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ABSTRACT Quality improvement in health care has a long history that includes such epic figures as Ignaz Semmelweis, the nineteenth-century obstetrician who introduced hand washing to medical care, and Florence Nightingale, the English nurse who determined that poor living conditions were a leading cause of the deaths of soldiers at army hospitals. Systematic and sustained improvement in clinical quality in particular has a more brief and less heroic trajectory. Over the past fifty years, a variety of approaches have been tried, with only limited success. More recently, some health care organizations began to adopt the lessons of high-reliability science, which studies organizations such as those in the commercial aviation industry, which manage great hazard extremely well. We review the evolution of quality improvement in US health care and propose a framework that hospitals and other organizations can use to move toward high reliability.

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Efforts to improve the quality of health care have used a wide variety of approaches. In the past half-century all of the following have been in vogue at one time or another: redesigning professional education; improving peer review of physician practice; re-engineering systems of care; increasing competition among provider organizations; publicly reporting data on quality; rewarding good performance; punishing bad performance; applying continuous quality improvement or total quality management tools; and measuring and improving the culture of health care organizations to facilitate the adoption of safer systems of care.¹⁻⁴

The answers to vexing quality and safety problems have often appeared clear, and victory has been declared over and over again. Unfortunately, although many small successes have been achieved, they have often been short-lived. And they have not been enough to solve complex, persistent, and deeply rooted quality and safety problems.⁵

Early attempts at quality improvement include

the work of epic figures such as Ignaz Semmelweis, the nineteenth-century obstetrician who introduced hand washing to medical care, and Florence Nightingale, the English nurse who determined that poor living conditions were a leading cause of death of soldiers at army hospitals. Later came pioneers such as Ernest Amory Codman, a crusader for the creation of hospital standards, whose strategy was to assess carefully the end results of care. The efforts of Codman and Abraham Flexner, who in 1910 wrote a groundbreaking report on medical education, jump-started efforts to improve clinical quality at the beginning of the twentieth century. Another important impetus was the American College of Surgeons' formation of the Hospital Standardization Program—the predecessor of the Joint Commission, the not-for-profit organization that accredits and certifies health care organizations (and where Mark Chassin, an author of this paper, serves as president).⁶

Improvement Efforts In The Early Days Of Medicare

Although the creation of Medicare in 1965 improved access to care, it did little to improve the quality of care that the newly insured could receive. However, in the following year Avedis Donabedian created the first conceptual framework for measuring health care quality—a framework that has powerfully influenced all subsequent efforts to improve quality. Donabedian proposed that quality could be measured by assessing structures, processes, and outcomes of care.⁷

About the same time, researchers began to use new scientific approaches to gather evidence on the contributions of specific clinical practices to improved outcomes. The modern randomized controlled trial had been born in 1948, with a report from the UK Medical Research Council on the treatment of pulmonary tuberculosis.⁸ By the 1960s a few hundred articles based on such trials were being published each year in the medical literature. By the mid-1990s that number was 10,000 per year.⁹ Today the Cochrane Central Register of Controlled Trials, a bibliographic database of definitive controlled trials, contains more than 640,000 reports.¹⁰

Although the growing collection of evidence shed light on the clinical efficacy of a variety of tests and treatments, it also magnified the problem of how to rapidly incorporate knowledge of what works into daily care for patients. Andrew Balas and Suzanne Boren have found that it takes an average of seventeen years for research to reach clinical practice.¹¹

UTILIZATION REVIEW COMMITTEES The law that created Medicare also required hospitals to establish utilization review committees, primarily to identify whether hospital medical staffs were providing appropriate clinical services and to prevent fraud. Identifying ways to improve care, although desirable, was rarely part of utilization review.¹² In addition, these review committees were relatively powerless in terms of improving care because there were no formal evaluation criteria to guide providers' decision making, and no mechanisms to adjust payment based on the quality of care.

