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Information Edge >> *Written by Elizabeth Gardner*

A measured dose of safety

Addressing adverse drug events is among first steps prescribed as Trinity Health installs an electronic medical record system

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Trinity Health is spending \$190 million during the next four years to install an electronic medical record system with sophisticated measures for decreasing medical errors. But in the interim, simple measures are working just fine for a fraction of that expense.

An ongoing "conversation" between Trinity's pharmacy computer system and its laboratory system is helping to avert hundreds of adverse drug events, or ADEs, per month through the simple measure of printing out alerts in its hospitals' pharmacies.

Fourteen of Trinity's 19 member health systems are using the ADE computer module, which looks at pharmacy orders and lab results together and prints out an alert in the pharmacy if the combination suggests there might be a problem.

The computer system prompts from 800 to 900 changes in orders each month-discontinuing a drug, changing a dosage or a delivery method, or substituting another drug. About 13,000 alerts are issued each month across all the hospitals that have the system installed.

A hospital pharmacist reviews each alert and either changes the order or contacts the physician if the alert warrants action, as about 10% of them do.

"People can remember seven things at once-that's why there are seven digits in phone numbers-but there are a lot more than seven things to remember when you're prescribing drugs," says Bruce Van Cleave, executive vice president of clinical and physician services at Novi, Mich.-based Trinity. "This system helps people remember things they already know."

The significance of that challenge when placing medication orders has given rise to a clamor in some circles for computerized physician order entry, which gives doctors immediate feedback about potential harm stemming from a medication decision.

Three reports issued by the Institute of Medicine, as well as pressure from the Leapfrog Group, a business coalition seeking to accelerate patient-safety practices, have spotlighted computer programs that analyze, calculate, alert and remind, depending on the information entered by a physician.

Computerized physician order entry is a key element of the electronic medical record planned for 17 of Trinity's member health systems. But as the price tag for the project demonstrates, the expense of such an innovation is considerable. And measurable benefits are years away.

So while computerized physician order entry begins its gradual spread into the routine of Trinity hospitals, the healthcare system has given its doctors an advance look at what the future will bring-laying out the potential benefit before making them change their ordering practices.

"We were looking for ways to leverage our resources and intellect to help people do the right thing," Van Cleave says.

Besides doing the right thing, the healthcare system's early and rough estimates of the business impact show savings of more than \$25,000 per month at one hospital using conservative internal estimates of the costs avoided by preventing ADEs. If per-case savings from published studies are plugged in, that monthly financial impact rises to nearly \$160,000.

Always on alert

The total investment for ADE reporting capability at all 17 health systems will be \$27.7 million, or about \$1.6 million apiece. Installation is complete at 14 systems to date, a Trinity spokesman says. The project constitutes the first phase of the overall installation of computerized physician order entry and represents about 15% of that \$190 million expense.

"This system provides a safety net," says Ted Woods, pharmacy information systems coordinator at Mercy General Health Partners in Muskegon, Mich., one of the first Trinity members to implement the alert system. "A lot of these things were being checked already but maybe not consistently. Probably the orthopedic unit wasn't getting the same level of attention as the intensive-care unit. Now nobody gets missed," Woods says.

For example, the system catches situations where drugs have affected a patient's blood count, and does it more consistently than the pharmacy's standard protocol, says Kevin Cahill, director of pharmacy at 359-bed Mercy Medical Center in Clinton, Iowa. "If we weren't specifically reviewing every lab, we might not notice. But with the alert system, there have been a number of times when we've brought blood-count problems to the physician's attention."

Seventeen rules—chosen by a systemwide clinical committee as those likely to have the most impact—cover dozens of drug and/or lab-result combinations (See related story, this page).

Quick action on an alert can prevent a patient from getting too much of the potentially deadly heart drug digoxin, based on his or her electrolyte levels, or being poisoned by more than 70 different drugs that can't be cleared quickly enough by impaired kidneys. The system can flag a drug that may cause delirium or suggest a substitute for an antibiotic that's causing diarrhea.

