Sometimes, all it takes to fix a big problem is a dedicated biomed and a fresh box of Sharpies. The Biomedical Services Department at Lexington Medical Center in West Columbia, SC, has a big job. The team of 13 biomedical equipment technicians (BMETs) service approximately 16,000 assets, including 700 infusion pumps, 1,700 pump channels, and 100 patient-controlled anesthesia modules throughout a 428-bed hospital, 60 physician practice locations, six urgent care centers, and two ambulatory surgery centers.

Among this multitude of equipment, it was the 540 physiologic monitoring command modules that posed one of the more frustrating and potentially dangerous healthcare technology management (HTM) issues for the hospital in 2012. The modules are used to measure and process physiologic signals from the patient (e.g., respiration, blood pressure, temperature) to pass on to the patient’s monitor. But no matter how hard HTM staff worked to keep those modules corralled in their departments, they managed to drift away from their assigned areas.

That the modules were all identical Spacelabs units didn’t help the matter. A command module from the surgical intensive care unit (SICU) looked similar to one used by anesthesia, and it came loaded with the same functions. But even though they looked and operated the same, they weren’t programmed to alarm in the same way.

At best, an improperly migrated module would result in an unnecessary call to the HTM department to “fix” the unit—a frustrating case of “no problem found.” At worst, it could result in critical physiological alarms being missed.

Michael Chisholm, a BMET at Lexington, too often was called on to repair these modules. In this case, staff in the intensive care unit (ICU) complained that the blood pressure alarms on the physiologic monitors failed to activate.

“We get a lot of calls after hours saying ‘my blood pressure’s not alarming.’ The first question we ask is, ‘What is your default setting set to?’ Then, we find out they have the wrong module,” Chisholm said. “Because they have the wrong module, they didn’t have the right alarm default settings. As much as you tell staff, ‘don’t swap them,’ they somehow let them get loose. That concerned me.”

**Challenge**

How can a physiologic monitoring module end up all the way in the wrong department?

Start with a patient who is admitted to the SICU following surgery earlier in the day. Their physiologic monitoring module is programmed for a cautious, intensive care environment. But suddenly, that patient needs to go back into surgery. Anesthesia takes the patient and their module into the operating room (OR) and plugs their SICU
module into their patient monitor. Once the surgery is complete, someone grabs an unused module off of a table—an anesthesia module—and plugs that in without thinking about whose module it is. The patient and their monitor return to the SICU together, now paired with an anesthesia module.

“The nurse looks at the module and sees that it has invasive blood pressure lines. She’s happy and thinks it’s what she needs. But nobody really knows all those default settings we set for each unit,” Chisholm said. “We tell the nurse managers but does it ever get down to nursing? I’m not sure.”

That’s an issue because anesthesia monitors are preprogrammed with the intention that they will be closely watched by healthcare personnel during a procedure. They’re supposed to keep quiet. In the SICU, such a silenced monitor could fail to adequately alert healthcare personnel to a dangerous medical event.

“If one of those migrates to a unit where somebody isn’t in the room all the time, and then you’re going to have no alarms—that's the danger. This is really a patient safety issue,” said Joe Howe, biomedical services manager at Lexington.

On the other side of the coin, modules would also follow patients from noisy areas, such as the emergency department, into the intermediate ICU. There, they’d produce too many alarms for their stepped-down setting, resulting in complaints and alarm fatigue.

Solution
Chisholm’s frustration over these issues built up. Then, one day, he sprang into action. What if there was a better way to identify the modules, he wondered?

“I just decided I’ve had enough of these callbacks at 3 a.m.” Chisholm said. “There’s no room to put on any kind of identifier because the module slides in. But it has a nice white front to it. I thought, ‘Well, why don’t I just take a colored permanent marker and go around the unit several times with the marker?’”

