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IN THIS ISSUE

Hospital medication technology can cut mistakes by tens of 1000s

Potential ADEs fell by half

Barcode technology combined with a barcode electronic medication-administration system (eMAR) can reduce potential adverse events related to medication errors by more than 50%, according to a new study funded by the Agency of Healthcare Research and Quality (AHRQ) of Rockville, MD.

Investigators observed 14,041 medication administrations and reviewed 3,082 order transcriptions. They found an 11.5% error rate of non-timing errors in medication administration among units that did not use barcode eMAR, versus a 6.8% error rate among those that did use barcode eMAR.[1]

Also, they found that the rate of potential adverse drug events fell from 3.1% without the use of barcode eMAR to 1.6% with its use, representing a 50.8% relative reduction.[1]

Barcode eMAR also resulted in a 27.3% reduction in the rate of timing errors in medication administration and an elimination of transcription errors, which occurred at a rate of 6.1% on units without the barcode eMAR.[1]

"We found a pretty dramatic reduction in errors made in the process of giving patients medications," says **Eric Poon**, MD, MPH, an assistant professor of medicine and director of clinical informatics at Brigham and Women's Hospital of Boston, MA.

"We projected the technology at our hospital is preventing about 90,000 serious errors a year," Poon adds. "These are errors that could potentially result in patient harm."

While these numbers are large, they still represent a small percentage of total doses administered at a large hospital.

"To put it in perspective, with or without the technology, health care providers are very

SUMMARY POINTS

- Study shows 50% decrease in potential adverse events related to medication errors with barcode eMAR technology.
- New technology prevents 90,000 serious errors a year at one hospital.
- Technological change improves safety and collaboration between disciplines.

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good at giving medications to patients," Poon says.

"The catch is that hospitals give a lot of medications — for example, we give 6 million doses a year," Poon says. "So even a very small error rate could translate into a large number of errors, which is why a high reliability safety net like barcode scanning at the point of medication administration can have a big impact."

The hospital began with barcode verification and the pharmacy in its initial quest to redesign the medication use system to make it a safer process, says **William W. Churchill**, RPh, MS, executive director of pharmacy services at Brigham and Women's Hospital.

"We published an article in the *Annals of Internal Medicine* and showed dramatic results in the incidence of medication dispensing errors and a dramatic reduction in potential adverse drug events from using that in the pharmacy," Churchill says.

The goal was to learn all they could while testing the system in the pharmacy before they rolled it out to the hospital's nurses. This worked very well as the hospital then rolled out barcode verification at the bedside, he adds.

"We rolled that part out with a lot better results and less difficulty than we had in the pharmacy," he says. *(See story on implementing barcode technology, p. 75.)*

Earlier research also demonstrated a strong economic benefit in implementing new barcode technology.

"When you look at all the costs associated with the technology, including five years of development and implementation and a $1.3 million one-time development cost, there is a net benefit after five years of $3.5 million from the decrease in adverse drug events," Churchill explains.

"The break-even point for a return on investment occurred within one year of the system becoming fully operational," he adds. "So it was pretty substantial."

The most relevant finding in the latest research in the *New England Journal of Medicine* is related to the 51% relative reduction in incidence of serious errors with potential for adverse drug events, Poon says.

These included mistakes where the wrong drug dose was given, as well as documentation mistakes, such as when a nurse gives a dose but neglects to document it on paper, Poon explains.

This type has a potential for harm if another nurse were to administer a second dose because of the lack of documentation, he adds.

"We keep track of errors that our system intercepts because every time a nurse gives a medication, the computer checks to see whether the right medication is being scanned, and if it's scanned, the computer registers a warning," Poon says. "We tracked the number of warnings the system issues, and we found the number of warnings to be stable."

Poon's future research may include a formal cost benefit analysis that looks at the avoided costs of preventing adverse events due to medication errors.

When hospitals install barcode scanning and eMAR, their chief obstacles involve workflow issues.

"I think this technology is complex and to pull it off successfully, you need to invest the right

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Editor: Melinda Young.
Executive Editor: Coles McKagen, (404) 262-5420, (coles.mckagen@ahcmedia.com).
Senior Managing Editor: Paula Cousins, (404) 262-5468, (paula.cousins@ahcmedia.com).
Director of Marketing: Schandale Kornegay.

Editorial Questions

For questions or comments, call Paula Cousins at (404) 262-5468.

amount of resources in designing the workflow," Poon suggests.

"You have to make sure your front-line clinicians are ready to take advantage of this opportunity," he adds. "They need to look critically at how to take advantage of the technology, thinking about how to do things differently."

