The recent proliferation of networked medical devices, while offering great promise for more nimble care, also has brought a slew of drawbacks, exposing patients and healthcare organizations to safety and security risks. Also as a result of these enhanced technologies, the need for biomedical engineering staff to possess a hybrid skillset—with training in both healthcare technology management (HTM) and information technology (IT)—is becoming increasingly essential.

“Across the healthcare industry, the convergence of IT systems and medical devices has become pervasive,” said Jennifer DeFrancesco, MS, CCE, CHTM, lead biomedical engineer for the Veterans Integrated Service Network (VISN) 11. “We’ve seen a jump in the past five years, probably from about 10% to 22–25% of our medical equipment portfolio being networked medical devices. These devices are in essence health information systems.”

VISN 11 consists of seven healthcare facilities in Michigan, Indiana, and Illinois. The network employs a total of 67 biomedical engineering staff. Biomed staff for VISN 11 are responsible for supporting approximately $300 million in medical devices and health information systems, which vary greatly in terms of complexity.

Challenge
DeFrancesco illustrated the need for hybrid HTM-IT service delivery through the example of smart infusion pumps. “Infusion pumps used to be standalone devices. Now, smart infusion pumps are tied to a server, which allows for remote diagnostics and library update pushes. As a result, they won’t run correctly unless the person configuring them has IT and server knowledge.”

On a more complex level, she said, clinical information systems relay data from various medical devices in VISN 11 intensive care and post-anesthesia care units to third-party software, which then translate those data into electronic health records (EHRs). These systems, DeFrancesco said, essentially perform “automated charting for a wide range of physiological variables.”

As a result, biomedical engineering staff “not only have to take care of individual medical devices but also third-party software and back-end servers, as well as ensure data integration into the EHR system,” said DeFrancesco. “To integrate with the EHR, we’re also working closely with IT and Informatics. So the level of complexity really runs the gamut,” she added.

Solution
In June 2014, leadership at VISN 11, along with biomedical engineering and IT staff, started to consider new ways to collaborate in supporting these complex systems. One factor they identified was working to bolster the traditional IT knowledge of biomedical
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engineering staff, which in turn would allow them to fulfill this evolving role of supporting networked medical devices. To this end, biomedical engineering collaborated with the Veterans Affairs (VA) Office of Information and Technology IT Workforce Development (ITWD) group to create a comprehensive learning plan to address and promote basic to midlevel IT skillsets.

DeFrancesco shared her idea with Lisa Goldstein, designated learning officer for VISN 11, and they collaborated on creating a proposal. With the support of executive leadership at the VISN level, Goldstein then sent the proposal to the VA Advisory Committee on Education for review, as well as shared it with Paul Holmes, employee education system learning consultant for the Veterans Health Administration (VHA).

Holmes said that his role is to determine whether education requests are valid and will result in return on investment for VHA. He also checks whether the VHA already is offering similar types of training.

“A lot of our trainings are designed from the ground up,” said Holmes. “But in this case, the training was already being offered, so we didn’t have to reinvent the wheel. We were able to leverage existing content.”

The training plan includes three progressive courses, with each course attended by two to three biomedical engineering staff from each hospital over the course of three quarters in the fiscal year. During the first quarter, the training prepares biomeds for the CompTIA Healthcare IT technician certification by providing basic knowledge and practices of IT and healthcare business operations.

“The first class was pretty broad in scope,” said Adam Biddle, a biomedical engineer at the VA Ann Arbor Healthcare System. “You learn everything from who the governing bodies behind Medicaid and Medicare are all the way down to basic Windows PC concepts.”

During the second quarter, the training focuses on the CompTIA Network+ certification, with biomeds gaining knowledge on managing and protecting network infrastructure and medical devices, as well as troubleshooting integrated networks.

“The second training got more into the physical connections—basic concepts to understanding how healthcare IT is connected,” explained Biddle. “We learned about core switches, level two and three switches, routers, and firewalls. The training also covered the different ways to connect and configure devices, as well as basic troubleshooting, resolving MAC addresses and IPs, and explaining the concepts behind a DNS.”

