Advancing Patient Safety:
A Decade of

Evidence

Design and

Implementation

1999

Advancing Patient Safety: A Decade of Evidence, Design, and Implementation

Introduction

Patient safety was a fairly new field when the Institute of Medicine's (IOM) sentinel report, *To Err is Human: Building a Safer Health System*, captured the Nation's attention in late 1999. While the IOM made recommendations to Congress for investigating medical errors and improving patient safety, the reality was that extensive foundation building needed to occur before meaningful improvements could be put into action. At the direction of Congress, the Agency for Healthcare Research and Quality (AHRQ), in conjunction with its Federal partners and non-Federal stakeholders, started the process of building the foundation to better understand patient safety challenges and how effective solutions could be rapidly implemented.

The IOM noted that many of the errors in health care result from a culture and system that is fragmented, and that improving health care needs to be a team sport. Research indicated

that mistakes were not due to clinicians not trying hard enough; they resulted from inherent shortcomings in the health care system. Today, while progress has been made, it has not spread evenly throughout the Nation's health care system.

Following are some highlights of the Agency's contributions in advancing patient safety during the past decade. These highlights are organized by year and by three key, ongoing challenges:

- Develop a solid evidence base.
- Design and evaluate useful strategies and tools.
- Disseminate information and tools for implementation.

Develop a Solid Evidence Base

To build a robust patient safety infrastructure, the Agency began its work to gain a better understanding of the systemic factors that combine in unanticipated ways and threaten patient safety. Researchers studied the best ways to identify and report on these factors and examined the impact that working conditions, health care information technology, and enhanced provider expertise could have on addressing patient safety challenges.

1999

The Agency's official designation as the Federal lead in patient safety began when the Healthcare Research and Quality Act of 1999 was signed into law. It required AHRQ to "conduct and support research and build private-public partnerships to: (1) identify the causes of preventable health care errors and patient injury in health care delivery; (2) develop, demonstrate, and evaluate strategies for reducing errors and improving patient safety; and (3) disseminate such effective strategies throughout the health care industry." Because of work already underway at that time, AHRQ was poised to release a call for research focused on systems-related best practices within weeks of the release of the *To Err is Human* report.
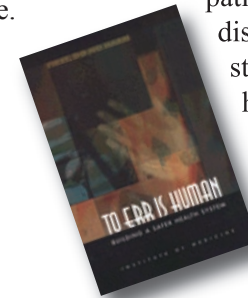
2000

Setting a Direction

In early 2000, just 60 days after the IOM report was published, the Federal Government, through an AHRQ-led task force, released *Doing What Counts for Patient Safety: Federal Actions to Reduce Medical Errors and Their Impact.* This report, which reflected energy and commitment to improving care, detailed more than 100 actions Federal entities could take to address threats to patient safety. By 2003, the vast majority of these actions were underway or completed.

Later in 2000, under AHRQ leadership, that task force held a National Summit on Medical Errors and Patient Safety. The meeting focused on multistakeholder collaboration and input to be used by AHRQ in setting its patient safety research agenda. By the end of 2000, Congress directed $50 million to AHRQ to fund patient safety research and improvement activities.
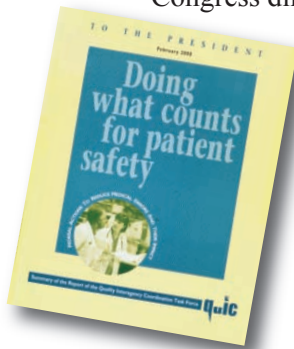
2001

Synthesizing Existing Evidence and Identifying Knowledge Gaps

With extensive input from Congress, the National Summit, and a broad group of stakeholders, two major efforts were undertaken following Congressional directives and using deliberations from the 2000 National Summit. First, AHRQ formulated a research agenda focused on identifying available evidence-based patient safety practices, gaining information on the requirements and effective use of medical error reporting systems, understanding the impact of working conditions and technology, and finding optimal methods for training professionals. Second, AHRQ enlisted researchers at the University of California, San Francisco (UCSF)—Stanford University Evidence-based Practice Center to review the published literature on the efficacy of various patient safety practices. This work, published as AHRQ Evidence Report No. 43: *Making Health Care Safer* (http://www.ahrq.gov/clinic/ptsafety/), was the first effort to apply evidence-based analysis to existing patient safety practices. Once published, the report was immediately used by providers as well as the National Quality Forum (NQF), a public-private partnership established as a voluntary consensus standards-setting organization, as it set about publishing and updating a set of endorsed patient safety practices.

