Scotland’s Successful National Approach To Improving Patient Safety In Acute Care
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Health Affairs; Apr 2011; 30, 4; ProQuest Nursing & Allied Health Source
pg. 755

GLOBAL EFFORT
By Carol Haraden and Jason Leitch

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**ABSTRACT** What does it take to transform the safety of health care across a nation, even a small one? The Scottish Patient Safety Programme, mandated by the government, began in January 2008 with the aim of reducing mortality in Scotland’s hospitals by 15 percent in five years. With the collaboration of political leaders, senior health care managers, clinicians, and patients, the program has improved the quality and safety of hospital care. At the halfway point, in-hospital mortality rates have declined by 5 percent, and infection rates for certain hospital-associated infections have been cut by more than half. The Scottish Patient Safety Programme continues to prove that a national strategic approach can lead to unprecedented improvements in patient safety.

Since the creation of the UK National Health Service in 1948, the health care system has been roughly the same in each country in the United Kingdom. However, in May 1999, with the creation of a devolved Scottish government, the new government in Edinburgh became responsible for health and social care in Scotland, and a new National Health Service, NHSScotland, was created, independent from the other three health systems in England, Wales, and Northern Ireland.

**Health Care In Scotland**
In Scotland today, the provision of health care through NHSScotland is overseen by fourteen geographically based local National Health Service boards and a number of National Special Health boards, which together supervise the functioning of the country’s roughly thirty-five hospitals. NHSScotland has approximately 158,000 staff, including more than 47,500 nurses, midwives, and visiting health professionals and more than 3,800 consultants (specialists). In addition, there are more than 12,000 doctors, family practitioners, and allied health professionals, including dentists and community pharmacists, many of whom operate as independent contractors providing a range of services within the National Health Service in return for fees and allowances.

**NATIONAL HEALTH SERVICE IN SCOTLAND** The National Health Service in Scotland has had a long history of innovation and research. For example, during the past few decades, Scotland has undertaken the Scottish Audit of Surgical Mortality—a peer-review system to examine every surgical death in Scotland; multiple countrywide health care improvement collaboratives; the Scottish Intercollegiate Guidelines Network—a well-organized system of guideline and standards production in many clinical areas; and implementation of lean methodology in the health care setting. Thus, in January 2008, when Scotland launched the Scottish Patient Safety Programme—a systematic approach to improving patient safety in all of Scotland’s hospitals—it was a natural outgrowth of the nation’s ongoing health care quality movement.

Despite many initiatives in the United States and other developed countries, the rate of patient harm in hospitals remains too high. A recent study of ten North Carolina hospitals found...
25.1 instances of patient harm per 100 admissions, while a 2004 study of Canadian hospitals found an adverse event rate of 7.5 per 100 admissions. Reducing the burden of harm is a goal of NHSScotland.

**NINEWELLS HOSPITAL** On a local scale, Ninewells Hospital had already succeeded at reducing patient harm. Located near Dundee, a moderately sized city on the North Sea coast, Ninewells Hospital reduced patient harm by more than 60 percent in three years, as measured by the Institute for Healthcare Improvement Global Trigger Tool. The tool is a method that uses systematic reviews of patient charts to find triggers that can identify harm.

The success of Ninewells Hospital grew out of its participation in the Safer Patients Initiative, a collaborative effort of the Institute for Healthcare Improvement and the Health Foundation, a UK health care charity. The initiative, which began in 2004, was designed “to find practical ways of improving hospital safety and to demonstrate what can be achieved through an organisation-wide approach to patient safety.”

The work at Ninewells Hospital captured the attention of politicians and health care leaders in Scotland. After considerable discussion, the Scottish government health directorate decided to attempt to spread the work begun in Dundee to the rest of Scotland’s hospitals. As a result, the Scottish Patient Safety Programme began in January 2008 in partnership with the Institute for Healthcare Improvement. The five-year goals of the program were to reduce inpatient mortality for any cause by 15 percent and to reduce hospital adverse events, as measured by the Global Trigger Tool, by 30 percent.

**From Theory To Practice**

To implement the new patient safety program, policy leaders turned to the theoretical work of Paul Carlile and Clay Christensen to construct a road map that would help the Scottish hospital system move from idea to implementation. The program implementation team also created a driver diagram to depict how the patient safety program would work (see the Appendix).