EXPERIMENTAL MEDICAL CARE REVIEW ORGANIZATIONS Partly because of the ineffectiveness of these utilization review committees, in 1971 Congress created the next generation of quality oversight entities. Called experimental medical care review organizations, these were associations of physicians that were administered and funded by the National Center for Health Services Research. These organizations reviewed inpatient and ambulatory services for quality and appropriateness of care, and they developed

pilot projects that linked quality review with identified improvement strategies. The organizations were themselves pilots. They became the model for Medicare's professional standards review organizations, which were established by the Social Security Amendments of 1972.

PROFESSIONAL STANDARDS REVIEW ORGANIZATIONS These organizations, like their experimental predecessors, were not-for-profit physician membership organizations. They were funded by federal grants, and their functions were to assess the medical necessity, appropriateness, and quality of inpatient care and services. They were intended to ensure that physicians and hospitals met their obligations under Medicare to provide high-quality care—obligations that included not overusing services, in spite of the incentives to do so that were implicit in fee-for-service payment.

The organizations were run entirely by physicians and were designed to help oversee the quality of inpatient medical practice. However, they were not supported by the American Medical Association, which viewed them as a type of governmental intrusion into medical practice.¹³ By the early 1980s the consensus was that despite annual budgets of over \$170 million, the organizations had not succeeded in keeping Medicare costs down or in improving quality.

PEER REVIEW ORGANIZATIONS In 1983 the professional standards review organizations were replaced by the Medicare Utilization and Quality Control Peer Review Organization program, which later became the Quality Improvement Organization program. The principal focus of the new organizations was to control costs by monitoring the use of services.¹⁴ They were designed to work with another innovation: a prospective payment system based on diagnosis-related groups for inpatient care under Medicare. In this system, a predetermined rate was set for reimbursing hospitals for treatment of specific illnesses—an arrangement that gave providers strong incentives to reduce costs below the set levels. The peer review organizations' original charge was to make sure that services provided for Medicare beneficiaries were appropriate, medically necessary, and of high quality.

Instead of being funded by federal grants, like their predecessors, the new organizations submitted competitive bids for contracts covering certain quality-related activities, such as reviewing medical records for evidence of preventable complications and unnecessary invasive procedures. The initial contracts focused on reducing the inappropriate use of services, but later contracts stressed ensuring or improving quality more broadly. In spite of that shift in emphasis, the paucity of data on evidence-based interven-

tions limited the organizations' effectiveness.

Yet research was demonstrating that a combination of results from randomized controlled trials, data from observational studies, and expert consensus could be used to develop evidence-based recommendations that physicians could use to deliver more-effective clinical care. These recommendations came to be known as clinical practice guidelines. The premise was that clinical care would improve if physicians had ready access to a distillation of evidence in the form of the specific recommendations contained in these guidelines.¹⁵

The Development Of Practice Guidelines

New data suggesting the existence of large geographic variations in practice patterns within Medicare that were not supported by clinical evidence, along with studies showing that the inappropriate use of common medical and surgical procedures was widespread, helped spark congressional interest in a new program of research on the outcomes and effectiveness of medical treatment.^{16,17} In 1989 the Agency for Health Care Policy and Research—later renamed the Agency for Healthcare Research and Quality—was created, replacing the National Center for Health Services Research.

The new agency initially had bipartisan support in Congress, which charged it with developing practice guidelines and conducting research. It was to focus on the more practical aspects of health care delivery (primarily cost and quality) rather than on basic biomedical research.¹⁷ And it was to pay particular attention to addressing large variations in practice and extensive inappropriate use of services.

The agency funded a series of Patient Outcomes Research Teams, multidisciplinary groups designed to review and synthesize clinical evidence, analyze practice variations, and assess patient outcomes. The agency also convened panels of experts that used all available evidence of effectiveness to develop clinical practice guidelines for a variety of clinical conditions. The guidelines were designed to prompt physicians to rely on scientific evidence in providing clinical care. At the same time, the movement to develop and promulgate guidelines gathered momentum, independent of the federal guideline development activity and under the auspices of a number of professional organizations, including the American College of Physicians, the American College of Cardiology, and the American Heart Association.^{18,19}

By the late 1980s researchers were increasingly documenting serious and persistent problems in

health care quality.²⁰ At the same time, hospitals and health systems began applying improvement methods that had worked in industry, such as continuous quality improvement.^{21,22} Some of these approaches had been around since the 1920s, although not used in health care.