Trinity has centralized computer services and patient-information repositories for all of its hospitals at its Detroit-area headquarters. That strategy has made it easier to coordinate use of the alerts, because each hospital doesn't have to handle implementing and maintaining the system on its own.

The list of alerts is standardized and all the users receive monthly reports showing how many of each have appeared at each institution so they can compare results. A reading taken last year showed that the number of clinically significant ADEs per 1,000 admissions ranged from 32 at a facility in Mason City, Iowa, to 179 at a Trinity hospital in Port Huron, Mich. (See chart).

Reception by the pharmacists has been good overall. Woods says the initial fear at Mercy General—that the system would cause more paperwork without improving care—has proved unfounded. "People understand now that it catches things that would fall through the cracks."

What's the payoff so far? That's hard to say, Van Cleave says, because the "before" picture is so hard to measure. ADEs are chronically underreported, and there's no infrastructure in place to capture a number to use as a starting point.

"Over time, we might see improvement in outcomes, or decreased incident reporting or less liability, but we wouldn't be able to point to a cause-and-effect relationship with this system," he says. "But that's not as important to me as that it's making this a better place."

"We haven't been able to reproduce the numbers that we've seen in the literature for cost reductions," says Chris Manthey, coordinator of clinical pharmacy services at St. Joseph Mercy Health System in Ann Arbor, Mich. "But it's a no-brainer that it should be done."

Measuring benefits

Mercy General took a stab at measuring benefits after it installed the alert module in May 2001.

Early in its implementation, the pharmacy staff conducted a one-month financial analysis of the system's performance at one of Mercy General's two campuses. The hospital had 1,247 admissions during the month and 970 ADE alerts were printed in the pharmacy. Pharmacists reviewed each one and found that 79, or about 8%, needed some action by a physician. None had been generated in error, and the staff disagreed with the system's recommendations in only

five cases.

A team of pharmacists reviewed the 79 "actionable" alerts after the fact, and determined that the pharmacy's regular review practices would have caught and corrected the situation in 45 of them, even without the ADE alert system. But that left 34 that they might not have caught.

To hang a dollar value on the system, the team assigned each averted ADE a price tag of \$800 (Mercy's internal cost estimate) to \$4,685 (the average cost of an ADE as cited in published studies).

Using that metric, Mercy General potentially saved from \$27,200 to \$159,290 in a single month on ADEs that wouldn't have been caught without the alerts.

Improving clinical significance

A 10% "action rate" for an alerting system is low-it means that the system is crying wolf nine times out of 10. But Trinity officials say the rate will increase as the level of automation goes up and the system's overall communication improves.

For example, the lab system currently doesn't have information on a patient's height and weight-key figures for determining whether a drug dosage is too high for the patient's kidney capacity. All it can do now is ask a human to cross-check with the patient's record whenever one of the target drugs is ordered.

Because details from a patient record are pertinent to so many decisions, the cross-checking alert is one of the most frequent notices triggered by the ADE alert system. Most of the time, the dosage is fine.

When the electronic medical record is implemented, the system will be able to make those calculations upfront. That one change should eliminate more than 40% of the system's false positives, based on Mercy General's one-month study.

Several Trinity pharmacists say they've started to see changes in physicians' prescribing patterns as a result of the system. The most frequent change is a reduction in dosages for drugs that are excreted through the kidneys. A lab test that measures levels of a substance called creatinine can tell physicians how well a patient's kidneys are clearing potent drugs from the body.

"The doctors got sick of us pestering them, so they're now writing that we can adjust the dose if necessary, or they're writing the correct dose themselves," Woods says.

"Our doctors have become a lot more attuned to renal function," Cahill says. "They'll check the creatinine clearance themselves, and some of them plug the values into their Palms (mobile handheld computers) and compute the dosage."

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