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Norton Healthcare**Membership****Services Office:**1660 Highway 100 South
Suite 306

Minneapolis, MN 55416

T. 952.545.5880

F. 952.545.6116

E. scottsdale@scottsdaleinstitute.orgW. scottsdaleinstitute.org

Using IT to Prevent Adverse Events Part Two: Solutions

**EXECUTIVE
SUMMARY**

This month's IE focus is on emerging IT solutions to prevent adverse events (AEs), a sequel to February's report on trends in this area. We hope last month's issue provided a framework for considering these solutions, which range from local to national in scope. We talk to experts at Baptist Health in Arkansas, Meridian Health in New Jersey, Summa Health System in Ohio and SI Sponsoring Partners Cerner and Thomson Healthcare.

While this report is on solutions, it doesn't hurt to provide a quick contextual review from Jerry Osheroff, MD, *FACP*, *FACMI*, Thomson Healthcare's chief clinical informatics officer and one of the country's leading experts on clinical decision support. He notes that initial efforts to detect quality lapses such as sub-standard outcomes and failure to follow best practices included "throwing IT at it" in the form of retrospective reviews of billing data as long as a year after an event occurred. Medstat (now

part of Thomson Healthcare) and other firms developed software algorithms to facilitate that kind of analysis. However, demand eventually developed for real-time tools and dedicated clinical data, a dream coming true today with electronic health records (EHR) and Clinical Decision Support (CDS).

"The EHR provides greater opportunities to intervene in real time," he says, buttressed by CDS tools, which provide the most sophisticated IT-supported mechanisms for identifying and preventing potential AEs. CDS has become an industry focus, reflected in the fact that *Improving Outcomes with CDS: An Implementer's Guide* has become a HIMSS' best-seller and Book of the Year last year. Osheroff is the lead author on that publication, and on the AMIA white paper "A Roadmap for National Action on Clinical Decision Support."

Still, while CDS "is coming together" for the industry, Osheroff acknowledges it's one of several elements required to tackle the AE issue. "I'll be the first to



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The Scottsdale Institute is proud to welcome new member Sharp HealthCare, based in San Diego.

Sharp HealthCare is a not-for-profit integrated regional health care delivery system. It includes four acute care hospitals (Sharp Chula Vista Medical Center, Sharp Coronado Hospital, Sharp Grossmont Hospital and Sharp Memorial Hospital) and three specialty hospitals (Sharp Mary Birch Hospital for Women, Sharp Mesa Vista Hospital and Sharp Vista Pacifica.) It also includes three medical groups, plus a full spectrum of other facilities and services.

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Jerry Osheroff, MD,
Chief Clinical
Informatics Officer,
Thomson Healthcare
Stamford, Conn.

admit that CDS is necessary but not sufficient to achieve that goal.” Other requirements include increased redundancy, redesigned workflows and development of cultures of safety. Osheroff envisions a future

state in which best CDS implementation practices, industrial strength CDS solutions and robust national CDS infrastructure come together in a continuous outcomes improvement loop. “Wouldn’t it be wicked cool?” he asks.

Icons in Akron

Healthcare systems like Summa Health System, a four-hospital system based in Akron, Ohio, are working hard to close their ends of the loop.



“We recently completed CPOE at two hospitals, our primary campus and another, and have 90% physician compliance,” says Pam Banchy, RN, Summa’s director of clinical systems. [See January’s “CEO Outlook” IE report for an interview with Tom Strauss, Summa president and CEO.] Summa works with more than 2,000 physicians, includ-

ing attendings and residents at the two campuses. “We’ve been able to incorporate food and drug allergy alerts, ADEs, contraindications, drug duplications and many MLMs (medical logic modules) at the point of clinician decision based on predefined criteria,” she says.

The paper system it replaced was torturous: physicians write orders; secretaries transcribe them on medication-treatment record forms; those documents go to pharmacy via fax or in-box; are picked up within 30 minutes; pharmacists look at the orders and either input them into the system or stop the process and say, “Oh, this dose exceeds the maximum;” they page physicians; wait for them to call back; and, finally, facilitate the orders being changed.

At Summa, those manual steps are eliminated by CPOE enhanced with clinical-decision-support content developed in-house that includes linking medications with therapeutic levels of liver enzymes, for example. The system automatically searches the database and brings up the patient’s last laboratory value to the clinician at the point of care “so she doesn’t have to go find it,” says Banchy.