Awarding the Initial Patient Safety Grants

With the research agenda and evidence report serving as points of departure, extensive work began to compile needed evidence. Nearly 100 grants were awarded to lay the groundwork for reducing harm to patients. The focus of these grants was to:

- Explore different ways of reporting, analyzing, and using data on medical errors.
- Investigate clinical informatics along with costs, feasibility, and usability factors.
- Examine the working conditions of providers, including the effects of staffing, work schedules, fatigue, and sleep deprivation on performance.
- Provide funding to centers of excellence to support and sustain demonstrated and programmatic approaches to patient safety research.
- Provide funding to developmental centers to encourage new researchers with innovative ideas to focus on patient safety challenges.
- Educate and train health care professionals about the emerging patient safety concepts, findings, and ways to disseminate the new information.

2002

Honoring Former AHRQ Director and Patient Safety Visionary

With work on AHRQ-funded grants underway around the country, the Agency lost one of the Nation's foremost patient safety visionaries when then-Director John M. Eisenberg, M.D., passed away in March 2002. Later that year, the NQF and the Joint Commission established the John M. Eisenberg Patient Safety and Quality Awards in Dr. Eisenberg's memory. These annual awards recognize the achievements of individuals who have made significant and lasting contributions to improving patient safety and health care quality. They also recognize individuals and organizations that, through a specific initiative or project, have made an important contribution to patient safety and health care quality in the areas of research or system innovation.

Design and Evaluate Useful Strategies and Tools

AHRQ's initial grants helped build a patient safety knowledge base and informed the Agency's thinking about the next steps it needed to take. As the knowledge base continued to evolve, it became clear that AHRQ needed to produce sound research studies and to ensure that the information, educational content, new approaches, and tools it provided were relevant to providers as they initiated their own patient safety improvement efforts. What follows is a brief description of some of the projects that were carefully designed, developed, and evaluated.

2003

Launching AHRQ WebM&M

To take advantage of the lessons that have been available from hospital-based morbidity and mortality conferences and make them more widely available and accessible to the field, the Agency implemented AHRQ WebM&M, Morbidity & Mortality Rounds on the Web (www.webmm.ahrq.gov), through a contract with

UCSF. AHRQ WebM&M serves as a free, online journal and forum for the examination of a variety of patient safety and quality issues. It features analysis of medical error cases by recognized experts and provides interactive learning modules for health care professionals, clinicians, administrators, patient safety officers, and trainees. Since its launch, AHRQ WebM&M has grown in popularity and continues to be one of AHRQ's most frequently visited Web sites.

Using Patient Safety Indicators

To help organizations understand and quantify patient safety events and areas of vulnerability in their institutions, AHRQ developed a useful measuring and monitoring tool: the Patient Safety Indicators (PSIs). The tool includes 20 hospital-level and 7 regional measures. By using hospital administrative data, PSIs can identify pressure ulcers, postoperative pulmonary emboli, accidental punctures and lacerations, and many other departures from safe care that are preventable. AHRQ continues to make the PSIs available as a free software program (www.qualityindicators.ahrq.gov) and uses PSIs regularly in its annual *National Healthcare Quality Report* and *National Healthcare Disparities Report.*

Training the Patient Safety Improvement Corps

In response to the need to expand the patient safety knowledge and skills of midlevel professionals responsible for investigating medical errors and initiating improvements, AHRQ partnered with the Department of Veterans Affairs' National Center for Patient Safety and began the first of four 9-month Patient Safety Improvement Corps (PSIC) training programs. Participants received training on tools and topics including analyzing root causes, analyzing health care failure modes and effects, applying human factors principles, assessing patient safety culture, and making a business case for patient safety. By the program's end, teams had been trained in every State, as well as the District of Columbia and Puerto Rico. Feedback the Agency received that PSIC graduates were, in turn, training their own personnel in patient safety principles acquired from the program provided evidence that this program represented a significant step in disseminating patient safety knowledge throughout the country.
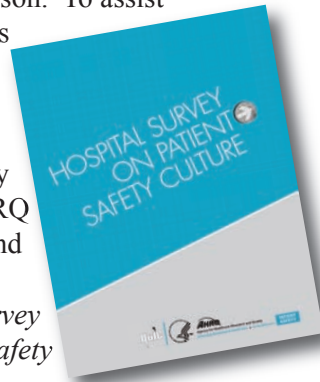