There should be adequate training for clinicians, along with ample support for them as the new technology is implemented.

"It's hard to argue with anything that reduces errors by more than 50%," Poon notes. "But the question remains: 'How can we have hospitals use this technology more easily?'"

Hospitals installing barcode scanning and eMAR technology will need the right financial and human talent resources to make it work, he adds.

Health systems that make training and support a priority might prevent some of the workflow problems that can occur with the installation of new technology.

No technological system is perfect, and medication mistakes still occur.

"The results from this study reflected our results early on during implementation, the 6-8 weeks after we rolled out the technology," Poon says. "We continue to work on the technology and have made quite a few improvements."

For instance, the hospital has provided staff with a tool called the Scheduler that helps nurses and pharmacists decide when patients should get their medications. Also, the eMAR screen was changed to provide more information, per a suggestion staff made.

"This makes it much easier for disciplines to work together and come to the best decision," Poon says. "And it's a good example of how we have had to listen to front-line clinicians to make the system better."

Also, the hospital tracked any trends regarding difficulty scanning medications to see if certain brands and manufacturers created the most problems. When they discovered a trend of one type of medication not scanning well, they made suggestions to medication manufacturers to change how they print barcode on the drugs to make these easier to scan, Poon says.

"Or sometimes we would go with the manufacturer who gives us a scannable barcode," he says. "It's to their advantage to change the barcodes because they see this technology as something to benefit patients."

The chief benefit is improved medication use safety, but there also have been benefits related to better collaboration between nursing and pharmacy and medical staff, Churchill says.

"We work off the same information, same dataset, and we know when drugs are ordered and reviewed by pharmacists, and we know when drugs are due and needed on the unit," he explains. "I think nursing and pharmacy have grown together and have become very close colleagues and allies in working together as we make medication safety a priority."

The big question for hospitals that lag behind in electronic technologies is whether their initial technology investment should be with a barcode eMAR or with computerized provider order entry (CPOE), Poon notes.

"CPOE can prevent medication errors, and this technology can prevent errors," he explains.

So which should a health care system choose to install first?

"CPOE tends to catch errors of cognition, physician errors, the kind of mistakes made because of a lack of knowledge or information," Poon explains. "Whereas, bar code scanning makes sure the therapeutic plan arrived at can be implemented as planned."

Brigham and Women' Hospital installed CPOE first, a technology the hospital has had for more than 15 years, he says. ■

Reference

1. Poon EG, Keohane CA, Yoon CS, et al. Effect of barcode technology on the safety of medication administration. *N Engl J Med* 2010;362:1698-1707.

Pharmacy chief outlines changes needed to implement new technology

Staff input is crucial to process

Making major technological changes in hospitals is both expensive and very labor-intensive. Hospitals should plan for pilot tests of the new equipment, educating and marketing the change to staff, and receiving feedback that will result in process changes.

The preparation work in advance of rolling out new technology systemwide is necessary to prevent long-term workflow problems and glitches.

"When you go through this trial period you really begin to see how processes actually are working in comparison to what we think they are doing," says **William W. Churchill**, RPh, MS, executive director of pharmacy services at Brigham and Women's Hospital in Boston, MA.

Brigham and Women's Hospital spent five years implementing a new barcode verification technology within an electronic medication-administration system (eMAR).

"We found that we had to make several changes in our order entry system, several changes in pharmacy processes, and changes in nursing processes," Churchill says. "It was not a surprise to most of us that we had to make changes, but it was a surprise that we had to do it in all three areas, and this was a fairly large undertaking."

Here are some examples of changes they made during the implementation process and how they solved problems:

• **Moving from paper to electronic orders:** "We were half in the paper world and half out of it," Churchill says. "We had electronic order entry, but manual eMAR."

Before eMAR, doctors would write orders with detailed instructions for the nurse. Then the nurse would record these on the eMAR. This process proved problematic.

For instance, a doctor would write an order for a medication and say that if the patient's heart rate is less than a certain value, the patient should be given this other medication dosage, Churchill explains.

This type of instruction was not a medication order, but a type of "if-then" decision tree that could not be translated in an electronic order. And physicians commonly wrote these types of instructions, which left hundreds of potential orders that could not be easily translated to the eMAR.

"There was no way to populate it on the eMAR because the only way it would populate on eMAR was if you had an official order that would appear on the pharmacy order and nursing order," Churchill says.