Escalating benefits

Still, efficiency gains for clinicians are secondary to patient safety. In the case of Heparin, for example, the system

reminds clinicians to order certain blood tests. And then there's the issue of training, recruitment and retention of residents and nurses. "Many [would-be] residents apply to only those organizations with CPOE and easy accessibility of the patient's chart," says Banchy. "Everything at Summa is in the electronic chart and completely wireless. So, not only can physicians take COWS [computers on wheels] into the patient's room, but when they do the residents are already looking at the chart. Multiple people can look at the chart at the same time."

Summa's CPOE came with about 20 quality indicators "out of the box," notes Banchy, and the hospital developed another 80 internally. "The software comes with guidelines and we modified it to fit our quality indicators. This is our platform going forward in terms of order-entry results. We will add some functionality for the ED and nursing."

Contract signing to implementation—purchase, training of staff, design and implementation—required three years, with the first hospital taking eight months to implement, a rate of about 100 beds a month. After that the process accelerated, with the second, 250-bed facility implemented in a two-week Big Bang ending on Jan. 3rd. "We came in under-budget and on-time," says Banchy. "Leadership adoption was exceptional and senior physician leadership was especially key. Physicians saw the value. It's truly a case of 'if you build it they will come.'"

Data collected so far: drug interaction alerts have averaged 23 a week; allergy alerts, 60 a day; dosage alerts amount to 18 a week. "Those are all preventable AEs. So we've avoided ADRs and events," says Banchy, adding that Summa is currently calculating the system's impact on quality and factors like reduction in length of stay.

National repository

With customer sites scattered across the country, major HIS vendors have a unique opportunity to partner with their clients in tracking AEs across states and regions. That's exactly what Cerner is doing. In 2000, the Kansas City-based firm created the *Health Facts*® data warehouse to centralize data from customers who agreed to supply the information—de-identified to protect privacy and confidentiality—in exchange for patient safety reports.



**Bobbi Zink, director,
Health Facts, Cerner,
Kansas City, Mo.**

"We identify retrospectively where adverse events have occurred," says Bobbi Zink, director of *Health Facts*. The data can be sliced and diced from multiple angles: medications or lab values alone and in conjunction, patient diagnosis and others.

*Welcome New Member
continued*

Serving a population of approximately 3 million in San Diego County, Sharp operates 1,870 beds, has approximately 2,600 physicians on medical staffs, 1,582 physicians in medical groups, more than 14,000 employees, and represents \$1.3 billion in assets and \$1.8 billion in revenue.

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April 10

Adoption of CPOE in Community Hospitals: Leading Practices

- Erica Drazen, VP, Emerging Practices, FCG, Boston

April 12

Integrating e-ICU and Robotics at Parkview

- Susan Ahrens, MD, director, Adult Critical Care, Parkview Health, Fort Wayne, Ind.

April 18

Software Quality – A New Reality

- Kent Gale, president, KLAS Enterprises, Orem, Utah
- Tim Zoph, CIO, Northwestern Memorial Hospital, Chicago

May 1

Patient Flow, Communications, or Preventing Adverse Events Case Study

May 8

Intermountain Healthcare: Documented and Tested Disaster Recovery Process and Procedures

- Karl J. West, associate VP, Information Services, Intermountain Healthcare, Salt Lake City

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Doug McNair, MD, PhD,
senior VP, Clinical
Research, Cerner,
Kansas City, Mo.

Doug McNair, MD, PhD, a senior VP for clinical research at Cerner, says the system's embedded rules consider factors like patient age because some drugs — anti-psychotics, for example—affect the patient's nervous system and greatly heighten the risk for falls. "That's especially true for older people with respiratory disease," he says, adding that pain medications can depress a person's pulmonary functions and also lead to AEs.

Other rules apply to pediatric patients, for example, associating the factors of age plus juvenile diabetes; or factoring in drugs that manage rheumatoid arthritis. "We've tried to focus on the opportunities for value to particular populations such as where the patient is located and her diagnosis or combination of diagnoses. You can look at multiple factors," says McNair.

Closed loop, vendor version

Cerner produces monthly reports for distribution to safety officers and pharmacists. McNair says the *Health Facts* data warehouse goes beyond retrospective data mining, however, because Cerner also uses it as a basis for developing point-of-care clinical decision support for its CPOE product.