The Joint Commission modified its traditional accreditation process—which was based on standards like those pertaining to the relationship between organized medical staffs and hospitals—to focus more on Donabedian's framework of structure, process, and outcome.⁷ Also, for the first time, the Joint Commission announced that it would require accredited organizations to use evidence-based measures of performance as part of their quality improvement programs, many of which were contained in clinical guidelines.^{6,23} For example, work began to examine existing clinical guidelines for trauma care, oncology and cardiovascular care for measures suitable for this use.²³

Randomized controlled trials continued to produce evidence of linkages between specific processes of care and clinical outcomes. This led to the development of many new performance measures, particularly for common clinical conditions such as acute myocardial infarction, heart failure, and pneumonia. Although there was growing interest on the part of providers, policy makers, and patients in the direct measurement of clinical outcomes, the technical challenges involved were substantial. Risk adjustment was especially complicated. Different patients admitted to a particular hospital have various risk factors that influence particular outcomes. To enable meaningful comparisons of outcomes across hospitals, differences in these risk factors among patients must be measured, and the data combined into one composite measure or score.²⁴

The Turn Away From Guidelines

In the mid-1990s, during President Bill Clinton's efforts to reform the health care delivery system, the literature on "what works" in health care continued to grow. However, shifting political winds in Congress set the stage for the near-demise of the Agency for Health Care Policy and Research, which was the principal funder for a large amount of the work on clinical quality.¹⁷

The attempt to dismantle the agency began with an effort to cut its budget, particularly in areas that were not deemed to have saved the taxpayer enough money. At the same time, an agency-funded literature review on treatment for low-back pain was published. The review concluded that there was no evidence to support

spinal fusion surgery and suggested that such surgery was commonly accompanied by costly complications. In a concerted effort to discredit agency-funded research, a small group of spine surgeons banded together and publicly criticized the review and the accompanying federal guideline on treatment of acute low-back pain.

Because of the political atmosphere accompanying the debate about health system reform in 1995—and the strong political allies of the spine surgeons—the agency was threatened with extinction in the congressional budgetary process. It survived, but with a sharp reduction in its budget for fiscal year 1996.

Four years later it was given a new name, the Agency for Healthcare Research and Quality, and a modified mandate. The new mandate still included a focus on research related to clinical outcomes and effectiveness as well as Medicare spending, but it no longer included the direct development of clinical practice guidelines. The assumption underlying the agency's creation was that assembling clinical evidence on what works in health care—derived in large part through research funded by the agency—and making it available to providers would increasingly drive improvements in medical practice.¹⁷

By the turn of the twenty-first century, a great many randomized controlled trials and meta-analyses were providing strong evidence that certain clinical interventions were effective, but it was becoming increasingly clear that patients were often not receiving evidence-based care. Two landmark reports from the Institute of Medicine^{25,26} galvanized new efforts to improve quality by further elucidating the magnitude of the problem and reframing it as a matter of patient safety. The new research results, clinical practice guidelines, and improvement strategies were overwhelming to practitioners and health care organizations. They realized that clinical care was inconsistent and performance was often poor, but they struggled to find effective solutions to these problems.

In response to a recommendation of President Clinton's Advisory Commission on Consumer Protection and Quality in the Health Care Industry, the National Quality Forum—a private, not-for-profit organization—was created in 1999. Its mission is to improve health care delivery by promoting the use of standardized quality measurements and public reporting of the resulting data.²⁷ The National Quality Forum has played an increasingly prominent role in identifying and evaluating measures being used by organizations in the public and private sectors to assess health care quality and patient safety.

Pockets of excellence coexist with enormously variable performance across the delivery system.

