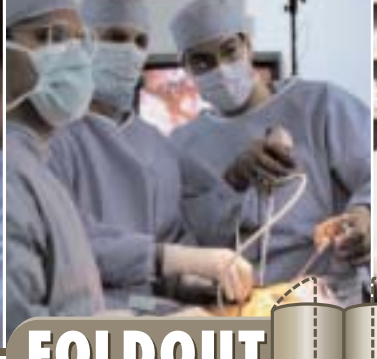





FOLDOUT FEATURE

Reducing Medical Errors

IT helps secure the patient safety net.

It's not often that a *number* becomes a battle cry. But when the Institute of Medicine's 1999 report estimated 98,000 deaths a year from medical mistakes in U.S. hospitals, healthcare leaders rallied to the cause of shrinking that alarming figure. The opportunities for error are varied and numerous—congestive heart failure misdiagnosed as heartburn, the wrong blood type or drug dose delivered to the bedside, for example.

In a Kaiser Foundation survey, 95 percent of physicians, 89 percent of nurses and 82 percent of administrators said they'd witnessed a serious medical error. Besides needless injury and loss of life, errors have economic costs: $17 billion to $29 billion annually.

When industry leaders began setting up safety initiatives to prevent such errors, they turned to IT tools for support. Among the most universally respected technologies are computerized physician order entry (CPOE), e-prescribing, clinical decision support and bar coding.

These electronic sentries do reduce medical mistakes. CPOE might, for example, reduce the number of prescriptions written to elderly patients for drugs that are particularly dangerous for them—a number (8 percent) that has shown no improvement between the Centers for Disease Control and Prevention's study in 1995 and the one in 2000. But because of their complexity and expense, implementation has been slow. Less than 2 percent of U.S. hospitals have "live" CPOE, according to the Leapfrog Group.

The problem is glaring enough that President Bush's proposed 2004 budget for the Department of Health and Human Services (HHS) Agency for Healthcare Research and Quality (AHRQ) asks for $84 million (up $24 million from 2003) to address it. Help for small community and rural hospitals accounts for $50 million—to invest in technologies such as CPOE, e-prescribing, clinical decision support, electronic medical records, handheld computers and computerized patient support groups. Another $10 million is allocated for AHRQ efforts in promoting IT among hospitals, such as developing clinical terminology and messaging standards. And $3 million will go toward developing a Web interface for several HHS agencies to share information on adverse medical events.

Private companies also are recognizing the potential efficiency and accuracy of e-prescribing and are investing in it. California-based WellPoint Health Networks, the nation's second largest health insurer, is offering a free handheld-based e-prescribing package to 19,000 of its contracting doctors and a discounted package to the remaining 150,000.

But federal mandates are still in the distance. The U.S. Food and Drug Administration requires that drug companies bar code all unit-dose drugs sold to hospitals by 2006. The recently passed Medicare Prescription Drug Improvement and Modernization Act requires establishment of e-prescribing standards by 2005 and provides for matching grants to small and rural practices to purchase e-prescribing software.

Building a sturdy safety net must involve everyone in healthcare—providers in small clinics, long-term care centers, urgent care centers, private homes and pharmacies. And IT is only part of the solution. Even the most sophisticated systems can't force providers to use them or heed the warnings they were set up to give. They can't solve funding or staffing problems or make patients more responsible for their own health. A culture of safety needs to be created, and nourished.

On the following pages, we've assembled some of the initiatives and organizations that are working to diminish medical errors and technologies that can facilitate these efforts. A look at the milestones over the years affirms that we live in a time of unprecedented medical discovery, innovation and information. But much work remains to be done in harnessing it for patient safety.

—Mary Van Beusekom

Safer by the Dozen

The Agency for Healthcare Research and Quality (AHRQ), an arm of the U.S. Department of Health and Human Services and a major source of research funding, studies healthcare quality, costs and patient safety; founded 1989; www.ahcpr.gov

The eHealth Initiative (eHI) aims to improve healthcare quality, safety and efficiency by giving patients, providers and payers access to reliable and secure electronic information through an interconnected health infrastructure; founded 2001; www.ehealthinitiative.org

The Foundation for Health Care Quality (FCHQ), a nonprofit organization that spans the concerns of practitioners, payers, government agencies, employers and consumers, sponsors programs in electronic commerce, quality measurement and consumer affairs; founded 1988; www.qualityhealth.org