2003

2004

Fostering a Culture of Safety

IOM's *To Err is Human* noted that health care providers were remiss in developing a culture of safety in their daily operations. Aviation and other high-risk industries were well aware that organizational leadership shapes culture, which in turn drives behavioral change, the pace of improvement, and ultimately outcomes. Health care had yet to learn this lesson. To assist organizations and their units in improving patient safety culture, AHRQ developed and released the *Hospital Survey on Patient Safety Culture* (www.ahrq.gov/qual/patientsafetyculture/hospsurvindex.htm), a psychometrically tested and well-received survey instrument. This tool continues to help hospital and organizational unit leaders assess their patient safety culture and identify areas in need of improvement. Today, more than 600 civilian and military hospitals and health care systems share data from their surveys and are able to compare their results to national benchmarks. Results indicate that teamwork within hospital units and supervisor and manager support for patient safety are areas of strength for most hospitals, but nonpunitive responses to errors and handoffs continue to be areas for improvement.

Initiating a Health Information Technology Portfolio

As health information technology (health IT) increasingly was recognized as a promising way to improve health care quality, safety, and efficiency, the Agency allocated a substantial portion of its patient safety budget to health IT. The health IT portfolio led to 200 projects that are currently distributed across 48 States and included the full spectrum of planning, implementation, demonstration, and evaluation phases that are essential to launch health IT projects effectively. To provide technical assistance and share knowledge and findings, the Agency established a National Resource Center for Health IT (healthit.ahrq.gov). All of the lessons learned from these projects are helping health care providers move closer to a fully operational health IT system in support of improved quality, safety, and continuity of care.

Examining Safety Impacts of the Work Environment

Another group of projects yielding valuable results focused on providers' work environment. As suspected, the 100+-hour workweek—a traditional rite of passage for young physicians—was found to increase medical errors. AHRQ-funded studies found that

The banking industry is more advanced in information technology than health care. I can take money out of my bank account anywhere in the world, but my hometown doctor can't tell me results from the lab across the street. – Carolyn M. Clancy, M.D., AHRQ Director
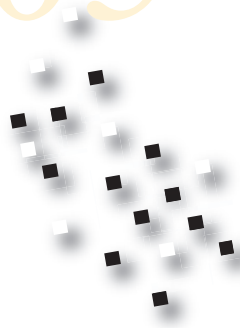
medical interns continued to work shifts that exceeded the 80-hour workweek limit set by the Accreditation Council for Graduate Medical Education in 2003 and that the long shifts medical interns worked led to 61 percent more needlestick injuries. Studies also found that after working extended shifts, medical interns doubled their risk of car crashes when driving home from the hospital. A toolkit, "Implementing Reduced Work Hours to Improve Patient Safety" (http://workhoursandsafety.org), was developed to help address some of the patient safety issues related to extended work hours.

Disseminate Information and Tools for Implementation

As the decade progressed and the knowledge base continued to expand, reports of successful application of evidence-based strategies began to increase. For example, by consistently following evidence-based procedures, some health care systems were achieving significant reductions in health care-associated infections.
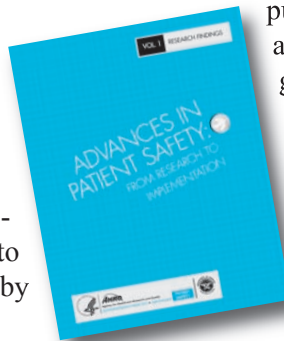
Unfortunately, these examples were the exceptions. Many facilities still were not addressing patient safety concerns. AHRQ recognized that getting evidence to the field in ways that provided organizations with adoptable solutions was crucial. In promoting widespread access to important resources, the Agency redoubled its efforts in what has become a long-term commitment.

