BRIGHT IDEAS

Army Medical Center Fortifies Training to Improve Efficiency

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At Tripler Army Medical Center (TAMC), based in Honolulu, HI, the healthcare technology management (HTM) struggles were no different than at most hospitals. Clinical staff and biomedical equipment technicians dealt with difficulty locating medical equipment, operator errors when using the equipment, and calls for repairs where no problem was found.

However, TAMC’s HTM operations and that of most American hospitals differ in two major ways. First, TAMC’s HTM umbrella spans an enormous territory, with 14,000 different maintenance-significant items dotting islands throughout the Pacific region. Far beyond its base of operations in Hawaii, TAMC’s HTM staff work and consult from Japan, Mongolia, the Royal Marshall Islands, and other locations.

Second, as a military medical treatment facility, most of TAMC’s staff operate on 3-year assignments. That translates to TAMC losing about one-third of its military staff each year, which complicates HTM efforts to train staff on how to use equipment.

Because of that turnover, medical equipment training at TAMC was like a sandcastle. Leaders could build it up, but the tides of deployment considerations would erode their efforts with each wave. A means of improving efficiency in the system had to be found.

In 2015, TAMC began an initiative to study, develop, and implement a process improvement plan. A concerted effort to provide supplemental staff training and keep track of medical equipment would form a levee against staff turnover, sparking a trend toward improved service, reduced costs, and added efficiency.

**Challenge**

In 2015, as part of a quality improvement initiative, TAMC’s civilian quality assurance and quality control analyst Elizabeth Maldonado and Warrant Officer Russell Hamblin began sifting through maintenance system data to look for ways to improve delivery of services to customers. The goal was to look for ways to improve issues related to equipment that was unable to be located, operator errors, and operator abuse, as well as “no problem found”—type issues, in order to alleviate stress between device users and HTM.

The data revealed several patterns, said Sgt. First Class Jose Maldonado, the medical maintenance manager who oversees quality assurance for TAMC’s equipment management branch, which encompasses medical maintenance, property management, and acquisitions.

“The same equipment would have a work order multiple times. We’d see the cost of the repair and that raised an eyebrow,” Maldonado said.

Other issues were apparent before the data were pulled.

“We already knew that the amount of the time our technicians were looking at equipment for services during the scheduled month was quite a bit more than it should be,” said Master Sgt. Wesley Reid, the noncommissioned officer and HTM manager in charge of TAMC’s equipment management branch.

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**At a Glance**

**SUBJECT**
Tripler Army Medical Center, Equipment Management Branch

**LOCATION**
Honolulu, HI, and several Pacific islands

**SIZE**
194 beds

**STAFF**
Seven members from healthcare technology management
Many medical device users weren’t familiar with the equipment they were using and believed it was broken even though it worked fine. Other times, equipment would indeed be damaged, but the cause was due to the operator’s lack of familiarity. The work order forms would describe these issues as “operator error.”

“That causes some strife between the departments,” Reid said. “The customer would believe that the issue was on our side, but the issue was that they were unfamiliar with the equipment. We had to give them training so they can do what’s right and make sure they have safe equipment to use.”

A concurrent issue was difficulty in locating equipment. Out of 1,600 devices checked monthly, about 30 were unable to be located for services. That resulted in wasted time for both technicians who were searching for it and clinicians who needed the equipment to be available for use.

In prioritizing its process improvement plan, TAMC referenced AAMI’s *HTM Levels Guide* by focusing on areas to train operators and technicians.

“We looked at the complexity for clinical use and a complexity of maintenance on the different devices,” Reid said. “We focused on devices that have a high complexity for use and a high risk to our patients, which would be in the operating room (OR), sterile processing department (SPD), and anesthesia—locations where there is a high density of high-risk equipment,” Reid said.

**Solution**

For the HTM staff at TAMC, the epiphany was understanding the downstream effects of the staff turnover necessitated by the 3-year assignment rotations. That turnover resulted in new staff members coming on board that were not entirely familiar, trained, or proficient in using their medical devices.

“Every year, one-third of our staff is rotating. When new equipment comes in, we can provide initial training, but a year later 33% of our staff will be new and may not be familiar with that equipment,” Reid said. “With high-risk, high-complexity equipment, we learned that we need to provide sustainment training and supplemental original equipment manufacturer training. This would reduce operator errors and ‘no problem found’ work orders that were clogging up our system.”

Prior to the sustainment training, a need to provide small “spot training” sessions sapped HTM staff’s time that could be spent on other tasks. TAMC could save money by flying in trainers to hold larger-scale training sessions—it’s easier to bring one trainer to a central location than to send several trainers out to disparate sites all over the Pacific.

“Another thing we do is we have technicians that focus on certain departments. So we have technicians specifically focused in the OR, anesthesia, and SPD. They know their customers and know to ask the right questions in order to determine who needs training,” Maldonado said.

Staff members were also sent for “superuser” training, where they can gain an expert degree of knowledge that they could use to reinforce other staff members.