**LOCAL HEALTH BOARDS** Scotland’s local health boards were recruited to convince hospital staff and patients that safety was a priority. This was achieved by emphasizing the importance of safety at health board meetings, introducing safety walkarounds, and including safety in board communications. Leadership walkarounds are conducted in all patient care areas: patient floors, emergency departments, operating rooms, radiology suites, the pharmacy, and laboratories. They provide a structured method for leaders to use in talking with front-line staff about safety issues in their organization and a rigorous mechanism to analyze information, identify effective actions, and ensure that these actions are performed.

**ESTABLISHING SAFETY AS A STRATEGIC PRIORITY** As the local health boards have done, the political entities with direct oversight of NHSScotland sent clear guidance that patient safety was a top priority. Patient safety became a common discussion item at the national meetings of chief executives, the board chairs, and other executive leaders such as medical and nurse directors.

**BUILDING A SUSTAINABLE INFRASTRUCTURE FOR IMPROVEMENT** Critical components of the patient safety program were developing a Scottish clinical improvement faculty as well as training and providing managers, leaders, and clinicians with measurement expertise. In addition, more than 200 clinicians received extensive formal instruction in improvement science. There was also a focus on organizational leadership and governing board member development regarding their respective roles in driving quality and safety in their boards.

**ALIGNING PATIENT SAFETY WITH OTHER PROGRAMS** There was sizable overlap between the patient safety program and the work of other national organizations whose mission it was to create safe and high-quality care. This often resulted in different definitions and measures for the same clinical outcome.

Front-line teams of doctors, nurses, and other clinicians such as pharmacists and physiotherapists often found it difficult to distinguish which definitions and measures to follow. For example, to determine if ventilator-associated pneumonia is present, there are two key guidance documents: Hospitals in Europe Link for Infection Control through Surveillance (HELICS), which offers five different categories for pneumonia; and the US Centers for Disease Control and Prevention’s definition of ventilator-associated pneumonia, which has three different categories.

To solve this problem, the patient safety program leadership had to work closely with expert clinicians to agree on definitions. The Scottish Patient Safety Programme leadership team met bimonthly with stakeholders to align the new program’s focus, clinical changes, measures, and definitions with existing national programs.

**ESTABLISHING A LEARNING SYSTEM** The learning system developed jointly by NHSScotland and the Institute for Healthcare Improvement consisted of biannual countrywide meetings attended by a leadership team and by local health board teams from each of four clinical areas: critical care, general wards, medicines manage-
ment, and perioperative care. At these meetings participants shared their experiences in overcoming barriers and creating solutions.

The learning system also included monthly calls with clinicians from each of the four clinical areas, during which progress and barriers were discussed with other teams and the faculty. Monthly progress reports on process and outcome measures were submitted to an electronic reporting site (see the Appendix).¹²

Program managers were trained to enter data into their respective extranet pages by an established date each month. Progress toward goals based on the data was assessed by the patient safety program director and improvement adviser.

In addition to monthly calls and data submissions, there were also site visits. Local and national events to build capacity and capability were held frequently, bringing together 50–300 clinicians for one to two days to build skills in measurement, the spread of innovation, testing changes, and reliable design.

The Model for Improvement¹⁴,¹⁵ was used as the core change model. The model, a simple yet powerful tool for accelerating improvement, builds on the work of W. Edwards Deming and Walter Shewhart. Deming built the method from many problem-solving theories, including Shewhart's specification, production, and inspection processes. The method is used extensively in industries as varied as chemical manufacturing and oil delivery.

The model consists of two parts. The first part asks three fundamental questions: What are we trying to accomplish? What changes can we make that will result in improvement? How will we know that a change is an improvement? The second part of the model uses the "Plan-Do-Study-Act" strategy to test and implement changes in real work settings. The strategy is useful in guiding the test of change to determine if the change is an improvement. This two-part model was taught to the Scottish health care teams implementing the patient safety program.

Setup For Success
Begun in January 2008, the Scottish Patient Safety Programme will continue until December 2012. The relentless focus on capacity and capability building during this period is meant to ensure that the ability to improve safety and quality will exist in perpetuity.

Results at the program's halfway point are encouraging. The national hospital standardized mortality rate (the ratio of observed deaths to expected deaths based on the health status of admitted patients) has fallen by 5 percent. Exhibit 1 depicts the ratio of expected to observed deaths, adjusting for many variables such as age and number of health conditions. Infection rates for *Clostridium difficile*, a bacterium associated with hospital stays and treatment with antibiotics, have fallen by more than 50 percent (Exhibit 2). And central-line catheter bloodstream infection rates have all improved (Exhibit 3), as have on-time provision of antibiotics and perioperative briefings in operating theatres (see the Appendix).¹⁶

Before the patient safety program began in January 2008, there was a five-month planning phase during which essential structures were established, including the program's leadership team, which comprised leaders from Quality Improvement Scotland, the Scottish government,
and the Institute for Healthcare Improvement. Aside from the leadership team, the key players were the Scottish government health directorates, existing local health boards, the special health boards (in particular, the National Health Service Quality Improvement Board), and the Institute for Healthcare Improvement.