"So we had to get all these instructions and make them eMAR friendly," he adds. "We had to make them appropriately list instructions for nurses, and we had to make sure none of the instructions contained what was tantamount to a medication order."

Pharmacists educated nurses on what to do if clinicians wrote a medication order within a medication order in their instructions. Since these were not valid in the eMAR world, nurses would have to call physicians when the patient's specified condition changes occurred and ask them at that point whether they wished to change the medication order. Then these changes could be reviewed by a pharmacist for clinical efficacy and safety.

"I think there were a lot more calls to physicians about getting orders written the right way," Churchill says. "This was very early on in the process when we were working our way through the early stages of barcode and eMAR verification."

• **Learning more about bedside administration of medication:** "We in pharmacy didn't know nearly as much as we would have hoped about medication scheduling," Churchill says.

Pharmacists needed to learn more about how intravenous antibiotics and other medications were scheduled, he adds.

The solution is to have pharmacists spend time with nurses to hear about the workflow issues nurses face daily in scheduling medication, he says.

"We took for granted that pharmacists would know how to do this, and we did have pharmacists meet with nurses, but that wasn't enough," Churchill says.

Having nurses educate pharmacists on their workflow demands in scheduling medications would be a more ideal approach.

• **Avoiding barcode problems:** The pharmacy had the responsibility of making certain every drug had a barcode on it and that each barcode worked.

"These were things we spent some time going through and testing in the pharmacy before it moved to nurses," Churchill says. "We weeded out the bad barcodes and repackaged medications that didn't have barcodes on them."

The hospital developed its own repackaging center with a machine designed for putting on barcode labels on injectable vials and syringes.

"We repackaged oral solids, oral tablets, and handled unique dosage formats like suppositories," Churchill says. "We hired repackaging technicians."

This work began in 2003 with the staff doing barcodes for 2-2.5 million doses a year up until about five years ago when the FDA required that all medication be barcoded. After this the amount of product that arrived without barcodes dropped off dramatically, Churchill says. ■

Hospital meets challenge of new IV medication delivery system technology

All averted errors captured by system

The big challenge for Women and Children's Hospital-Kaleida Health of Buffalo, NY, was using new IV medication delivery technology for patients that ranged from premature infants to geriatric adults.

"We needed an IV pump that would address our entire spectrum of patients, and the new pump wasn't very useful for pediatrics at first, so we leveraged it to make it pediatric-friendly," says **Michael A. Cimino**, MS, RPh, clinical pharmacy services manager at Women and Children's Hospital.

The process took several months, and it required flexibility on the part of the pump's manufacturer, who made a number of infrastructure changes to accommodate the hospital's needs.

Often, when new technology is blocked by old processes or specialized needs, the solution is work-arounds where hospital staff bypass some of the technology's functions to adjust it to suit their patients' specific needs. But this can increase the risk of medication errors, Cimino notes.

"So we wanted to approach the problem directly and have the programming designed specifically for pediatrics, while recognizing the fact that in other parts of our hospital, it also could be used for different populations," he says.

Here's how hospital pharmacists and others met the challenge:

• **Build flexibility into IV pump's library:** Pharmacists can program the pump's drug library with doses in a range that is applicable for a particular population. For instance, the Women and Children's Hospital needed to have doses for premature neonates all the way to adults, but these needed to be segregated by hospital area so there would be no mistake of adult doses being administered to children or babies, Cimino explains.

"If this pump was going to be used in the ob/gyn area, then you could pick a category for the pump so you'd have access to the library specific to that population," he says.

Cimino assigned a pharmacist clinical coordinator to the job of programming the pump's library with appropriate dosage ranges.

• **Use a multidisciplinary team approach to improving process:** "We had assistance from the pump manufacturers, and this was a multidisciplinary process that involved pharmacy, nursing, medical staff, ISP, and medical engineering," he adds.

"We used the pumps, trying them out and identifying problems," Cimino says. "And this had a benefit in terms of implementation."

Each time the team made improvements to the IV pump process, various end users would try out the changes and report back with suggestions until they were satisfied, he says.

"This is in contrast to other situations where technologies are introduced with minimal education and end-user input and satisfaction," Cimino says. "End users include physicians and others who rely on this technology either directly or indirectly."

Often the end result is that employees have difficulty using the new technology, and the acceptance rate is low.

"This process went very smoothly with a high rate of acceptance because of iterations of trials," Cimino says. "We kept going through the process of identifying problems and addressing them to get to the point where all end users were happy with it."

• **Solve workflow problems through trials and improvements:** Some workflow issues are difficult to anticipate, so they are discovered only through a trial or testing process.