Where We Are Today

Health care quality and safety today are best characterized as showing pockets of excellence on specific measures or in particular services at individual health care facilities. Excellence across the board is emerging on some important quality measures. In 2009, for example, hospitals, on average, provided life-prolonging beta-blockers to heart attack patients 98 percent of the time. In addition to this very high average, few hospitals demonstrated poor performance: 97 percent of them scored greater than 90 percent on this measure.²⁸ And hospitals have reduced the percentage of patients who acquire some preventable infections in intensive care units.²⁹

In addition, more organizations than ever before are actively engaged in a wide variety of improvement efforts. These include the Medicare quality improvement organizations and a number of state-based initiatives, such as the New York State Cardiac Surgery Reporting System, which stimulates improvement in the outcomes of cardiovascular procedures by collecting and disseminating clinically valid data on risk-adjusted mortality rates by hospital and physician.³⁰ Private organizations such as the Institute for Healthcare Improvement, the Robert Wood Johnson Foundation,³¹ and the Commonwealth Fund have played vital roles in facilitating improvement activities on the part of health care providers and communities. Regional collaboratives of multiple stakeholders³² have invigorated local improvement efforts, as have numerous initiatives directed by large integrated delivery systems and medical centers.³³ Federal initiatives emanating from the health reform law, such as programs to create accountable care organizations, may further accelerate progress.

What has eluded us thus far, however, is maintaining consistently high levels of safety and quality over time and across all health care services and settings. The pockets of excellence mentioned above coexist with enormously vari-

able performance across the delivery system. Along with some progress, we are experiencing an epidemic of serious and preventable adverse events. These include patients' undergoing surgical procedures intended for others,³⁴ fires in operating rooms,³⁵ and patients' committing suicide while in the care of hospitals.³⁶

Moreover, the available evidence suggests that the risk of harmful error in health care may be increasing. As new devices, equipment, procedures, and drugs are added to our therapeutic arsenal, the complexity of delivering effective care increases. Complexity greatly increases the likelihood of error, especially in systems that perform at low levels of reliability.

The most complex health care is delivered in hospitals, which are populated by patients whose severity and acuity of illness have been increasing inexorably. This is because many of the least sick patients no longer require hospital stays to receive the care they need. For example, patients are no longer admitted to hospitals for diagnostic evaluations. Surgical procedures previously performed only in hospitals with considerable lengths-of-stay are now routinely and safely done in ambulatory settings. Treatments such as long-term intravenous infusions for combating certain serious infections are performed safely at home. Thus, we face the intersection of two interrelated trends: Hospitals house patients who are increasingly vulnerable to harm due to error, and the complexity of the care hospitals now provide increases the likelihood of those errors.

The need for major improvements in safety and quality has never been greater. Yet current approaches are not producing the pace, breadth, or magnitude of improvement that all stakeholders desire. Along with a number of other observers, we believe that it is essential to look outside health care for solutions.³⁷ Specifically, we should first get a clear picture of how complex organizations establish and maintain extremely high levels of safety. Then we must apply the lessons we learn from them to health care.

High Reliability In Health Care

The study of "high reliability"—or consistent performance at high levels of safety over long periods of time—began with investigations of organizations that manage extreme hazards with exemplary safety records, far better than those in health care today. At the turn of the twenty-first century, knowledge of this science was only beginning to seep into health care. Today we have studies of many different "high-reliability organizations," including the nuclear power industry, the commercial air travel system, and the flight decks of aircraft carriers.³⁷ These studies

have revealed several common key features that facilitate the maintenance of consistent excellence.

These principles have been well described elsewhere.³⁸ Together they make up what Karl Weick and Kathleen Sutcliffe have called a "collective mindfulness," which is a dominant attitude or cultural feature that all high-reliability organizations display.

Collective mindfulness means that everyone who works in these organizations, both individually and together, is acutely aware that even small failures in safety protocols or processes can lead to catastrophic adverse outcomes. As a matter of routine, workers in these organizations are always searching for the smallest indication that the environment or a key safety process has changed in some way that might lead to failure, if some action is not taken to solve the problem. Continuously uncovering these safety concerns permits an organization to identify safety or quality problems at a stage when they are easily fixed. In health care we are too often in the position of investigating severe adverse events after they have injured patients, which means that we have missed opportunities to pinpoint and correct quality problems before they cause harm.