The Health Technology Center (HealthTech) is a nonprofit research and education organization that provides information to healthcare organizations about technology's future impact on healthcare delivery; founded 2000; www.healthtech.org

The Institute for Healthcare Improvement (IHI) is a nonprofit group that aims to advance the quality and value of healthcare through education and a membership network; founded 1991; www.ihi.org

The Institute for Safe Medication Practices (ISMP) is a nonprofit organization that works to prevent adverse drug events via improved drug distribution, naming, packaging, labeling and delivery-system design; founded 1994; www.ismp.org

The Leapfrog Group, a consortium of about 150 organizations that provide healthcare benefits, works to identify problem areas, propose solutions, set quality benchmarks and offer incentives for provider organizations to adopt them; founded 2000; www.leapfroggroup.org

The National Alliance for Health Information Technology (NAHIT) is an alliance of health industry leaders working to accelerate implementation of standards-based IT to improve patient safety, care and efficiency; founded 2002; www.nahit.org

The National Quality Forum (NQF) is a nonprofit organization devoted to formulating a national strategy for consensus-based healthcare quality measurement and reporting standards; founded 1999; www.qualityforum.org

The National Patient Safety Foundation (NPSF), a nonprofit group dedicated to creation of a core body of knowledge about patient safety, looks for ways to apply that knowledge and communicate its findings; founded 1996; www.npsf.org

The Patient Safety Institute (PSI) is a nonprofit organization created to provide a structure for national medical information exchange; offers secure, real-time access, at point of care, to information in disparate sites; founded 2001; www.ptsafety.org

The Patient Safety Officer Society (PSOS) is a nonprofit professional alliance that strives to advance the role of the patient safety officer in healthcare organizations around the country; founded 2002; www.psos.org

FOUR FOR SAFETY

Bar coding

Uses standardized bar code formats to label and identify patients, medications and medical inventory. Bar code readers track items (e.g.,I.V. fluids, blood products, medication doses) from order through administration to ensure that appropriate drugs are dispensed to correct patient.

The Food and Drug Administration final rule for bar code label requirements for human drug and biological products became effective April 26, 2004. Under the published rule, drug products that receive approval on or after that date must comply with the rule within 60 days. Drugs approved before the effective date must comply by April 26, 2006.

What can it do?
Excels at confirming the identity of patients, drug and biological products, dosage units and orders.

Any pitfalls?
- All elements in the medication loop must be barcoded.
- Bar-code scanners operate with single units and, therefore, are not appropriate for batch operations.
- Bar-code scanners must be compatible with bar-code formats.
- Patient wrist bands may have incorrect information. Multiple wrist bands may have conflicting data.
- Packages, labels and wrist bands often too small to accommodate all relevant information.

More than 1,500 surgical patients annually are sutured up with surgical sponges or medical instruments still inside them, according to a study by the AHRQ.

Clinical decision support

An integrated set of knowledge-based tools linking evidence to best-practice guidelines through links with the electronic medical record, the clinical data repository and databases, such as the Physician's Desk Reference, ePocrates and the Sanford Guide to Antibiotic Use.

What can it do?
- Enables the clinician to utilize all relevant information, including best-practice guidelines, drug databases and patient-specific information, and practice evidence-based medicine at the point of care.
- Can generate treatment plans, display reminders and trigger automatic alerts for adverse drug events.

Any pitfalls?
- Can generate too many alerts, which may be ignored by clinicians.
- Few benefits if not integrated with CPOE, electronic medical record and bar-code systems.

Computerized physician order entry (CPOE)

Generally an integrated application that enables physicians and other caregivers to order diagnostic tests, medications and treatments electronically. Also called computerized provider order entry.

What can it do?
- Link evidence to best practices at the point of care.

Safety Firsts

1930s: Wallace Flint writes master's thesis on automated supermarket checkout system, but too costly for actual use.

1949: N. Joseph Woodland (top) and Bernard Silver apply for patent for bullseye bar code. Limited printing and autoidentification technology delay its implementation for more than 20 years.

1950s: Physician Logan Robertson, Asheville, N.C., is first to use machine-readable IBM mark-sense and punch cards to record patients' history, physical and lab data.

1950s: "Doc in a box," early clinical decision support system, is conceived. It requires impractical amount of data and is rejected by physicians, who want computerized assistance, not replacement.