2005

Disseminating Advances in Patient Safety

AHRQ released *Advances in Patient Safety: From Research to Implementation* (http://www.ahrq.gov/qual/advances/) as a way to share the progress occurring in the first half of the decade. The four-volume publication, comprising 140 articles, sought to bridge the gap between the research underway and its integration into practice. The compendium covered a wide range of research paradigms, clinical settings, patient populations, reporting systems, measurement and taxonomy issues, tools and technology, implementation challenges, safety culture, and organizational considerations. The

volumes helped fuel efforts to improve patient safety and provided a measure of progress. More importantly, they also provided a sense of remaining challenges.

Three years later, in 2008, the four-volume *Advances in Patient Safety: New Directions and Alternative Approaches* (http://www.ahrq.gov/qual/advances2/) was released. It focused further on reporting systems, risk assessment, safety culture, clinical process improvement, systems redesign, patient involvement, teamwork and communication, simulation, human factors applications, tool development, technology, and medication safety.

2006

Initiating the AHRQ Patient Safety Network

As patient safety research and information began to grow, it became clear that a consolidated resource for patient safety information was needed. In response, the Agency designed requirements for the AHRQ Patient Safety Network (www.psnet.ahrq.gov), a one-stop, online resource for patient safety information. A team at UCSF implemented and continues to support the project with weekly updates. Health care providers, researchers, administrators, and consumers can access this resource to learn about the latest news, research findings and publications, pertinent legislation, conferences, and tools related to patient safety.

2006

Building Health Care Teamwork Nationwide

Despite the recognized importance of teamwork in aviation and other high-risk industries, it is only recently that teamwork, coordination, and communication have started to be recognized as key ingredients in the delivery of safe health care. AHRQ and the Department of Defense's Military Health System jointly released a comprehensive training resource, known as TeamSTEPPS™ (Team Strategies and Tools to Enhance Performance and Patient Safety; teamstepps.ahrq.gov). Adapted from procedures that were originally developed, tested, and refined for flight crews, the team-training curriculum provides health care organizations with evidence-based training techniques for effective communication and team building. More than 14,000 copies of the customizable curriculum have been distributed to U.S. hospitals, health professions schools, and military medical facilities. Nearly 1,000 master trainers have been trained and are prepared to train other health care professionals.

Reducing Central Line-Associated Blood Stream Infections

By using a comprehensive safety program featuring a checklist to ensure that health care workers follow five crucial steps when placing a central-line catheter, AHRQ-funded researchers at Johns Hopkins University in Baltimore were able to dramatically reduce blood stream infections. With additional funding from the Michigan Health and Hospital Association's Keystone Center intensive care unit project, infection rates dropped 66 percent over an 18-month period in the 77 participating Michigan hospitals. As a result, $200 million and an estimated 2,000 lives were saved. Results of the sentinel Keystone Project study were published in the *New England Journal of Medicine*.

Using Simulation to Prevent Harm

Patients can sometimes be harmed unintentionally as clinicians learn new procedures. Much of the time the harm is not serious; however, some procedures, such as complex surgical operations, have very thin margins of safety. Simulation provides a way for newly trained clinicians to become skilled and more adept before treating patients.

Concurrent with the recent growth of simulation centers in medical schools, AHRQ initiated its Improving Patient Safety through Simulation Research grants program. These 19 simulation grants provide a safe environment in which providers can acquire proficiency in various clinical procedures: treating acute myocardial infarction, inserting ultrasound-guided central venous catheters, diagnosing melanoma, providing obstetric emergency response in rural hospitals, disclosing medical errors, and demonstrating how simulation can be used to design and develop an electronic patient tracking system in the hospital emergency department.

2007

Designing the Physical Environment

An emerging body of evidence focuses on the physical environment and how its design can serve to facilitate or impede the quality and safety of care that patients receive as well as the work-life quality of providers. Designers of new hospital construction during the past decade have started to take advantage of this research. AHRQ released a DVD, *Transforming Hospitals: Designing for Safety and Quality*, that illustrates how three hospitals incorporated evidence-based design principles in their construction and renovation projects. These design principles include single patient rooms and better ventilation systems for pathogen control; standardized room layouts; better lines of sight and reduced steps to the point of care; adjustable lighting; noise

reduction materials; convenient placement of hand-hygiene dispensers; and safer systems for lifting and transporting patients.