In addition to the overarching atmosphere of collective mindfulness, high-reliability organizations have two other features in common. First, after organizations identify potential deficiencies in safety processes, they eliminate these deficiencies through the use of powerful tools to improve their processes. These are the tools of robust process improvement, described below.

Second, the organizations rely on a particular organizational culture to ensure the performance of improved safety processes over long periods of time and to remain constantly aware of the possibility of failure. This may be called "safety culture"; it is also described below.

Although high-reliability science has greatly increased our understanding of how these organizations function, it does not provide much practical insight into how organizations can move from low to high reliability. Some studies are beginning to shed light on health care organizations' experiences in adapting high-reliability principles to their operations.^{39,40} How effective these principles can be in improving safety and quality in health care remains to be determined. In the following sections, we propose a model that may serve as a guide for health care organizations wishing to travel down the road toward high reliability.

Three Requirements For Achieving High Reliability

We suggest that for health care organizations to become highly reliable, three interdependent and equally critical changes must take place: Leadership must make a commitment to the goal of high reliability, the organizational culture that supports high reliability must be fully implemented, and the tools of robust process improvement must be adopted.⁴¹

LEADERSHIP We emphasize leadership commitment as the first of these three because without it, no important initiative for organizational change can succeed. This commitment must be shared by boards of trustees and all senior managers, both clinical and administrative. Everyone must be committed to a long-term process and recognize that it may take ten to fifteen years. In addition, leaders must focus on the journey from low to high reliability by making it their highest priority and by requiring all levels of management throughout the organization to do the same.

In practical terms, this kind of commitment requires embedding the aim of high reliability into the vision and mission statements of health care organizations, setting measurable goals, and monitoring their achievement. Each of the components of high reliability described here is as susceptible to these fundamental management processes as are the routinely managed procedures for maintaining financial soundness, improving patient satisfaction, or increasing volume of business.

SAFETY CULTURE We believe that the organizational culture that is so essential to establishing and maintaining high reliability in health care is the “safety culture” described by James Reason and Alan Hobbs.⁴² They posit that this culture involves three mutually reinforcing imperatives: trust, report, and improve.

Trust is essential in two different ways if an organization is to receive a continuous flow of information about possible hazards or unsafe conditions. First, all front-line workers must trust each other in order to feel safe when they identify a problem that may involve or uncover errors made by others. If a maintenance engineer discovers a problem with how a piece of medical equipment has been serviced, she must not feel that her coworkers will ostracize her if she reports the problem up the chain of command. Second, the engineer must trust that management will fix the problem. Otherwise, any risk she might take in reporting it will not be worthwhile.

High-reliability organizations receive regular reports on potentially unsafe conditions, poorly functioning safety procedures, or simple

changes in the environment that might lead to failures of safety systems. These reports typically reveal problems in their early stages, before they pose major risks. When such a report leads to safety improvements and those improvements are communicated back to the workers who originated the report, the trust that led to the report is reinforced, and the safety culture of the organization is strengthened. Thus, in a healthy, fully functional safety culture, the three imperatives positively reinforce each other.

In organizations where trust is not widespread or deeply ingrained in the workforce, workers typically don't report unsafe situations when they can still be easily corrected. If the organization does not receive such information, it cannot make improvements until the problem becomes worse or harm occurs. If the organization does not take effective steps to improve safety, or if it punishes those who report safety problems, workers' lack of trust in management is reinforced and reporting becomes even less likely. Thus, deficiencies in the “trust, report, and improve” cycle can negatively reinforce each other and block progress toward high reliability.

ROBUST PROCESS IMPROVEMENT How have high-reliability organizations created nearly perfect processes? What can health care organizations learn from them in this regard?

