FROM THE FIELD

Pittsburgh Regional Healthcare Initiative: A Systems Approach For Achieving Perfect Patient Care

How one region is seeing real improvements in patient care, thanks to a carefully planned and executed strategy.

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ABSTRACT: The Pittsburgh Regional Healthcare Initiative (PRHI) is an innovative model for health system change based on regionwide shared learning. By linking patient outcomes data with processes of care and sharing that information widely, PRHI supports measurable improvements in regionwide clinical practice and patient safety. In addition, through the redesign of problem solving at the front lines of care, PRHI helps health care organizations to evolve toward becoming sustainable systems of perfect patient care. This paper describes PRHI's design for change, reviews the progress and limitations of the shared learning model, and offers a set of broader policy considerations.

SERIOUS, WIDESPREAD PROBLEMS exist in the U.S. health care system, causing over- and underuse of services and variability in treatment and outcomes and harming millions of patients every year.[1] Although most agree that fundamental changes are needed in health care, there is no commonly accepted blueprint for redesigning the health care system to deliver high-quality care.[2] Regional efforts involving multiple organizations are rare, and few rigorous scientific studies document their effectiveness in improving patient outcomes.[3]

Still in the early stages of its development, the Pittsburgh Regional Healthcare Initiative (PRHI) is an innovative model for achieving measurable and sustainable improvements in health care on a regionwide basis. Organized in 1997, the collaborative includes forty-four hospitals in twelve counties in southwestern Pennsylvania; hundreds of physicians; four major insurers covering 85 percent of the commercial market; thirty-two large and small business health care purchasers representing more than 200,000 workers and dependents; organized labor; and dozens of civic leaders. Supported by partnerships with state and federal government agencies, national organizations and foundations, and local entities, these stakeholders assume direct responsibility for

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designing and implementing key aspects of the initiative.

PRHI's vision is to achieve perfect patient outcomes by identifying and solving system problems at the point of patient care. The initiative's core components focus on improving the quality of health care in five clinical practice areas and across two patient safety issues. Using a regionwide learning model that links patient outcomes data with processes of care, PRHI shares that information across regional health care providers and practitioners to support measurable performance improvement. In addition, through direct support of front-line care models in which health care workers respond quickly to specific problems, PRHI fosters the evolution of organizations toward a sustainable system of perfect patient care, in which everyone, every day, delivers the right care at the right time for every patient.

This paper describes the principal components of PRHI's design for change; reviews the progress and limitations of the regionwide shared learning model to date; and offers a set of broader policy considerations to support other regions striving to achieve perfect patient care.

PRHI'S Design For Change

To build a new health care system, people working in that system need a common purpose and a suitable level of focus around which to align their efforts. While leadership engagement is an important prerequisite for providing the necessary organizational commitment to and investment in change, the change itself must come from the ground up, as front-line health care teams redesign the processes of care.[4]

■ **Common purpose.** PRHI partners have aligned their efforts around one common purpose: achieving perfect patient care. This represents the theoretical limit of performance and is a nonarguable, values-based goal. PRHI's experience has shown that for improvements to occur regionwide, local health care stakeholders must regard the patient as the most important of all competing interests in health care. PRHI's initial attempts to ad-

dress the region's overcapacity of emergency helicopters and the proliferation of cardiac surgery centers failed because the competitive self-interest of regional providers prevented consensus. By recognizing the patient as the single organizing principle for health care delivery and the central point of problem solving, PRHI partners are beginning to work across institutional boundaries.

■ **Suitable level of focus.** To achieve perfect patient care, PRHI is focusing its efforts on two complementary and overlapping components of the health care system: clinical practice and patient safety. The initiative has targeted five clinical practice areas for quality improvement: maternal and infant health, orthopedic surgery, advanced cardiac care, depression, and diabetes mellitus. These areas were chosen because they affect a large number of people; treatment and outcomes vary widely; they are costly; and sound regional data make comparisons of results possible. The regionwide goals are as follows: for maternal and infant health, zero inappropriate choice of mode of delivery (vaginal delivery, cesarean section, or vaginal birth after a previous C-section [VBAC]), leading to zero variation in outcomes; for orthopedic surgery, zero complications; for advanced cardiac care, zero complications and zero hospital readmissions resulting from complications of incident admission; for depression, zero readmissions due to inappropriate posthospitalization followup with a mental health specialist; and for diabetes, zero unnecessary hospitalizations due to inappropriate outpatient care, zero preventable complications, and zero readmissions.