Very early on it was decided to embrace the concept of "one team" rather than the traditional customer-supplier relationship. The group would act as one team—not a "Scottish team" and an "Institute for Healthcare Improvement team"—to ensure a single shared purpose and vision.

Each of the fourteen local health boards was asked to appoint a program manager for patient safety and an executive leader. Subsequently, each local board was asked to appoint an executive leader for each of the four clinical work areas (critical care, general wards, medicines management, and perioperative care).

The Scottish government set up the National
Turning data into information in order to drive clinical improvement requires technical and behavioral change.

Advisory Board, chaired by the chief medical officer, as the high-level governance group for the program. Stakeholders from the National Health Service, government, and patient groups all had representatives on the board. National Health Service Quality Improvement Scotland, the main operational organization, appointed a program coordinator for the patient safety program, hired regional facilitators, and set up the Scottish Patient Safety Steering Group to oversee delivery of the program.

In addition to the formal structure, a great deal of time was spent with crucial stakeholder groups on planning and delivering the program, including the chief executives, the board chairs, the medical directors, the nurse directors, Health Protection Scotland (a board established in 2005 by the government to coordinate activities aimed at protecting the Scottish people from infectious and environmental hazards), patient groups, the Royal Colleges, and relevant specialist societies.

Getting Measurement Going

Data and measurement systems that are accurate and reliable were crucial components of the Scottish Patient Safety Programme. Data were needed at the national and hospital levels. Because all clinical improvement is driven by clinicians and staff caring for patients, the development of data and measurement systems began there.

Turning data into information in order to drive clinical improvement requires both technical and behavioral change. Hospital data collection and analysis systems are rarely developed to support improvement. As is the case with health care everywhere, Scottish hospitals had a great deal of data collected and reported by various groups, destined for various entities such as national audits and government-led performance management systems.

Before the patient safety program came into being, the data had two common characteristics. They were most often used to judge the performance of health boards and, therefore, of the executives in charge. What’s more, they were rarely used by the producers of the data to improve performance. Outcome data such as rates of infections and cardiac arrest were often presented as summary statistics from data aggregated at the hospital or health care board level. These outcome data may be useful in understanding the progress of a large entity or institution on important measures, but they did little to help individual National Health Service doctors, nurses, pharmacists, and other health care professionals understand and improve the processes that resulted in those data. To improve, clinicians needed timely data that reflected the reliability and capability of the processes of care that they controlled.

To produce timely data that would reflect current work, the patient safety program had to work with providers to develop data collection systems that were as near to real time as possible. To accomplish this, clinicians were required to enter all of their patient care data into a secure extranet site developed for the patient safety program. The extranet is an extension of a network—in this case, the Institute for Healthcare Improvement Intranet—that allows controlled access for users from outside the organization.

To decrease the data entry burden, the safety program employed three strategies. First, data already required by other national health programs were integrated into the new safety program. For example, Health Protection Scotland already collected data on infection rates, so these data were incorporated into the patient safety program and used for outcome measurements.

Second, existing automated data systems were integrated into the new patient safety data collection program. For example, data on intensive care unit central-line infection rates were integrated into existing systems such as Ward-Watcher. Another example of automating the data involves improving anticoagulation (preventing blood clots after surgery). A data system was developed de novo to obtain the rate of a patient’s coagulation if it exceeded a specified level. These data could then be aggregated from existing lab reports for medicines management.

Third, the patient safety program used sampling strategies for measuring process reliability. For example, when the goal was that an early warning scoring sheet—in other words, a documented assessment of patients’ vital signs mapped against criteria that showed that the patient might be at risk—be completed for every patient on a forty-bed unit, staff were asked to
measure every fifth patient, or complete a certain number of scoring sheets each day.

In the end, the data must be perceived as useful to the clinicians in order to drive improvement. The measures from individual hospitals must be aggregated in a manner that allows health care board executives and national leaders to evaluate the progress and effectiveness of the ongoing work.

A ‘Sticky’ Improvement Model
Changes are often simply handed to clinicians to implement. In the extremely complex system of health care, this approach is seldom successful. A fundamental requirement for improvement to succeed is that the members of the delivery system need to know how to create successful change.