Chisholm jumped online with the hospital’s office supply store and bought a kit of Sharpie permanent markers. He developed a color-coded system, so each department would be identified by a color code (Figure 1). Chisholm then drew around the plastic faceplates of the modules with the marker as quickly as he could get his hands on them, starting with the ICUs (Figure 2).

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Columns and Departments

Getting the ink on the units proved to be the easy part. The task also required looking up and printing off the listing of all the modules assigned to each department from Lexington’s computerized maintenance management system (CMMS) and validating where the module belongs by using the serial number and asset number. Accessing the areas where the modules were used posed one of the greatest challenges for the project. Much of the work needed to be done on the weekends.

Chisholm distributed the plan throughout the Biomedical Services Department through its weekly meetings with the support of Howe, his manager. He communicated the color scheme with clinicians by meeting them on daily rounds.

“I would take a module and show the coordinators and say, ‘This is your color code.’ I’d show the managers and say, ‘You need to make sure all your modules have this color. If you don’t have this color, please call us,’” Chisholm said.

Results
Marking all 540 physiologic monitoring modules took about a year and a half.

The effort to improve communication between HTM and other hospital departments ultimately paid off for the departments and the hospital. Now that the initiative is in full swing, Chisholm said he rarely gets called for improperly configured blood pressure alarms.

“It was a matter of communicating with the people working with the monitor,” Chisholm said. “In the emergency department, I’d tell the techs, ‘You know, you don’t have to swap the module.’ They thought they could, because they were never properly educated on what can and can’t be done. We do still have issues with anesthesia. They seem to like all modules regardless of color.”

Clinical staff responded positively to the color coding of the modules. The easy-to-see system aids in conducting asset inventories because the module’s home is visible with just a quick glance, said Donna Peterson, director of nursing at Lexington.

“But most importantly, our staff verifies that the correct module is in use during the admission process of all OR cases to the cardiovascular ICU or the SICU,” she said.

The initiative also caught the attention of the manufacturer, Spacelabs. Hunter Ives, Spacelabs account manager for the southeast region, said the company was impressed by both Chisholm’s idea and his initiative.

“Michael was way ahead of the curve—a real problem solver. He was the first biomed that I’m aware of in the southeast region to develop this kind of color-coordinating system,” Ives said. “He understood that no longer can biomeds just be concerned about biomed functions. You have to work with other departments within the hospital.”

Eventually, Spacelabs began to distribute a series of 32 color stickers designed to work with any hospital’s color-coding system. Those have since replaced the Sharpie pens on the physiologic modules (Figure 3). The color-coded system that Chisholm developed remains in place.

“Clinical staff like the stickers because you can see them from across the room. The Sharpie pen was okay, but you had to be fairly close to see what color it was. Now you can tell without even going into a patient’s room if the right module is in the right department,” Howe said.

“I would take a module and show the coordinators and say, ‘This is your color code.’ I’d show the managers and say, ‘You need to make sure all your modules have this color. If you don’t have this color, please call us.’”

—Michael Chisholm, BMET at Lexington Medical Center

Figure 3. A physiologic monitoring module from the Lexington Medical Center emergency department uses a red sticker to aid in identification.
Conclusion
An added benefit of the project was that HTM staff got the chance to verify each module by serial number to make sure it was in its rightful owner’s hands in the first place. The project helped keep Lexington’s CMMS tidy and organized, Howe said.

A subsequent project will work to permanently secure the physiologic monitoring modules to the patient monitor in some departments. While the color coding system helped to reduce the migration of modules away from their home departments, some still manage to escape. That project will use a new screw available from Spacelabs that hides behind the label and prevents the module from being removed mistakenly.

For this project and others in which Chisholm demonstrated a passion to solve problems and develop solutions, Howe nominated him for Lexington Medical Center’s annual excellence award: the “Lexy.” Chisholm won the award, which was a first for a BMET at Lexington.

“Patient safety is everyone’s job,” Howe said. “And any idea that you have that can help enhance that—you should speak up.”

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