1959: R.S. Ledley and L.B. Lusted publish paper in *Science* on potential of artificial intelligence in medicine—credited with starting field of medical informatics.

1961: Mark Blumberg, Stanford Research Institute, proposes early form of CPOE system using punch cards identifying patient, ordering physician and order.

© Charles E. Rotkin/CORBIS

1965: Children's Hospital, Akron, Ohio, installs IBM model 1620 with 1710 process control system (shown in 1966 photograph at left) and keys for order entry, admissions, nutrition services and census information.

1966: Lockheed Missiles and Space Co. begins design of total computer-aided hospital information system, to be known as a "medical information system" (MIS).

1968: Denver General Hospital installs early medical information system—the Urban Comprehensive Health Care Information System—to store patient records and clinic data.

1970s: Lawrence Weed, M.D., develops Problem-Oriented Medical Information System—55,000 information displays with branches to all symptoms of each disease diagnosis—for project at University of Vermont.

1970-1980: Homer R. Warner, T. Alan Pryor and Reed M. Gardner (left to right, in mid-70s photo) develop early clinical decision support system that leads to development of Health Evaluation through Logical Processing (HELP) program.

1971: El Camino Hospital, Mountain View, Calif., converts to Lockheed-designed MIS.

1974: National Cash Register Co. installs first Uniform Product Code scanner at Ohio supermarket. First product scanned, 10-pack of Wrigley's Juicy Fruit chewing gum, now displayed at Smithsonian Institution's National Museum of American History.

1977: Machine-readable identification system for blood banks is studied.

1930s 1940s 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978

• Integration with pharmacy knowledge bases and electronic medical records enables automatic alerts for drug-drug interactions, allergic responses and inappropriate orders for patient-specific conditions.
• Provides order entry documentation, drives interventions and streamlines workflow.

Any pitfalls?
• Requires integration with other clinical systems to be effective.
• Requires changes in workflow and culture.

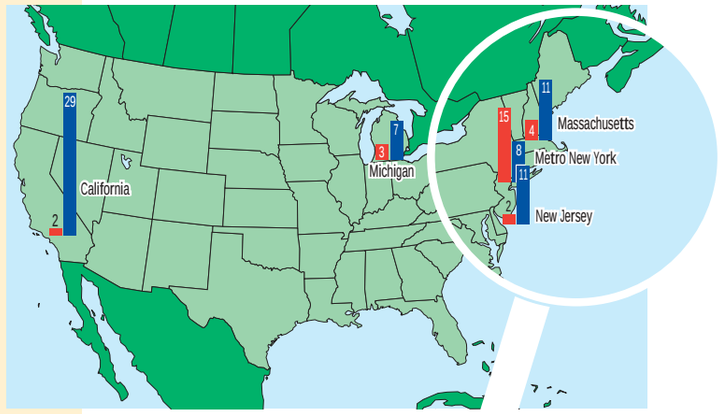
E-prescribing

Software enabling physicians to electronically write and transmit prescriptions directly to the pharmacy. Many systems include access to drug and healthcare knowledge databases, which can generate drug and allergy interaction alerts at the time of prescribing. Advanced, integrated systems populate the patient's electronic medical record.

What can it do?
• Eliminate errors associated with handwritten orders.
• Alert physicians at the time of prescribing to potential drug-drug interactions and allergic responses.
• Streamline order entry and medication workflow.

Any pitfalls?
• Standalone e-prescribing systems lack access to critical information, such as decision support tools and patient demographics needed for decision-making.
• Prescriptions generated are unlikely to be captured in the electronic medical record.

Top 5 rollout regions for hospital CPOE



Current No. of systems meeting Leapfrog criteria*
No. of systems to be implemented before 2005

*Criteria: Drug-ordering system has error-preventive software; inpatient CPOE has alerts for ≥50% of common, serious errors; physicians electronically document reason before overriding interceptions.

Source: The Leapfrog Group, Washington, D.C. Data submitted up to February 2004 and compiled by Medstat.

As many as 1.9 million drug-related injuries (about 180,000 life-threatening or fatal) occur each year as a direct or indirect result of medical errors, according to a study funded by the AHRQ and the National Institute on Aging at the National Institutes of Health.

Top 10 Patient Safety Myths—and Truths—Healthcare CIOs Need to Know

1 **CPOE alone can improve patient safety.** Although helpful in minimizing medication-order errors, CPOE is only one part of a solution that must support safety processes across the enterprise.