"They work hand in hand," he says, providing an example of how one feeds into the other. "In some cases it's hard to identify what's safety and quality related to preventing bed sores. If they're not prevented or managed they can be both life-threatening and expensive. You can look in the data warehouse and find disproportionate numbers of people in certain subpopulations with greater risk, such as older, frail women who suffered strokes and significant weight loss. Then you can use that data to look at events moment to moment using CDS."

An advantage in this kind of analysis, he says, is that *Health Facts* uses a standardized nomenclature that's "been part of our data model since the 1980s," based on ICD9 codes, SNOMED, NDC codes and CPT procedure codes. "All of these apples can be compared to apples."

Zink says Cerner reaches out each year to encourage customers to participate, although sharing safety data—even when it's de-identified—is not always an easy thing for a healthcare provider organization. To date, she says, the *Health Facts* data warehouse contains more than three terabytes of data, including more than 500 million lab results with detailed date and time values, and more than 80 million medication orders based on NDC code, dose, frequency and route. Future plans are to gradually adopt additional data elements from flow sheets, problem lists, surgery and other alerts done within the

process of care. A team of 24 biostatisticians—masters and PhDs, epidemiologists and pharmacists—helps maintain the data warehouse.

Winged feet for physicians

Delivering rules-based clinical information to physicians on the run must be part of any closed loop system for preventing AEs.



Alan Ying, MD, CMO,
Thomson Healthcare
Stamford, Conn.

Alan Ying, MD, recently named chief medical officer for Thomson Healthcare was the CEO and founder of MercuryMD,

which provides a mobile platform

for physicians to extract patient clinical information from disparate hospital systems and present it in a concise, integrated and interactive display. As part of Thomson Healthcare, MercuryMD has developed the Clinical Xpert, CareFocus module for this mobile application as a tool to develop rules based on specific circumstances. The module is being used today in several dozen installations.

While most IT aimed at AE prevention is currently focused on medication administration, Ying notes, it is getting more predictive by moving upstream in

the process. The blood thinner Coumadin is a case in point. Chronic increase in blood thinness may be imperceptible to a provider from looking at individual factors, but a combination of early indications that could occur can help prevent internal bleeding or stroke.

“There are numerous examples like this,” says Ying, including nosocomial infections which can be prevented by analyzing data, for example, that certain bacteria proliferate in a corner room on the third floor and determining that transplant patients should not be assigned there. This approach requires heavy-duty analytics to identify patterns followed by workflow interventions to prevent the likely adverse event.

Patterns

Clinical Xpert, CareFocus applies a real-time “pattern filter” that plugs into existing HIS-vendor systems to provide information to physicians, nurses and pharmacists. Two types of rules are involved: 1) At the point of care, “black & white” rules based on discrete facts such as whether a patient is on beta blockers or other medication; 2) Further upstream, identifying all the subtle data elements that build toward a possible AE.

Typically at the start of a CPOE implementation, health systems will write order-based rules such as “If A, then C and not B,” says Ying. However, six months to a year after Go Live they real-

Upcoming Events continued

May 10

HL7 Update

- Robert Dolin, MD, Kaiser Permanente, HL7 Board Member and Co-chair, HL7 Structured Documents Technical Committee, and Co-Editor, CDA
- Liora Alschuler, HL7 Board Member and Co-chair, HL7 Structured Documents Technical Committee, and Co-Editor, CDA.

May 15

Subsidizing Physician EHRs: Open Discussion

- Chris Podges, CIO, Munson Healthcare, Traverse City, Mich.

May 16

Email Encryption Approaches and Tools

- Ashini Surati, CHRISTUS Health, Irving, Texas
- Pat Moylan, Parkview Health, Fort Wayne, Ind.

May 22

Patient Flow, Communications, or Preventing Adverse Events Case Study

May 30

Partners Healthcare: The Connected Health Imperative - A Transformational Care Delivery Model for the Hospital/Physician Network

- Joseph C. Kvedar, MD, director, Center for Connected Health, Partners HealthCare System, Inc., Boston

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“People have alert fatigue because they have alerts related to stuff they don’t need.”

ize just a fraction of prescription drugs have been incorporated into those orders, either because of the sheer volume of existing formularies or because a slew of new ones has emerged. Thomson Healthcare has focused on supplying a broad and deep database of content that stays current with the latest JAMA study—and making it possible to integrate that content into a hospital’s CPOE system. As more mainstream provider organizations adopt this kind of analytics, to not do so may become a source of risk.