For example, the new IV pump's information screen was too small for the multidisciplinary care team to read from 10 to 15 feet away as they conducted patient rounds, Cimino says.

"If they can't see the rate or dosage, then someone has to walk over there to read it," he adds.

Physicians didn't like this inconvenience, so pharmacists asked the manufacturer to change the size of the screen and its writing so that it could be seen from 10 feet away. The manufacturer made the changes, and physician satisfaction increased with the new technology, Cimino says.

SUMMARY POINTS

- Hospital needed IV pump that would work for pediatrics and adults.
- Pharmacists programmed pump's drug library with necessary dose ranges.
- A trial period helped determine workflow issues.

Another workflow problem involved the touch screen's reprogramming process.

When nurses needed to reprogram the touch screen to change the dosage, they had to touch 4-5 different screens before reaching the correct one, says **Kelly Michienzi**, PharmD, clinical coordinator.

"It took them too long," she says. "We had hot buttons added to the touch screen so they can quickly titrate doses without going back to the main menu to reprogram dosages."

With the new hot button, nurses can make changes with one touch.

Since one of the hospital's goals was to program the IV pumps for use in pediatrics, they added dosing units for a pediatric population, Michienzi notes.

As a safety measure, this meant the maximum dosage needed to be changed so nurses couldn't exceed the usual adult dose, she explains.

"On the first version of the old pump software, you could pick one or the other, and if a patient was a large individual, you could program it to give a bigger dose than the usual adult dose, Michienzi says.

As nurses and pharmacists worked with the new technology, they found they wanted better and longer descriptions in drug naming.

"If you use a drug for more than one indication, you need to be able to put it in twice with more description," Michienzi says.

For example, the drug naloxone could have two different dosages based on the indication.

"If the indication is for narcotic reversal, then you would use a high dose," Michienzi explains. "If the indication is just because of a side effect of itching then the patient needs a low dose."

In the old version, nurses would just see the word "naloxone" on the pump. After making the change, this became "naloxone-overdose" or "naloxone-pruritus," she adds.

This change also improved patient safety by making it less likely someone would accidentally give a patient a high dose of naloxone when they needed a low dose for treating itching.

This long trial and improvement process eliminated the need for staff to do work-arounds with the new technology, Cimino notes.

"We addressed how the normal workflow for a nurse would occur," he says. "So there was very little need to do work-arounds, and the equipment was user-friendly."

The changes they made followed the normal logic and flow of end-users' work process.

• **Measuring outcomes more efficiently:** Hospitals and pharmacy departments want to measure medication errors and safety improvements, but self-reported methods often greatly under-report errors.

The IV pump technology could automatically track and report all prevented medication errors. When someone attempted to administer a medication at the wrong rate or wrong dose, the machine captured this information. And it was captured anonymously, so mistakes couldn't be tracked back to the person who made the error. This proved to be a much more efficient way to track prevented medication errors.

The Women and Children's Hospital found that the voluntary medication error reporting system only identified 4.6% of all prevented errors, Cimino says.

"Our incidence reporting system was bad at identifying and reporting, as compared with the electronic method of identifying errors," he adds.

While everyone has a responsibility to voluntarily report medication errors, there are several barriers to their doing so: first, there is the fear of reprisal; secondly, they might fix the error, see that nothing bad has happened to the patient, so they rationalize that it's okay to not report it, Cimino explains.

"If a person is afraid that reporting an error will impact someone's employment and the hospital has a punitive system, then they'll fix the problem but not report it," he says.

Third, even if a hospital has a mandatory reporting policy, staff will find ways around it because this is a very time-consuming process. And, fourth, even if a hospital employee is well-intentioned and takes time to report all medication errors for a week, the next week the person's workload might be so significant that fewer errors are recorded.

This leads to an inherent variability in reporting errors, Cimino says.

"It might take a significant amount of time to report errors, and how will people get their work done if adequate resources are not allocated to that activity," Cimino says.

Another benefit to having the new technology track medication errors was that the very process of tracking the errors led to a reduction in errors.

In data collected over one 12-month period, Cimino found that from the baseline of the first weeks after the IV pump's implementation to the end of the first year of its use, prevented medication errors dropped by almost 50%.

"This was a user-friendly pump, so there weren't that many pump errors because of staff's unfamiliarity with the technology," Cimino notes.