Clinical teams were encouraged to customize changes. For example, certain established processes must occur when a clinician is inserting a patient’s central-line catheter. To standardize their approach, one organization’s critical care unit might decide to develop a cart carrying all supplies required for central-line insertion, while another organization’s team might opt for the development of central-line insertion “packs” containing all supplies for one patient. Focusing on adherence to the required process and outcome rather the approach allowed teams to develop and own their own changes.

The patient safety program used the Model for Improvement as the methodology to create and sustain improvement. The government set compelling and measurable aims, including the extent of the improvement and the time in which it needed to be achieved—what is known as “how much and by when.” In partnership, the Scottish government and the Institute for Healthcare Improvement developed a measurement plan that tracked progress toward the results over time using run charts. Lastly, evidence-based changes from both the literature and the documented experience of clinical experts were used.16-20

The Scottish Patient Safety Programme Changes
Scottish acute care hospitals are testing and implementing a series of proven changes to achieve new levels of safety in many areas, including medication management and the prevention and treatment of pressure ulcers. The full list of changes and measures can be found in the Appendix.12

Leadership and an infrastructure that support sustained improvement must grow alongside the front-line clinician’s ability to improve the safety of direct patient care. In addition to establishing a sound rationale for all changes, several criteria were considered when the recommendations were being developed. Improvements must have a large impact on severe events; address high-frequency occurrences; be easily accomplished; demonstrate a sound cost-benefit ratio; have a balanced impact on institutional resources; have a timeline for implementation; and be applicable in multiple care settings.

Present And Future Challenges
Any change in the accepted order of business is a challenge. This is never more true than when attempting to change clinical practice at such a large scale. To reduce large system measures such as mortality and adverse event rates, organizations must implement a number of changes that have been shown to have a major effect on those measures. In addition, those changes must be tested and disseminated throughout the organization.

The changes must affect patient care deeply and broadly in order to show system-level improvement. It does not appear to be necessary to adopt 100 percent of the changes before the measures show strong improvement. However, a majority of clinical areas where the problems are most evident must have adopted the changes and produced results.

Strategies that have been used historically for producing change, such as imploring staff in meetings, writing repeated memos, or publishing guidelines and pathways, are inadequate for supporting the scaling up of improvements from pilot to all relevant clinical areas; new strategies must be developed. A national infrastructure to support the patient safety program was discussed earlier in this article.

Each health care board also had to create new roles and deploy new organizational structures. Leadership had to manage the scaling up and implementation of more than forty changes in four clinical areas, by developing and managing
The patient safety program has been effective in creating both enthusiasm and improvement.

A master plan that measured both coverage and completeness.

Leadership and governing board meetings began to include patient safety program reports on their respective agendas. Quality and safety became a more prominent part of these meetings.

Integrating quality, safety, and improvement into clinical training and practice was also crucial. Because trainee doctors are often the first physician a patient sees, their involvement at every stage was important. They are often responsible for medication lists, consent for operations, and consent for invasive procedures such as the insertion of tubes. Making data transparent so that clinicians could see their performance became an important subject as staff posted results in the hallways of patient care units.

The focus of this patient safety initiative was on in-hospital acute care. That mental health, primary care, and pediatrics wanted to be “in the tent” as well was an unexpected but welcome challenge. Each group asked the Scottish Patient Safety Programme, which is adult and acute care based, if they might join the collaborative meetings and also begin to develop changes and measures to improve care in their respective clinical areas.

Embracing broad participation while also maintaining focus on the ambitious acute care aims was a balancing act. As a way to encourage and support their efforts, primary care and pediatrics groups joined the program’s acute care meetings. Discussion and learning focused on how to best to manage the interfaces between care settings.

Each new proposed program by these other groups immediately highlighted the need for both national and board-level infrastructure to support the work. The new quality strategy, discussed below, includes programs developed for mental health, primary care, and pediatrics.

Toward A National Quality Strategy
Leaders of NHSScotland have found that the patient safety program has been effective in creating both enthusiasm and improvement. From the level of clinical engagement to the positive outcomes such as reduced infection rates, key leaders in NHSScotland have asked how the methodology could be spread to other areas.

The most dramatic development to emerge from the patient safety program was the publication of NHSScotland’s quality strategy in May 2010. This strategy’s foreword says: “The ultimate aim of our quality strategy is to deliver the highest quality healthcare services to people in Scotland and through this to ensure that NHSScotland is recognised by the people of Scotland as amongst the best in the world. We want to achieve this aim in a way this is recognisable and meaningful to everybody.