Does this trend foreshadow industrial-strength alert fatigue? Ying says the devil is in appropriate detail. “People have alert fatigue because they have alerts related to stuff they don’t need,” he says, adding that alerts depend on well-honed knowledge management. “It’s important to say, ‘This is exactly what you need to know in your particular clinical role.’ The tool must be highly specific—in contrast to the formulaic rules that dun clinicians 10, 20 or even 30 times an hour,” says Ying. With the Clinical Xpert, CareFocus module, pharmacists and case managers create the rules, thus providing a strategy that helps eliminate inappropriate alerts. “That’s how you get by alert fatigue.”

For example, at one unnamed provider organization, endocrinologists and diabetic specialists previously had to either wait for a physician consult or manually

sort through paper-chart piles to identify patients at risk. A team of five diabetic specialists established a list of 10 criteria that identify those patients electronically. “Now those providers don’t have to wait for a consult. They get the information on a handheld,” says Ying.

Early birds catch AEs

“We’re good at identifying patients after they’ve left, but then it’s too late,” says David House, VP and CIO at Baptist Health, a five-hospital system based in Little Rock, Ark. “When you identify things early in the cycle, you can begin treatment more quickly.” Baptist, the largest healthcare system in Arkansas, in 2001 implemented the now Thomson Healthcare’s (MercuryMD) Clinical Xpert solution suite as a way to provide physicians with a PDA-based rounding tool offering mobile access to clinical and lab results, demographics and medication profiles.



Baptist Health



David House, VP/CIO,
Baptist Health,
Little Rock, Ark.

A year ago, to build on that initiative Baptist adopted an integrated module to identify and manage clinician-defined patient populations through custom-

designed, electronic patient lists that were then made conveniently available to clinicians on

either hand-held devices or web-enabled desktop PCs.

“We said if you could identify patient populations for a particular physician, why couldn’t you begin to build a list of patients based on a medication they were or weren’t on, or a certain lab value and identify some of those people while in the hospital?” asks House. “We started building queries downloadable to a PDA or a desktop. The idea was to identify populations earlier in a stay and allow us to intervene earlier to manage them to better outcomes.”

The pharmacy became an early target for these views. “Pharmacists used to be people in the back room counting pills. Now we’re relying on them for their clinical skills. The system has changed the whole work of clinical pharmacists,” says House. Infection control has also been improved by being able to differentiate antibiotic or non-antibiotic populations.

Fast return

Vanesa Rambo, Baptist project leader, says the system cost \$74,000 plus a full-time FTE, and with only six months of data seems to be generating positive returns. Last June, Baptist trained clinical pharmacists to use the system as a way to both increase workflow efficiency and improve compliance with JCAHO and CMS core measures, including beta-blocker therapy in AMI patients. Clinical queries can identify, for example, kidney

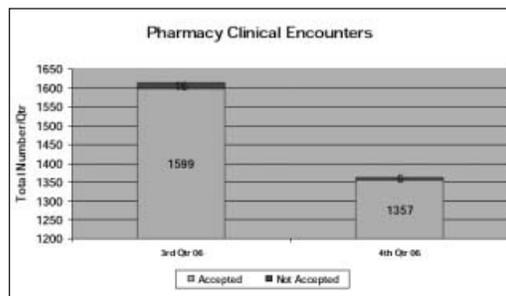


Vanesa Rambo, project leader, Baptist Health, Little Rock, Ark.

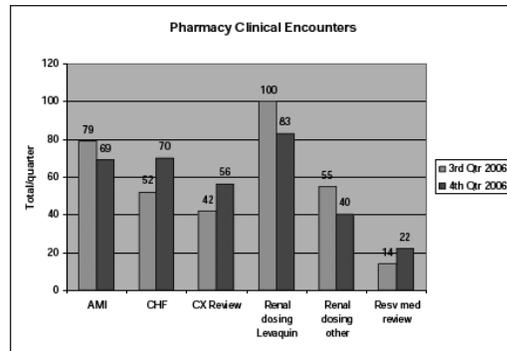
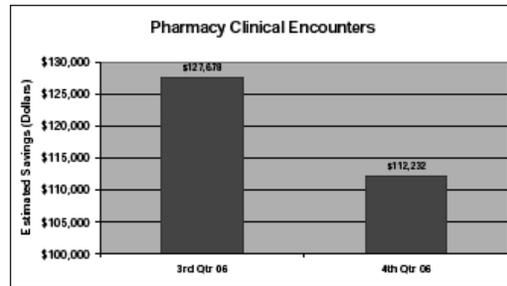
patients in order to avoid medications harmful to kidney function; patients with infections to enable the most effective and cost-efficient medication management; to identify potential adverse side effects; and to determine appropriate medication therapy, such as ensuring a pneumonia patient is on the right antibiotics.