2 **My vendor understands patient safety.** Vendors may know their system's capabilities, but that's not the same as understanding how CPOE is actually used and the implications for patient outcomes.

3 **Return on investment is the reason to address patient safety.** Although benefits, such as decreased lengths of stay, can improve the bottom line, it's impossible to directly measure financial gain from patient safety initiatives.

4 **Implementing an advanced clinical system will mean staff reductions.** No clinical system contains enough current information to replace human decision-making.

5 **If we build it, they will come.** Don't expect medical and nursing staffs to enthusiastically support a clinical system that they haven't helped choose.

6 **Everyone has a patient safety problem—except us.** When thinking about how your organization delivers care, if you can imagine an error occurring, it probably will.

7 **Benchmarking will define where to start improving safety.** Reporting systems are too immature and reporting of errors is still too threatening to rely on existing, and incomplete, benchmarking data.

8 **Patient safety requires a new corporate department.** Patient safety should be integral to all processes, part of the organizational fabric, rather than a siloed division.

9 **It's OK to store almost all of our patient data on an outpatient system because that's how most people receive care.** Often, outpatient systems cannot be extended into an inpatient or long-term care system, which leaves a major hole for safety checks to drop through.

10 **Most medication errors occur at the order-writing stage of the process.** Have you studied your system carefully enough to be positive that there are no problems when medication is dispensed or administered?

Adapted from "*Top 10 Patient Safety Myths*," Brian Shea, Cap Gemini Ernst & Young Health, New York, June 14, 2003.

1980s: Development begins of microcomputer-based video display terminals with keyboards customized for nursing functions for bedside use.

1989: George Hripcsak and colleagues begin developing Arden Syntax for logic modules to facilitate sharing of medical alerts and reminders; first used in clinical care in 1991; adopted as national standard by American Society for Testing and Materials in 1992.

1991: Institute of Medicine publishes *The Computer-Based Patient Record.*

1997: National Council for Prescription Drug Programs' SCRIPT Standard Version 1.0 is approved.

2002: Federation of American Hospitals calls for standardized bar coding on single-unit doses of drugs.

2003: U.S. Department of Health and Human Services adopts first set of uniform standards for electronic sharing of clinical health information among federal agencies.

2003: Institute of Medicine publishes *Patient Safety: Achieving a New Standard of Care*, which advocates nationwide implementation of computerized information systems.

2003: The Medicare Prescription Drug Improvement and Modernization Act requires establishment of e-prescribing standards by 2005.

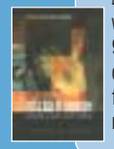
2003: Center for Information Technology Leadership publishes "The Value of Computerized Provider Order Entry in Ambulatory Settings," validating benefits of CPOE.

1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005

1981: U.S. Department of Defense begins bar coding all products sold to military.

1992: Walgreens implements its Pre-Scribe software.

1999: Institute of Medicine releases *To Err is Human*, which estimates 98,000 hospital deaths annually from medical mistakes.



2001: Institute of Medicine publishes *Crossing the Quality Chasm* on improving care.

2001: Medical Scientists, Boston, releases HybridAI, rational artificial intelligence technology—a form of clinical decision support.

2004: FDA mandates linear bar coding on prescription drugs and blood products by 2006. Bar code must contain, at minimum, National Drug Code number.

2004: HIMSS workgroup releases "Clinical Decision Support Implementers' Workbook" as free download (www.himss.org/ASP/cds_workbook.asp).

In a poll by the National Patient Safety Foundation, 42% of respondents indicated that either they or a friend or relative had been affected by a medical error; 32% said the error had a permanent adverse effect on the patient's health.

Sources: *Demanding Medical Excellence*, 1997; *A History of Medical Informatics in the United States: 1950 to 1990*, 1995; www.ahrq.gov/clinic/ptsafety/chap43a.htm; www.coiera.com/aimd.htm; www.devicelink.com; www.educ.queensu.ca/~compsci/units/encoding/barcodes/history.html; www.elcaminohospital.org; www.fact-index.com; www.fda.gov/OHRMS/DOCKETS/98fr/04-4249.htm; www.himss.org; www.infj.ulst.ac.uk/~ccjg23/peertutorials/alan.html; www.itsc.org.sg/synthesis/2001/itsc-synthesis2001-jinsoon-bar-coding.pdf; www.medicalscientists.com