The third-quarter training prepped participants for the CompTIA Security+ certification by educating them on securing a network and managing network risks.

“The third training focused on algorithms that are used for encrypting data—their strengths and flaws—as well as the difficulties of making wireless secure and how to do port security on physical wired connections,” said Biddle. “So this training moved beyond the conceptual into how to actually secure devices and protect information.”

Kelly Wright, instructional systems specialist for ITWD, explained that while biomedical engineering staff took these CompTIA certification exams independently, exam vouchers were supplied to cover the cost.

Results

To date, VISN 11 biomedical engineering staff have a 100% pass rate on all certification exams.

Jeffrey Howerton, biomedical equipment support specialist at the Indianapolis VA Medical Center, shared a recent experience in which the training has paid dividends. “I received a call to a workstation where a radiologist had zero networking ability. In the past, someone from IT would have had to resolve this issue. But I was able to trace out the switches and contact our networking staff and let them know that a port was closed. Being able to talk on their level to identify the issue made the process a lot easier. They were able to reset the switch, and we were back online and the radiologists were happy.”

“If I hadn’t been trained in this area, I definitely would have been tripping on myself. And that’s just one of the many experiences I’ve had,” added Howerton.

Wright underscored the ubiquitous nature of IT in the healthcare setting: “In this day and age, just about everyone touches IT in some fashion. And the more well-trained people we have out there, the better it is for everyone.”

Cybersecurity risks, she said, escalate the importance of this learning. Although
training can’t eliminate cyberattacks, it certainly helps to lower risk. “For anyone who uses a computer in our system, proper training can help ward off potential problems,” said Wright. “There are so many things that we can do in training to help those individuals.”

And for biomedical engineering staff, she said, the benefits are clear. “This is the perfect opportunity to take some of the courses that we offer to our IT people and train our biomedics. Not only does this help them interact with IT people, it helps them stand on their own.”

“Our biomedics are very good at what they do. And our IT people are very good at what they do. Just having that handshake and knowing that you can work with each other is a great benefit,” she added.

DeFrancesco also highlighted this “foundation of trust” that has arisen between biomed and IT as a result of the training. “On a global level, the training definitely has enhanced our foundational knowledge. We’ve been able to service equipment and help information system staff in a more reliable and responsive way.”

“At the 30,000-foot view level, we’ve also created a more reliable system overall because of the increased knowledge,” added DeFrancesco. “We’re seeing less equipment downtime and less frustration from end users.”

Tony Zapata, deputy network director for VISN 11, underscored the importance of this reliability and constant connectivity. “Even for a simple piece of medical technology, if it’s tied into a nurse’s workstation, it has to be operational 24 hours a day, 7 days a week. Therefore, having more professionals around who know how to assess and fix connectivity issues quickly is imperative to us providing optimal patient care.”
DeFrancesco said that VISN 11 is hoping to continue the training into a second year but is currently in a “holding pattern” while the group awaits information on funding. She also noted that VISN 11 recently merged with VISN 10; therefore the number of sites involved in the training is likely to change.

Meanwhile, she said that the group is discussing the future curriculum (or makeup) of the training programs. “We’re looking at offering more advanced training to meet the needs of changing technology. This training might include physical network administration, training on different servers and tools, and even more robust security training and certification.”

Conclusion

Zapata said that given the ever-increasing complexity of healthcare technology, effective care cannot be delivered without a culture of collaboration. “I like the sharing of knowledge. From an executive leadership perspective, it was great to see the efficient and effective use of resources, especially considering some of the budgetary constraints we face. It’s very easy to support a pilot like this because it clearly demonstrates positive outcomes and an ability for us to deliver enhanced patient care,” he said.

“People are so busy in their day-to-day work lives that they don’t have a moment to think about practical ideas for improving the overall situation. We’re very fortunate to have Jennifer’s visionary leadership; she was able to step back and say, ‘This is a need. It’s a good idea. This is going to help us provide even safer patient care. How about if we explore it?’”

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