After the training and query development, pharmacy workflow and accountability were reorganized and each shift was assigned the Clinical Xpert, CareFocus queries for daily review, with monitoring documented in a database. Data collected since last June by Kevin Robertson, PharmD, a Baptist clinical pharmacist, shows that about half of clinical encounters (see graphs below) involved use of Clinical Xpert, CareFocus queries. That figure is expected to rise with increased staff proficiency and expanding application of the tool.

“We started building queries downloadable to a PDA or a desktop. The idea was to identify populations earlier in a stay and allow us to intervene earlier to manage them to better outcomes.”



“It was day-end and by the time people saw it, that was yesterday’s information. For pharmacists, being that late could mean a patient got two more doses of a drug that might cause kidney failure.”



At Baptist’s North Little Rock campus the case coordination department uses Clinical Xpert patient profiles in team meetings. “It helps them so much,” says Rambo. “They used to spend every morning sifting through paper records. It has cut an hour off their day. They love it. It’s one of the best tools they’ve ever used.” At the main Little Rock campus an infection-control epidemiologist began using the system last month to identify new isolation patients hours earlier than was possible under the previous process, which also required sorting through an overwhelming pile of paper medical records. “It’s so fascinating,” says Rambo. “It’s one of the most useful tools any hospital can use. When clinicians understand what this tool can do, they can’t live without it.”

The biggest challenge for Baptist and the plan for the future, she says, is to

convert more data online. Like many provider organizations, the health system is caught between the paper and electronic worlds. Says Rambo: “MData CareFocus is a tool that reinforces the value of digital information. It’s not about the method of input, but, instead about the power of the output and the positive outcomes that can be derived by pinpointing patients and intervening early.”

Garden of safety and quality

Clinical Xpert is just one of several patient-safety-and-quality solutions used by Meridian Health, a four-hospital health system based in Neptune, N.J. “We have all kinds of solutions in place,” says Margaret Quinn, MD, CMIO at the health system serving central New Jersey suburbs. “Our nurses do nursing assessments, including online risk scores for falls and pressure ulcers.” Those scores are incorporated in a work list and, when appropriate, alerts are posted in bold letters at the top to prompt clinicians to order their pressure-ulcer prevention protocol, for example.

Meridian had the ability to run day-end reports on specific patients on, say, risky drugs, but found it wanting. “It was day-end and by the time people saw it, that was yesterday’s information. For pharmacists, being that late could mean a patient got two more doses of a drug that might cause kidney failure,” she says.

The Clinical Xpert, CareFocus module allows Meridian clinicians to use handheld devices to access a list of all

patients on that drug real-time and highlight those with abnormal levels and act on them immediately.

Quinn says when the solution was launched 18 months ago it was not only “huge for our clinical pharmacists,” but also for other care-team members like nutritionists, who need to know data such as what patients have low albumin. While it’s difficult to directly link any single tool to quality improvements, overall positive results are mounting. Meridian won the John M. Eisenberg Award for Patient Safety and Quality in 2005 jointly from the National Quality Forum and The Joint Commission based on evidence-based protocols and compliance with core measures.

More specifically, Meridian clinicians have increased compliance with prescribing beta blockers for AMI patients to 62% in 2003, 85% in 2004 and 100% in September 2005—maintaining that level of compliance since that time. “We’re a demonstration of what online tools can do for you,”

says Quinn, “and that’s where real value lies—not so much in specific improvements in compliance but in the increasing realization that online tools prompt positive changes in quality.”

Conclusion

Despite being relatively embryonic from an industry-at-large perspective, detection and prevention of clinical adverse events via systematic, IT-enabled strategies is advancing on several fronts nationally and locally. The goal, as Thomson Healthcare’s Osheroff and others have described, is to create a closed loop of data-sharing between two poles: point-of-care clinical decision support and national data repository. It’s a familiar challenge because it both reflects and shapes the advancement of healthcare IT generally, involving the development of clinical and IT standards, the further penetration of EHRs among providers and the shifting of the healthcare economic equation to pay for performance. As I’ve said for 10 years, we’re about 10 years away, right?



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