The point is that hospitals always have difficulty tracking potential medication errors unless they have a technological solution to tracking the information, he adds. ■

Hospital's ADE system improves medication safety, cuts costs

Length of stay also decreased

Saint Joseph Regional Medical Center of Mishawaka, IN, has an adverse drug event (ADE) alert system that has resulted in decreased severity-adjusted mortality rates, length of stay (LOS), and drug costs since it was implemented more than five years ago.

The hospital is part of Trinity Health, a large, multistate Catholic health care system. Trinity has been working for seven years on installing electronic medical records in all of its facilities, and the adverse drug alert system has been a part of that effort, says **Jason P. Jablonski**, RPh, director of pharmacy, respiratory therapy, sleep disorders center, and neurodiagnostics at Saint Joseph.

"Our pharmacy department cost-per-person went down from $867 to $826, and we didn't have any changes in staffing because of the alert system," Jablonski says.

Jablonski and co-investigators conducted a retrospective observational study evaluating the effects of the ADE alert system in seven Trinity Health network hospitals. They found that an external control group had increased pharmacy drug costs for the same period, with costs rising from an average of $734 to $797 per patient.[1]

SUMMARY POINTS

- Pharmacy department cost-per-person declined from $867 to $826 under new adverse drug event alert system.
- New ADE alert system relies on programmed rules regarding drug use.
- The system enables department to do more medication initiatives.

The study also found a significant decrease in severity-adjusted mortality rates in the study ADE alert system group. Also, severity-adjusted LOS decreased significantly in the study group.[1]

The ADE alert system relies on programmed rules regarding drug use. The study outlined 17 rules that were used to trigger an ADE alert.

"The 17 alerts are part of the package," Jablonski says.

For instance, rule 1 involved the use of digoxin, magnesium, and potassium products. It states that the alert is triggered when digoxin is ordered. The alert prompts clinicians to check the patient's laboratory values for low serum potassium (< 3.4 meq/L) or low serum magnesium (< 1.3 meq/L) concentrations or elevated digoxin concentration (> 2.2 ng/mL). The alert also states that if the patient's electrolyte level is low, then current orders should be checked for the absence of potassium or magnesium supplementation.[1]

"It would say, 'You just entered an order for digoxin, and your patient has low potassium or low magnesium, and there are no supplementation of potassium or magnesium ordered,'" Jablonski explains. "So you then call the doctor and tell him or her that the patient's potassium is low and will get lower."

The goal is to prevent an ADE, he adds.

The second rule is similar, but pertains to when the patient, perhaps already on digoxin, has a high digoxin level.

"If the patient was on digoxin and the lab work drawn three days later showed low potassium or magnesium, then this would produce an alert that would warn the pharmacist that they should contact the physician," Jablonski says. "They should let them know about the low magnesium or potassium and that supplementation would be in order."

Other alerts pertain to drugs that might cause hyperkalemia, high serum creatinine concentration, low serum albumin concentration, ketorolac, elevated liver enzymes, drug-induced delirium, low platelet counts, low absolute neutrophil count, and major sedative properties.[1]

"Rules three and four are sister orders," Jablonski says. "The alert triggers when you order a drug that might cause hyperkalemia."

So if a physician orders a potassium-sparing drug or a diuretic, causing the potassium to increase to > 5.4 meq/L, then the alert will ask why a product is being ordered that will make the potassium rise even more, he explains.

The fourth alert triggers when the patient's serum potassium concentration is > 6.0 meq/L. In this case, the alert will suggest that maybe the

patient should no longer be given a potassium supplementation, he says.

The fifth and sixth rules involve renal drugs.

"The alert looks at all drugs that need renal adjustment," Jablonski says.

For instance, the fifth rule's alert is triggered whenever drugs that are excreted renally are ordered, except for one-time orders.[1]

Lab results from the previous seven days are checked for high serum creatinine concentration.[1]

The 17 rules are standard ADE rules for the electronic ADE alert system, but health care facilities can select whichever medication rules they want to use, Jablonski says.

"We've done a lot over the years to tweak them and make them more specific so we won't get a lot of false positives," he explains. "Like with the renal rule, it doesn't look to see if the drug has already been adjusted."

Also, as the health system's electronic medical record has come on line, the pharmacy department can do so many more medication safety initiatives, he says.

"This was phase one, an elementary safety process we implemented years ago," Jablonski says. "We were trying to measure if there was any value in the process."

What they found was that over time the alerts trained the staff. While they might have used the alerts to inform their decisions initially, over time they incorporated the rules in their work.

For instance, the rule 17 is an alert triggered whenever a dose of amitriptyline ≥ 50 mg is ordered for a patient who is 65 years of age or older. As clinicians became familiar with this rule over time, they stopped ordering amitriptyline as frequently, Jablonski says.