In the 1990s health care organizations experimented with the industrial quality improvement tools of the time—specifically, the approaches of continuous quality improvement and total quality management. Some hospitals and systems were able to achieve some improvements in quality with those approaches. However, most of the improvements were in nonclinical areas, and the tools were largely ineffective in solving clinical safety and quality problems.⁴³

Today, some health care organizations are adopting the new generation of industrial quality methods and applying them to issues of clinical safety and quality. The new approaches—Six Sigma, lean management, and change management—are far more robust in their ability to solve difficult safety and quality problems. We refer to them, collectively, as “robust process improvement.” Taken together, they are a systematic approach to dissecting complex safety problems and guiding organizations to deploy highly effective solutions.^{44,45}

The power of these tools lies in their systematic approach, which involves the following: reliably measuring the magnitude of a problem; identifying the root causes of the problem and measuring the importance of each cause; finding solutions for the most important causes; proving the effectiveness of those solutions; and deploying programs to ensure sustained improve-

ments over time. Robust process improvement enables health care organizations to avoid crucial failures common in many efforts to improve clinical quality. The following example illustrates how and why they can be so effective.

An Example: Hand Hygiene

In late 2008 the Joint Commission created its Center for Transforming Healthcare to work together with hospitals and systems that have mastered robust process improvement methods to apply these tools to vital safety and quality problems.^{46,47} Hand hygiene was the first problem addressed by a group of eight hospitals that worked with the center.⁴⁸

Teams from the Joint Commission and the eight hospitals first agreed how to measure hand hygiene, developed the measurement system, and proved its reliability. Applying the measurement system produced the first discovery: Baseline hand hygiene performance at the hospitals in April 2009 was a disappointingly low 48 percent.

The next crucial step was to understand the exact causes of poor hand hygiene. Each hospital team used robust process improvement tools to find every important cause of failure and validated its importance statistically. This led to the second discovery: There were fifteen different causes of poor hand hygiene. Some of the most frequent causes were misleading data suggesting that performance was much better than it actually was; inconvenient placement of dispensers for alcohol hand rub; gaps in training of health care workers in hand hygiene; and a poorly developed safety culture, which did not support people who attempted to prevent others from failing to wash their hands. Each cause requires a different, specific intervention to improve hand hygiene.

The third discovery came when the teams examined the distribution of the causes whose significance they had validated across the eight hospitals: Each hospital had a different set of important causes. The implications of this finding are important.

A time-honored method of improving health care is the replication of “best practices.” For example, if your hospital is struggling with a problem, you identify a hospital that has reported success in dealing with that problem, and you copy at your hospital exactly what the successful hospital did. But if the causes of your hospital’s problem are different from the causes at the institution that generated the “best practice,” its interventions are unlikely to work in your hospital. This phenomenon suggests that the key to effective improvement is to identify the

specific root causes of a problem in each organization, in order to deploy interventions designed to target each important cause.

Robust process improvement can prevent another common problem in clinical quality improvement: the lack of sustainability. Improvement teams focus on identifying and engaging the people who will be responsible for overseeing improved processes. The teams also develop with these “process owners” plans for monitoring the performance of the improved processes and for intervening if performance begins to deteriorate. Using this approach, the eight hospitals reported in August 2010 that their aggregate performance for hand hygiene had risen to 81 percent—a rate they had sustained for ten months.

The Joint Commission has produced tools to spread the knowledge gained from this project to all of the health care organizations it has accredited.⁴⁹

Mapping The Road To High Reliability

What practical steps can health care organizations take to achieve high reliability? We recommend that they begin with a self-assessment that examines their organizational readiness in terms of the three components described above: leadership, safety culture, and the capacity to execute robust process improvement. Exhibit 1 shows some characteristics displayed by organizations in three different stages of readiness for high reliability—minimal, developing, and approaching—for each of the three components. Health care organizations can gain an overall understanding of how close to—or far away from—high reliability they are and where to focus their improvement efforts, by comparing their current state in each of these three areas with the descriptions in Exhibit 1. Note that “approaching” does not represent the achievement of high reliability. That achievement is determined primarily by establishing and maintaining rates of failure that are near zero on important measures of quality across all clinical services provided by the organization. Some existing tools can help organizations look more deeply into some of these areas and begin to translate the self-assessment into action plans for improvement.^{38,50,51}

Individual health care organizations that wish to make progress toward high reliability have chosen many different paths. Perhaps the most common strategy is to begin by training their staffs to use robust process improvement tools and methods, and then to apply the tools to various processes in the organization, including fi-

