambulance and notice we are the only ones inside the hospital. Everyone else was still in a bunker nearby and didn't get the call [about the] incoming wounded. We gather everyone and prepare the trauma bays. They start coming in. First two, then four, now six injured casualties. Four of them have relatively serious injuries. One soldier was taking a shower and a hot metallic shrapnel fragment pierced through the barracks metal container, drilled straight through his left leg, shattering the tibia and injuring his below-the-knee popliteal artery. A tight tourniquet stopped the bleeding. [We performed] on-the-table angiography to evaluate arterial flow. The vascular surgeon performed a venous bypass graft. His leg is saved from amputation! One of the many great collaborative efforts and success of a multispecialty (radiology, orthopedics, general and vascular surgery, ER, anesthesia) and multinational (American, Canadian, British, Dutch, Danish, Australian) team.

**Image right: Up to 24 wounded patients are "medevac'd" to the hospital in Kandahar each day. Image below: Boucher (center) and staff prepare to evaluate incoming patients at a military hospital in Kandahar.**



save lives. We're basically bringing first-world medicine to the battlefield, providing the same level of care as in San Diego, Los Angeles, or New York City."

Boucher agrees about the importance of IR services at the MMU. "The extraordinary groundwork that Dr. Ferrara established with IR fundamentally changed how we provide health care to our battlefield casualties," he says.

## Setting Aside Differences

Despite the importance of incorporating imaging into saving lives, providing quality care just would not be possible without teamwork and camaraderie among coalition forces at the MMU. "I've had three deployments and the teamwork is stronger than in any other environment," explains Ferrara. "When you practice in a setting with no financial constraints, everybody works toward a common purpose.

"Sometimes, there are competing interests between different specialists [in the United States]. Those all just sort of melt away in the battlefield environment." Ferrara also noticed the value of interacting with providers from other countries. "The exchange of information on an academic and policy level is very valuable," he says. "It's very helpful to get a circumspect view of world health care by getting to work with these other folks."

"One of the greatest satisfactions I had is working with different nations," Boucher says. "You really come to appreciate how other countries deal with casualties and communication. It allows you to practice with people you never would have, and it gives you a really rewarding feeling. You develop a sense of camaraderie you can't explain, in which you set aside all things that create friction."

## Filling a Void

Despite the cooperation involved and subsequent rewards, practicing in a combat environment is not without its tolls. "Each morning when I opened my eyes, I was either exhausted from an all-nighter



or very thankful that no immediate battle injuries occurred in the past few hours,” says Boucher. “It always felt like the calm before the storm.” Boucher adds that they saw up to 24 wounded patients in a single day, and that most of these trauma situations were mass casualties. “The trauma is as horrific as you can ever imagine,” he says. “These young soldiers come in with the most gruesome injuries, mostly due to IED [improvised explosive device] blasts.”

For Boucher, this situation made him even more committed to providing the best care possible. He used his service in Kandahar as an opportunity to mentor Afghani doctors interested in radiology and start the first radiology-physician mentor program. “There were no local radiologists in the Afghanistan health-care system,” Boucher explains. “At Kandahar Regional Military Hospital, they didn’t have CT capability or skilled sonographers. The Afghan doctors were very appreciative and eager to learn. I felt a greater sense of community by being involved.”

Boucher was also instrumental in bringing state-of-the-art imaging equipment to a new brick-and-mortar hospital, which will now have the most advanced technology of any U.S. military hospital in Iraq or Afghanistan — the first ever 64-MDCT CT scanner and digital radiography and PACS. Boucher also anticipates an unprecedented IR-capable operating room, which, he explains, “will elevate the standard of care for wounded war fighters.”

## “Not in Kansas Anymore”

Despite having the same commitment to providing high-quality services, certain aspects of battlefield radiology, such as patient movement and financial constraints, preclude radiologists from delivering the type of imaging services that they can provide in the United States. For instance, “We seldom keep patients for more than 24 hours,” Ferrara explains. “If they’re stable, we need to keep beds open for new casualties.” After approval, individuals are often sent back to Walter Reed Army Medical Center in Washington, D.C., or to Landstuhl Regional Medical Center in Landstuhl, Germany.

“It can be rewarding to find out they did well and they are back home,” he adds. “It also helps you continuously improve your practice patterns by getting a longitudinal view of how patients fare over the course of their treatment.”

Because of the rare type of medicine practiced in Kandahar, Ferrara concludes that one thing is important to realize: “We’re not in Kansas anymore.” Rather, for such issues as radiation dose, physicians must remember that their patients often have a nine-hour flight ahead of them to Germany. “We always use the ALARA principle; however, we don’t have the benefit of observation.” According to Ferrara, missing an intra-abdominal wound is quite serious because a stable patient is often put on a plane, flying over hostile countries, without access to sufficient medical services.

“The decision paradigm is different in Afghanistan,” Ferrara continues. “The algorithm is to observe the patient, but there, you can’t. If a man bleeds out in an airplane, there’s no way to save his life in flight. So, the first priority is to make sure these patients get home alive.”

Boucher says the Navy is also proactive in maintaining the best software, hardware, and technology for optimizing dose. “It outfits every CT scanner with the best radiation reduction principles. It really spends the extra money to ensure the safety of the patients,” he says. “We have some of the best medical staff and our troops deserve the best.” As dedicated battlefield radiologists, Boucher and Ferrara are providing this very form of above-and-beyond care. ■

## ENDNOTE

1. “Mission and History.” Available at <http://bit.ly/bzFjhN>. Accessed Oct. 25, 2010.