Engaging Patients

AHRQ teamed with the Ad Council to launch a series of public service advertisements to help patients understand the importance of being active members of their health care team, which in turn improves the quality of care and prevents harmful patient safety events. The ads urged patients to ask their clinicians relevant questions, take notes, follow up on test results, and be mindful of discharge instructions and recommended followup care. The "Questions Are the Answer" ad campaign featured television commercials, radio broadcasts, print ads, and a Web site (www.ahrq.gov/questionsaretheanswer) with an interactive question builder that enabled consumers to develop and print a customized list of questions to take with them to medical appointments.
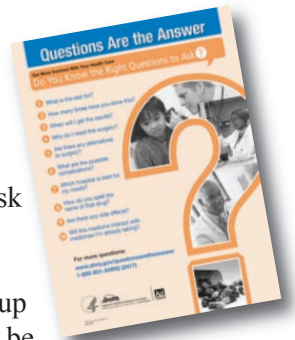
2008

Preventing Health Care-Associated Infections

Data indicate that health care-associated infections (HAIs) are the most common serious complication of hospital care, striking nearly 2 million U.S. hospital patients, resulting in an estimated 99,000 deaths, and costing the health care system up to $20 billion each year, according to the Centers for Disease Control and Prevention (CDC). The most common HAI is methicillin-resistant *Staphylococcus aureus* (MRSA). With some MRSA-related projects already underway, Congress directed AHRQ to work with its Federal partners at the CDC and the Centers for Medicare & Medicaid Services to develop an action plan to identify and help reduce the spread of MRSA and related HAIs. The action plan is designed to:

- Reduce MRSA infections through the use of novel interventions.
- Determine scope, risk factors, and control measures for hospital-acquired, community-onset MRSA infections.
- Test methods to reduce hospitalization for treatment of community-acquired MRSA.
- Understand the role of interfacility MRSA transmission on overall infection rates.
- Understand the role of nursing home transmission of MRSA and develop interventions to reduce transmission.

Building on the success of the Keystone Project, the Agency also supported a nationwide expansion to reduce the rate of hospital-related central line-associated blood stream infections (CLABSIs). Several private organizations contributed funds to broaden the scale of the projects to all 50 States, to settings beyond intensive care units, and to other infections. In 2009, U.S. Department of Health and Human Services Secretary Kathleen Sebelius called on all hospitals to reduce CLABSIs by 75 percent over 3 years by using the research findings and focused tools that AHRQ has supported.

Reducing Hospital Readmissions

AHRQ continued to promote and provide funding to expand use of a tool to help hospitals redesign the discharge process and curtail costly and unnecessary readmissions by ensuring that patients have the necessary information to recover at home. Called the "Re-Engineered Hospital Discharge Program," or Project RED, it draws on input from a multidisciplinary health care team and features a personalized instruction booklet and instructions for nurses to help patients understand after-hospital care instructions, including how to take medications and when to make followup appointments. Additional funding led
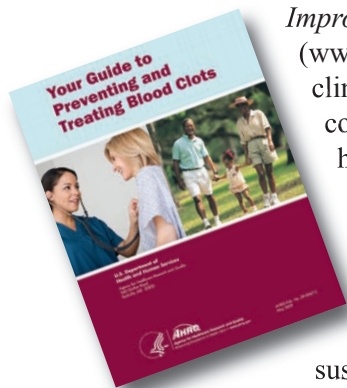