“This is ambitious, but it is achievable and we are well placed to deliver. The aim is set at a high level, but the means to achieving it will be built from the ground up. What will make Scotland a world leader will be the combined effect of millions of individual care encounters that are consistently person-centred, clinically effective and safe, for every person, all the time.”

The quality strategy sets out three quality ambitions for NHSScotland.

PERSON-CENTERED CARE Mutually beneficial partnerships between patients, their families, and those delivering health care services will respect individual needs and values and demonstrate compassion, continuity, clear communication, and shared decision making.

SAFE CARE There will be no avoidable injury or harm to people from health care they receive, and an appropriate, clean, and safe environment will be provided for the delivery of health care services at all times.

EFFECTIVE CARE The most appropriate treatments, interventions, support, and services will be provided at the right time to everyone who will benefit, and wasteful or harmful variation will be eradicated.

Conclusion
Our aim was to describe a countrywide improvement program designed to reduce mortality and harm using specific tested interventions. The work began in 2007, when senior leaders within NHSScotland decided to spread to the entire country the promising results achieved at Ninewells Hospital.

The Institute for Healthcare Improvement was chosen as a partner because of its expertise in running large-scale collaborative improvement projects and its relentless focus on execution and
results. One of the factors essential to success was the early engagement of key politicians and policy makers. This was done by showing data from around the world demonstrating what best-in-class looked like and persuading them that combining all of the interventions would result in the mortality reduction goal.

The Scottish Patient Safety Programme has proved, and continues to prove, that a countrywide strategic approach can lead to unprecedented improvements in patient safety. A man
dated collaborative using a systems approach has not, to our knowledge, been tried in any other publicly funded health care system in the world.

Countrywide improvement is the result of increased capacity and capability; a clear and reusable model for improvement; commitment to the development and use of reliable and actionable data systems; the dedication of clinicians, staff, and leadership; and the health service’s passionate belief in the right of Scots to have the best care possible.

The authors gratefully acknowledge the enormous contribution of Terri Frankel and Robert Lloyd to the data elements of this analysis. In addition, the thoughtful and helpful advice of Jane Raesner, Vol Weber, and Frank Daviddoff was invaluable.

NOTES


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8 Classen DW, Resar RK, Griffin F, Federico F, Simmonds TC, Kimmel N, et al. "Global Trigger Tool" shows that adverse events in hospitals may be ten times greater than previously measured. Health Aff (Millwood). 2011;30(4):581–89.


12 To access the Appendix, click on the Appendix link in the box to the right of the article online.


Coauthors Carol Haraden and Jason Leitch examine the Scottish Patient Safety Programme, mandated by Scotland’s government to reduce mortality in the country’s hospitals by 15 percent during the period 2008–13. They find that the program’s collaborative structure, involving political leaders, senior health care officials, clinicians, and patients, has improved the quality and safety of patient care. Hospital mortality and infection rates have all declined, prompting the extension of patient safety programs throughout Scotland and beyond.

The coauthors worked on several projects together in 2005, when they were both at the Institute for Healthcare Improvement (IHI) in Cambridge, Massachusetts, and even shared office space for three months. Haraden was—and still is—a vice president there, and Leitch was a quality improvement fellow. Until recently, Haraden lived in Scotland, where Leitch is now based. They are also working together on a similar project on Denmark intended to reduce mortality and adverse events in five Danish hospitals.

According to Haraden, the authors were surprised by how much cooperation and enthusiasm they received from executives on Scotland’s Health Boards, which oversee the country’s National Health Service. “We expected apathy at best and outright opposition at worst,” she says. “The combination of strong political and executive leadership outlining the vision and holding the system accountable for results, combined with those who treat patients leading the actual changes at the point of care, has led to unprecedented improvements in process and outcome.”

Haraden also leads the IHI team for patient safety programs in the United Kingdom and Europe. She has been a dean in higher education, a clinician, a researcher, and a consultant. She has published several papers on measuring patient harm and improving intensive care outcomes and has served as a judge for many national quality awards. Her master’s degree in pediatric nursing is from Boston University, and her doctorate in statistics and research is from the University of Wyoming.

Leitch is the national clinical lead for quality for the Scottish government. He is also chair of the Conduct and Health Committees of the General Dental Council, the regulatory body for dentistry in the United Kingdom. Leitch holds a dentistry degree from the University of Glasgow, a doctorate from the University of Glasgow, and a master of public health degree from Harvard University.