Another advantage of the alerts is that pharmacists can rely on these to warn them if a patient's lab values worsen while on drugs that are renally excreted, he notes.

"It's an automatic surveillance," he adds. "Before, hospitals would each day receive a report from the lab showing all serum levels."

Another change taking place is that some of the alerts now are being transformed into more dramatic alerts that will pop up on the computer screen when clinicians are keying in a drug order.

The ultimate goal is to send physicians a message each time they prescribe a drug. The message would address whether the particular drug therapy is relevant, and it would outline the drug's potential side effects and how it might impact the patient's care.

"Some day, we'll have a truly smart system that will prevent ADEs from ever happening before they get off the ground," Jablonski says. "If a physician tries to order warfarin, and there is no baseline PTNR, then it will pop up on the screen and say, 'You can't proceed until you order this lab.'"

The electronic ADE system is moving in this direction, but still has some distance to go, he adds. ■

Reference

1. Piontek F, Kohli R, Conlon P, et al. Effects of an adverse-drug-event alert system on cost and quality outcomes in community hospitals. *Am J Health Syst Pharm* 2010;67:613-620.

Health system develops telepharmacy model that works for ICUs

It saves money and expands reach

Rural and smaller hospitals struggle with covering all pharmacy staffing needs around the clock, often paying for contract pharmacy services to fill in on weekends and night shifts.

Now there is a successful model that shows a different, more efficient, and, at least for large health care systems, a more cost-effective way to provide these services.

Aurora Health Care in Milwaukee, WI, has developed a telemedicine model for providing pharmacy services to rural and outlying hospital intensive care units (ICUs). Their model has saved the hospital money.

Called the electronic ICU (eICU), the program has satellite hospitals within the health system install technology that provides audio and video connections with a central telemedicine office location, says **Thomas W. Woller**, MS, FASHP, vice president of pharmacy

SUMMARY POINTS

- Electronic ICU using telepharmacy model saved health care system $300,000 in first year.
- Telepharmacists perform medication order review.
- They also provide formulary support services.

services at Aurora Health Care, which is a 15-hospital health system.

"So if you go into the hospital's ICU, you'll see a camera and microphone," Woller says. "These are linked electronically to a central location where we have nurses, physicians, and pharmacists."

The health system has 246 ICU beds, and all of these are connected to the remote eICU monitoring facility.[1]

In 2007, the eICU's first year, the program saved the health care system approximately $300,000, Woller says.

There were about $500,000 in drug cost reductions plus about $600,000 savings from not having to pay an outside contractor to do pharmacy order entry work, and the total cost for the service was less than $800,000 for the year.

The cost included salaries for eICU pharmacists, pharmacy technicians, and minimal supplies.

"We documented over 1,000 interventions that were initiated by a pharmacist at the eICU location," Woller says.

When the health system first began to contract with the software vendor who provides eICU services, there weren't plans to include pharmacists in the eICU site, Woller notes.

"The services were only designed to be for a physician and nurse and only for ICU patients," he explains. "There would be a microphone and camera at every ICU bed, and these would link back to this office setting."

When Woller heard about these plans, he spoke with the pharmacy clinical director about how it would be ideal to have a pharmacist involved, as well.

"But we couldn't make the numbers work," Woller recalls. "We didn't think we could offset the costs of a pharmacist position."

Then about six months later, the health care system had made changes that made it an even more integrated system, and a new opportunity arose: "We looked at doing order entry for smaller hospitals and saw an opportunity there clinically," Woller says.

They reviewed the costs of providing medication review services for night and weekend shifts at the system's smaller hospitals and saw that they were paying hundreds of thousands of dollars a year to contractors.

"Physicians write these orders in the middle of the night, and these have to be verified by a pharmacist to make sure the orders are right and the proper warnings are attached," he says.

Traditionally, these approvals would be delayed until 7 a.m. when the hospital's pharmacist reported for work. But in recent years the Joint Commission of Oakbrook Terrace, IL, has required a prospective order review program, and this has forced even small hospitals to contract with services that provide pharmacy review around the clock, he explains.

Woller and the clinical director determined that if they added the prospective order review services to pharmacists staffing the eICU then this would make it cost-effective, while improving patient safety.

"If we didn't have to pay an external vendor, then we could use the money to pay for this project," Woller says. "And we improved the quality of care, so it was a win-win-win."

Even the start-up costs were feasible, costing an estimated $40,000 for the electronic equipment dedicated to the pharmacist and pharmacy technician, Woller says.