“We’re aiming to sustain an amount of training among different departments on those high-risk and high-complexity pieces of equipment,” Reid said. “We want to make sure that every year when that changeover comes around, we hit up those people so they’re proficient and make sure it’s documented in their competency assessment folders. We want to ensure that they’re trained on their equipment but, more importantly, that they’re using equipment safely and not damaging it. Furthermore, we wanted to raised awareness of when equipment was truly broken and needed to be brought to us.”

To address “unable-to-locate” issues, TAMC implemented both an active and passive radio-
frequency identification (RFID) system beginning in February 2016 to track the location of medical devices in the hospital building. The system required heat mapping the hospital to determine where existing wireless networks could be used to track devices, as well as where to place new access points. The most significant effort was the tagging of more than 12,000 devices while ensuring little disruption to patients. Using hand-held units, HTM staff can now know the department in which equipment is being used, know the equipment’s status, and analyze usage patterns.

Results
Following the process improvement plan, TAMC saw an overall reduction of HTM work orders (from 872 in financial year 2015 to 540 in 2016). The improved efficiency allowed for a decrease in work hours (from 1,650 hours in 2015 to 1,073 hours in 2016) and a subsequent reduction in costs (from $233,699 in 2015 to $144,443 in 2016).

“We expect exponentially better savings this year. At some point, we expect those savings to plateau as we experience less return on investment,” Reid said. “The savings in time and money have allowed us to work on other projects and deal with a backlog of other work orders. The training just pays for itself and then some.”

For high-risk areas (anesthesia, OR, and SPD), instances of operator error and no-problem-found work orders also dropped from 2015 to 2016 (Figure 1). The percentage of work orders determined to be due to operator error dropped from 34.3% in financial year 2015 to 19.5% in financial year 2016.

The RFID-based project to improve the ability to track and locate equipment resulted in two main benefits. First, devices were easier to locate when they were needed for patient care. Second, HTM staff could know the location of devices that were due for service, which reduced maintenance burdens on clinical staff. The RFID system reduced search time for medical devices that were due for service by 10%. Unable-to-locate instances decreased from a

![Graph showing work orders for anesthesia, operating room, and sterile processing department at Tripler Army Medical Center from Oct. 2015 through Sept. 2016. *Total number of work orders for high-risk areas (anesthesia, operating room, and sterile processing department).](image-url)

**Customers Served by Tripler Army Medical Center’s HTM Staff**

- Tripler Army Medical Center, Hawaii
- Schofield Barracks Army Health Clinic, Hawaii
- Kwajalein Hospital (12-bed remote hospital with emergency surgical capabilities), Kwajalein Atoll, Royal Marshall Islands
- All military veterinary and Army dental clinics on Oahu and Kwajalein Atoll, Royal Marshall Islands
- Hawaii-based special forces and Navy Seal units
- 25th Infantry Division, Hawaii
- Warrior Ohana Medical Home, Hawaii
- Warrior Transition Battalion, Hawaii
- Joint POW-MIA Command, Hawaii
- Subject-matter expert exchanges with Mongolian Armed Forces Hospital
- Support to Department of Veterans Affairs clinic in American Samoa, as requested
- Site assistance visits to Japan and Kwajalein
peak of about 30 per month before to five following the initiative (Figure 2). “That’s 25 more items that you know are available and safe for patient use, which is going to help the productivity of the service department,” Reid said. “A side effect is that it reduces the person-hours that my technicians have to spend looking. They can now spend time working on another piece of equipment. The RFID system was very effective and efficient in the end, and it improved patient safety overall.”

**Next Steps**

The process improvement plan proved to be a success for TAMC. Going forward, TAMC plans to implement its medical device sustainment training across the entire organization by engaging nursing leaders from all departments and providing educational resources.

Future applications of the RFID system will take the data that have been collected to improve how equipment is procured and used. For example, the system now allows tracking of the amount of time equipment sits in storage, is being used on a patient, or is undergoing maintenance.

“Staff Sgt. Juan Herrera helps a staff member locate equipment using TMC’s RFID system."

Figure 2. Instances of “unable-to-locate” equipment at Tripler Army Medical Center from May 2016 through May 2017.

Future applications of the RFID system will take the data that have been collected to improve how equipment is procured and used. For example, the system now allows tracking of the amount of time equipment sits in storage, is being used on a patient, or is undergoing maintenance. The information can be used to reallocate equipment to different departments based on usage rather than purchasing new equipment or used to improve equipment processing time.

“This eliminates the need for new procurement from the high-use area and provides greater return on investment on the underutilized devices. We can also identify devices that we need to divest in due to low use and avoid maintenance costs if no longer needed,” Reid said. “I look at the RFID system as one more tool or approach at my disposal in solving complex problems in an expedited manner.”

As a military institution, the tides of 3-year assignments will continue to pull against efforts to maintain a high level of staff training and proficiency at TAMC. But through the use of RFID technology, smart planning, and sustained training, TAMC has shown that it’s not just possible to mitigate the downstream effects—it’s possible to build higher.”