EXHIBIT 1

Stages Of Maturity In Health Care Organizations' Path To High Reliability

Organizational characteristic	Stage of maturity		
	Minimal	Developing	Approaching
Leadership	Quality activities focused on regulatory requirements Strategic importance of quality improvement not recognized Metrics for quality goals not part of strategic plan or incentive compensation Information technology provides little support for quality improvement Physicians not actively engaged in quality improvement	Chief executive officer leads proactive quality agenda Board reviews adverse events Organization sets a few measurable quality aims Information technology supports some quality and safety initiatives Physician leaders champion quality goals in some areas	Organization commits to goal of high reliability for all clinical services Organization aims for near-zero failure rates in vital clinical processes Some services demonstrate near-zero failure rates in some vital clinical processes Reward systems for staff prominently reflect accomplishment of quality goals Information technology integral to sustaining quality improvement Physicians routinely lead quality efforts
Safety culture	No program to assess safety culture No assessment of trust or intimidating behavior Root-cause analyses limited to most serious adverse events; close calls not recognized or evaluated	Establishing safety culture accorded high priority by leaders at all levels First measures of safety culture deployed Beginning initiatives to encourage reporting and analysis of close calls	Safety culture is well established Measurement of safety culture is routine and drives improvement Regular reporting of close calls and unsafe conditions leads to early problem resolution
Robust process improvement	No formal quality management system External requirements are focus of improvement efforts No commitment to sustainable improvement	Organizational commitment to adopt strong quality improvement tools Training of selected staff beginning Improvement tools used to achieve gains in quality and safety in addition to routine business processes	Robust process improvement tools used throughout organization Patients engaged in redesigning care processes Mandatory training of all staff in robust process improvement Proficiency in robust process improvement required for career advancement

SOURCE Authors' analysis.

nancial and other business processes.

Developing and implementing such a program will consume resources. However, the costs of adoption can be recovered by using these methods to improve revenue-generating activities—for example, by ensuring that all allowable charges are included in bills for services, and that payment is received for all bills—and to reduce other costs in order to generate overall savings. In this way, an organization can learn how to use robust process improvement to address crucial safety and quality problems while generating a return on its investment.

Conclusion

Many organizations outside of health care been able to establish high levels of excellence in managing hazardous processes and to maintain

those levels over long periods of time, with rates of adverse events many hundreds of times lower than occur commonly in health care. Can health care reach this state of high reliability and stay there?

We know of no health care organizations that have achieved that goal. High reliability may be beyond the reach of health care. However, based on the lessons of high-reliability science and past efforts to improve health care quality, we believe that leadership commitment, full implementation of a safety culture, and thorough adoption of robust process improvement tools and methods together are the pathway most likely to lead to success. This approach offers the best hope yet for health care to achieve and sustain the elusive goal of consistent excellence in safety and quality. ■

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here for how high reliability may be approached by health care organizations.

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In their article in this issue of *Health Affairs*, Mark Chassin and Jerod Loeb offer an overview of developments in the campaign to achieve better quality and safety in US health care, particularly during the past two decades. The authors are, respectively, president and executive vice president for health care quality evaluation at the Joint Commission.

Chassin became president of the Joint Commission—previously known as the Joint Commission on Accreditation of Healthcare Organizations—in 2008. The commission accredits and certifies more than 18,000 health care organizations and leads initiatives to improve the care those institutions provide. Before joining the Joint Commission, Chassin was the Edmond A. Guggenheim Professor of Health Policy and

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Chassin previously served as commissioner of the New York State Department of Health. Under his tenure, the state conducted the nation's first program to publish annual data on risk-adjusted mortality following coronary artery bypass graft surgery by hospital and surgeon. As Chassin wrote in a 2002 *Health Affairs* article, “many hospitals were prompted by the data to improve their cardiac surgery programs, and statewide mortality fell substantially as a result.”

Chassin also served as a member of the Institute of Medicine committees that authored the two seminal reports on patient safety and quality, *To Err Is Human* and *Crossing the Quality Chasm*. He is a board-certified internist and also practiced emergency medicine. He received his medical degree from Harvard University and a master's degree in public policy from the Kennedy School of Government at

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