"I believe we were the first organization to apply both clinical and distribution activities in a virtual environment, and we were the first to incorporate pharmacy into a full telemedicine unit that included nursing and physician participants," he adds.

The central eICU office operates 24 hours a day, every day, and it's staffed by people who juggle their eICU schedules with traditional clinical care in the main hospital. Pharmacists staff the office most hours of the day, and during busier times, from 6 p.m. to 2 a.m., there will be two pharmacists on duty, he says.

While in the office-based eICU, they look at as many as six different video screens, which include a look at the ICU patients, as well as their medical records, monitoring equipment, and other data.

"The patient is in a traditional ICU bed that might be 100 miles away," Woller explains. "The patient still receives direct patient care, and this is a secondary level of care."

The eICU pharmacists wear telephone headsets and speak into microphones when communicating with staff at the bedside. They monitor their remotely located patients' drug therapy, provide medication order verification, and provide all the safety checks they normally would in an ICU setting.

"A high percentage of interventions are questions we have from physicians or nurses about drug therapy being ordered for the patient," Woller says. "These are the typical questions an ICU bedside pharmacist would handle."

The difference is that the pharmacist will handle these questions simultaneously from five to 10 different hospitals, located hundreds of miles apart.

Also, the eICU pharmacist provides recommendations about antimicrobial coverage and provides formulary support services. ■

Reference

1. Meidl TM, Woller TW, Iglar AM, et al. Implementation of pharmacy services in a telemedicine intensive care unit. *Am J Health Syst Pharm* 2008;65:1464-1469.

Hospitals benefit in many ways when hiring medication safety officer

Avoided mistakes can save money

The role of medication safety officer (MSO) in hospitals has grown over the past two decades, but the recent recession has caused a setback with hospitals cutting back on the position. This is a big mistake, an expert says.

Medication safety officers educate hospital staff on safety and prevention, they help hospitals implement new technologies related to medication distribution and use, they participate in project management, and they take leadership roles within health care organizations, says **Deb Saine**, RPh, MS, medication safety manager at Winchester Medical Center in Winchester, VA. Saine was scheduled to speak about the role of the medication safety officer at the American Society of Health-System Pharmacists (ASHP), held June 6-9, 2010, in Tampa, FL.

Larger hospitals developed this specialized role over the decades in response to greater accreditation, regulatory, and public emphasis placed on safety standards, Saine notes. *(See story on what medication safety officers do, p. 83.)*

"As technology became more integral in medication use, the concept and role of the medication safety officer became more prominent," she adds.

The journal *Pharmacotherapy* released a report in 2008 based on a survey in which the authors asked respondents if they had someone serving as a drug safety officer.

"In that survey, it was reported that about 35% of all responding hospitals said they provided drug safety officer services," Saine says. "There might be variances in what that encompasses and what that person's job responsibilities are."

Although hospitals see value in having a dedicated MSO, the cost of creating that position has limited its growth.

A survey conducted in the fall of 2009 by the Institute for Safe Medication Practices in Horsham, PA, found that half of its 848 hospital respondents reported that the economic downturn has forced them to reduce time or eliminate the MSO or quality/risk management staff position. In some cases, the prior MSO's responsibilities were assumed by others, including pharmacy directors.

It's a mistake to cut these positions because hospitals need to increase their focus on medication safety and improve outcomes due to initiatives by the Joint Commission of Oakbrook Terrace, IL, and the Centers for Medicare and Medicaid Services (CMS), Saine says.

The CMS has core measures for diseases like congestive heart failure (CHF), which hospitals must meet, and many of these measures involve drug use, she adds.

"So the hospital has to report its performance on those core measures, and that's another role for the medication safety officer," she says. "Our goal is to optimize safety and help hospitals meet those outcomes."

"It's hard to quantify what a medication safety officer brings in terms of finances, but if we look at the incidence of preventable adverse drug events, one number used is that two of every 100 admissions experience a preventable medication-related adverse event," she explains.

"The hospital cost associated with that ADE is estimated at $5,800, and there is an average increase in the length of stay of 4.6 days," Saine says. "The $5,800 doesn't include indirect costs associated with that ADE, and those costs can reach as high as more than $10,000 per admission."

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A 700-bed hospital could save more than $2.8 million a year in preventing ADEs, she adds. ■

Medication safety officer role adds value to hospital pharmacy

They serve a variety of roles for hospital

For hospital pharmacies that are considering advocating for a new position dealing with medication safety, the first question might be: What does a medication safety officer do?