2008
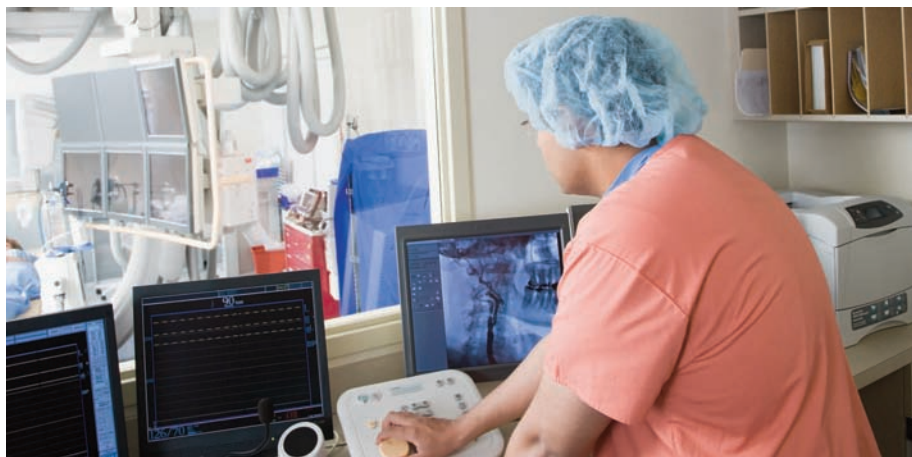
to the creation of a virtual nurse discharge advocate and a version of the tool adapted for patients with low health literacy.

Using Tools to Enhance Patient Safety

To give providers a head start in their efforts to give patients the safest and highest quality of care possible, AHRQ funded several projects (http://www.ahrq.gov/qual/pips/) to design, develop, and test implementation-ready tools. AHRQ products that came about as a result of these projects include *Your Guide to Preventing and Treating Blood Clots* (www.ahrq.gov/consumer/bloodclots.htm) for consumers and *Preventing Hospital-Acquired Venous Thromboembolism: A Guide for Effective Quality Improvement* (www.ahrq.gov/qual/vtguide) for clinicians. The latter is a comprehensive tool to help hospitals and clinicians implement processes to prevent dangerous blood clots. The 60-page guide details how to start, implement, evaluate, and sustain a quality improvement strategy.

Distributing an Evidence-Based Handbook for Nurses

Given the central role that nurses serve in patient care and the likelihood that they are among the first health care professionals to recognize errors and prevent harm to patients, the Agency teamed with the Robert Wood Johnson Foundation to develop and distribute a handbook for nurses entitled *Patient Safety and Quality: An Evidence-Based Handbook for Nurses*. Even though working conditions may be less than optimal and the needs of patients are quite diverse, the opportunities for patient safety and quality improvement are clearly addressed. More than 22,000 copies of the three-volume handbook have been distributed to nursing schools and clinicians in the field.

2009

Learning and Improving Through Patient Safety Event Reporting

Since enactment of the Patient Safety and Quality Improvement Act of 2005 for establishing Patient Safety Organizations (PSOs), AHRQ worked closely with its Federal partners to refine and implement provisions of the Act. Final

regulations governing PSOs were published in 2009. Through the Act, PSOs can collect voluntarily reported patient safety events and share these data without fear of legal discovery because the law extends a legally secure environment of privilege and confidentiality protections for hospitals, clinicians, and others working under the auspices of PSOs.

To ensure that patient safety events reported to PSOs can be collected in a standardized fashion and analyzed in a meaningful way, AHRQ coordinated the development of common definitions and reporting formats called the Common Formats (www.pso.ahrq.gov/formats/commonfmt.htm). They enable health care providers to collect and submit information on patient safety events and unsafe conditions in an apples-to-apples fashion. Subsequent data submission to a Network of Patient Safety Databases will enable AHRQ to report on patient safety in its annual National Healthcare Quality Report.

Given that consumers can be an important source of information for

understanding patient safety events and health care system failures, AHRQ, in another patient safety event reporting project, is developing specifications for the future development of consumer reporting systems.

Educating Patients About Medication Safety

Blood thinning medications such as warfarin are used to treat harmful blood clots that cause strokes, heart attacks, and other serious conditions. However, research shows that blood thinners can have serious side effects. According to data from AHRQ's Nationwide Emergency Department Sample, more than 7,300 Americans a year are treated in U.S. emergency departments for uncontrolled bleeding associated with use of blood thinners, and about half have to be hospitalized. To help patients use these medications safely, AHRQ released two bilingual tools, a patient booklet entitled *Blood Thinner Pills: Your Guide to Using Them Safely* (www.ahrq.gov/consumer/btpills.htm), and a 10-minute educational video entitled *Staying Active and Healthy with Blood Thinners* (http://www.ahrq.gov/consumer/btpills.htm#videos).