Medication safety officers (MSOs) have many different skills, including medication expertise and a good understanding of how the medication use process works, says **Deb Saine**, RPh, MS, medication safety manager at Winchester Medical Center in Winchester, VA.

"We have to be collaborative and team-oriented because medications aren't used just in the four walls of pharmacy," Saine explains. "We have to keep the big picture in mind and think of all the different disciplines that interface with the medication use process."

Plus MSOs need good leadership and communication skills because they'll have to influence practice changes, she adds.

Here are some of the processes and tasks MSOs can perform:

• **Promote culture of safety:** Medication safety officers need to promote a culture of safety throughout a hospital organization, from front-line staff to leadership, Saine says.

"This culture acknowledges that humans make errors, so when we design processes around medication use, we build in redundancies, countermeasures, and safeguards to prevent errors from happening," she explains.

"It's very important that the organization encourages reporting errors that have occurred or areas of risk for patient harm," Saine adds.

One way to do this is to look at medication errors with a systems-based approach, meaning that the process for capturing errors is not focused on individuals, but on trends and errors that might result from workflow and system problems.

Also, MSOs help health care organizations learn from past mistakes by initiating process and system changes that will reduce the risk of medication errors.

"The last thing is to make certain there is accountability for health care workers' actions and their job performance related to handling medications," Saine says.

"All of these address the idea of culture or safety," she adds. "As a medication safety officer, you really depend on information from front-line staff that is doing the work because if you don't know what's wrong, then you can't fix it."

• **Collect medication error data:** Most of the information that will help a medication safety officer identify system and process problems related to medication errors will be collected from error reports.

Hospital staff will report a risk or incident that occurred, and the MSO will collect the data. Or else electronic dispensing equipment or medication orders will collect data about mistakes that were prevented.

"When we use automatic dispensing cabinets, that technology gives us information on how many drugs were obtained by override by the nurse, and we can drill this information down into which drugs, which area, and which reason they were overridden," Saine says. "Then we look for risk factors in the data."

Also Smart Pumps collect information on how many times alerts were issued and what nurses did in response to the alerts.

Whether a health system collects voluntary medication error reports or has technological methods of collecting information, it's important to supplement this information with one-on-one encounters.

"The other ways I get information is through safety rounding, asking staff questions, observing how they practice," Saine says.

Medication safety officers can visit staff and speak with them about their individual medication safety issues and concerns, Saine says.

MSOs also can attend committee meetings, picking up on trends and issues in these venues.

The key is to engage with people in settings where they might be comfortable discussing medication problems they've experienced or witnessed.

A final source of error information is from external resources, such as newsletters, Joint Commission sentinel event alerts, publications, and journals. These sources might identify a trend with a particular product or practice that also is common to the MSO's hospital.

• **Assist with special projects:** Medication safety officers can be leaders in special projects, including transitions from paper-based or mechanical processes to electronic processes with new technology.

"When we were thinking of transitioning from old IV pumps to Smart Pumps, I led the team that looked at the selection of those pumps," Saine says. "Once we selected that pump, it was my responsibility to coordinate building the drug library, coordinating updates, and providing ongoing monitoring, using the technology performance improvement software."

In another project related to the Joint Commission's patient safety goal for anticoagulation therapy, Saine was the leader of an interdisciplinary team responsible for meeting that goal.

"When that standard was published, hospitals had one year to prepare before they were expected to have everything in place," Saine says. "We had six hospitals involved in the project to meet those requirements for the safety goal."

Through Saine's leadership, the team convinced the hospital to hire a pharmacist who specializes in anticoagulation management.

MSOs also can help hospitals implement new or improved risk reporting systems.

"I helped to drive the need for that because I was looking for improved data on our medication errors and adverse events, and these weren't present in our current system," Saine says. "So we interviewed different companies, selected a system, and it was my responsibility to build the module for medication management, error reporting, and adverse event reporting, and that's system-wide."

Saine also works on paper order sets and computerized provider order entry (CPOE) to make sure all error sets are built clearly and safely and comply with all standards of practice.

"I do that by teaching pharmacist specialists, including a critical care specialist, an anticoagulation specialist, and a pediatric specialist, what they need to look for in terms of errors, safety, and prevention when they review those orders," Saine says. "I provide a checklist for them because the number of order sets built are too much for one person to review."

"My goal is that they will teach this information to the students and residents they round with," Saine says. "Our biggest challenge is influencing performance and how others work and making certain they integrate medication safety in their day-to-day work." ■