Looking Toward 2010 and Beyond

The progress cited in this document bears witness to the innovation, energy, and skillful execution of many individuals and organizations that are at the leading edge of conducting patient safety research and translating that knowledge into useful tools and strategies for implementation. To be sure, much has been done to improve the safe delivery of health care since the IOM report was released 10 years ago. For the decade ahead, AHRQ is eager to support the advances and improved understanding that will continue to occur in health IT, reporting systems, infection control, medication safety, physical environment design, systems and clinical process redesign, simulation and training, evidence-based tools and resources, patient-centered care, and patient safety culture change, among other developments.

Yet, no one is completely satisfied with the extent of progress. The Agency is ever mindful of the challenges and improvement opportunities that remain. While there is a measure of success in identifying and verifying practices that improve safety, further work is needed in demonstrating how practices get implemented and integrated into clinical workflow and in ensuring there is a full and unrelenting commitment to providing the safest care possible. This commitment needs to exist throughout the continuum of care. Even when the evidence is substantial and the integration into practice is well conceived, buy-in from providers and decisionmakers often remains an issue. For patient safety practices and gains to be widely distributed and sustained, institutional leadership will need to be informed, actively engaged, and supportive.
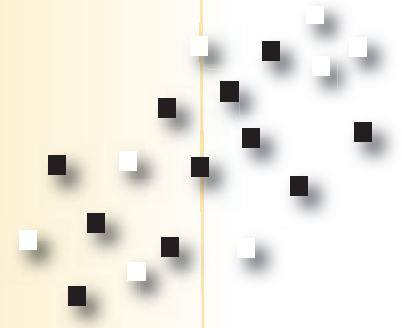
The experience gained in the first decade confirms the complexity of our changing health care system. In the years ahead, new challenges will arise for providers and institutional leaders as they strive to deliver safe, high-quality care. We have learned that safety is a changing, emergent property of systems, and as our health care system changes so will the threats to patient safety. The promising beginnings and lessons learned in the first decade will serve us well as we undertake the challenges that lie ahead.

2010 and beyond

Advancing Patient Safety: A Decade of Evidence, Design, and Implementation

Patient safety was a fairly new field when the Institute of Medicine's sentinel report, *To Err is Human: Building a Safer Health System*, captured the Nation's attention in late 1999. While the Institute of Medicine made recommendations to Congress for investigating medical errors and improving patient safety, the reality was that extensive foundation building needed to occur before meaningful improvements could be put into action. At the direction of Congress, AHRQ, in conjunction with its Federal partners and non-Federal stakeholders, started the process of building the foundation to better understand patient safety challenges and how effective solutions could be implemented. This timeline presents highlights of the Agency's contributions in advancing a safer U.S. health care system during the past decade.

Healthcare Research and Quality Act of 1999

———

Institute of Medicine's To Err is Human: Building a Safer Health System

1999

National Summit on Medical Errors and Patient Safety

———

Doing What Counts for Patient Safety: Federal Actions to Reduce Medical Errors and Their Impact

2000

AHRQ patient safety research agenda

———

Patient safety grants

———

Evidence Report No. 43: *Making Health Care Safer*

2001

John M. Eisenberg Patient Safety and Quality Awards

2002

Patient Safety Indicators

Patient Safety Improvement Corps

AHRQ WebM&M, Morbidity & Mortality Rounds on the Web

Health information technology portfolio

National Resource Center for Health IT

"Implementing Reduced Work Hours to Improve Patient Safety"

Hospital Survey on Patient Safety Culture

AHRQ PSNet, AHRQ Patient Safety Network

Advances in Patient Safety: From Research to Implementation

Keystone Project

Improving Patient Safety through Simulation Research grants

TeamSTEPPS™

Transforming Hospitals: Designing for Safety and Quality

"Questions Are the Answer" campaign

Advances in Patient Safety: New Directions and Alternative Approaches

Health care-associated infections action plan

"Project RED"

Patient Safety and Quality: An Evidence-Based Handbook for Nurses

Consumer and clinician publications on preventing blood clots

Patient video and booklet on blood thinner medicines

Patient Safety Organizations and Common Formats

2003 2004 2005 2006 2007 2008 2009