In the area of patient safety, the initiative has targeted two cross-cutting, multispecialty issues: nosocomial (hospital-acquired) infections and medication errors. These were chosen because they highlight system problems that result in patient harm; they require everyone in an organization, including its leaders, to take part in learning and problem solving; and they are readily measurable. Regionwide goals are zero medication errors and zero nosocomial infections. Over time, PRHI aims to extend this work across the full spectrum of

health care.

■ **Leadership engagement.** A basic premise of PRHI's work is that sustainable improvements require the direct support and participation of the highest levels of leadership. As examples from other industries illustrate, change is possible only when leaders take charge of quality and safety and declare them to be everyone's responsibility. Otherwise, legal concerns and traditional barriers to resource deployment will discourage hands-on problem solving and inhibit learning.

PRHI's near-term strategic plan calls for more explicit engagement of hospital chief executive officers (CEOs) in the initiative's key activities. For example, the involvement of flagship hospitals in PRHI efforts to improve cardiac care hinges on their executives' and boards' formal commitment to PRHI goals and principles.

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Engaging leaders in this way requires an atmosphere of inclusiveness, trust, collaboration, and mutual support, along with clear accountability for reaching agreed-upon, patient-focused goals. The commitment of PRHI partners, even in the context of a very competitive local health care environment, was formalized through the endorsement of PRHI Charter Documents by the region's major hospitals and by executives of the region's largest employers and health plans.[5]

PRHI's governance and operations further reflect its collaborative nature. Participants from all sectors of the health care community help to design and carry out the initiative's work. Physician leadership and engagement has been essential. Key business, labor, and civic leaders also actively participate as members of leadership committees and working groups, and media representatives are regularly informed of the initiative's progress.

■ **Front-line change.** In PRHI's regionwide change model, health care is viewed as a complex, adaptive system comprising multiple but interdependent parts organized according to patients' needs.[6] In this learning paradigm, smaller microsystems (for example, clinical or service units) have the capacity to learn and change as a result of experience. If they have sufficient institutional support and follow relatively simple rules, they can bring about sustainable systemwide performance improvement. A major challenge lies in changing routine processes and procedures to alter the ways in which people conduct their everyday work.

To meet this challenge, PRHI has begun aggressively promoting a strategy of "real-time" error reporting and decentralized problem solving among participating institutions. Leaders create a safe environment by setting the following expectations: 100 percent of errors will be reported; staff closest to the error will identify a root cause and propose a solution within twenty-four hours; and that information will be immediately shared across the institution, including with the CEO.

As part of this process, PRHI is adapting to health care one of the most successful business improvement models in the world: the Toyota Production System (TPS). The tacit knowledge underlying the TPS can be captured in a simple set of rules that guide the design, operation, and improvement of every activity, connection, and pathway for each product and service.[7]

Real-time error reporting and TPS design rules have been applied successfully at Alcoa in Pittsburgh by former U.S. Treasury Secretary and Alcoa CEO Paul O'Neill, PRHI's founding cochair. Now, through application of the TPS "learning line" approach, a few of the region's health care leaders are learning how to use systematic, decentralized problem-solving principles on the front lines of care and are diffusing that learning across their organizations. PRHI offers a sequential exposure and education program for local and national health care stakeholders who are interested in learning more about this approach.

Facilitating Regionwide Shared Learning

Drawing on conventional learning theory, PRHI's regionwide shared learning model moves along a sequence from data collection to information sharing to problem solving, across a wide range of clinical practice areas and patient safety issues. The PRHI approach is designed to uncover and address patterns of unwanted variation, continuously improve work processes, and reach goals related to patient outcomes.

■ **Regionwide data collection and reporting systems.** Establishing valid and reliable data collection and reporting systems is a first step in the regionwide shared learning process. For clinical care, PRHI has benefited from an independent statewide database of inpatient care, including severity-of-illness measures and treatment outcomes, collected by the Pennsylvania Health Care Cost Containment Council (PHC4). Rather than having to depend on the goodwill of hospitals and physicians to generate new data or endure years of planning to create its own database, PRHI, in partnership with PHC4 and local physician leaders, has used existing public data to provide baseline information on patient outcomes for its five targeted clinical practice areas.

Reports issued to PRHI hospitals and physicians between July 1999 and November 2001 have focused on regionwide variations in outcomes attributable to potentially inappropriate choice of mode of delivery; complications in total hip and knee replacements; mortality, complications, and hospital readmissions related to advanced cardiac care; inadequate posthospitalization follow-up for depression; and unnecessary hospitalizations attributable to inadequate outpatient care, preventable complications, and readmissions for diabetes. In the case of diabetes and depression, inclusion of Health Plan Employer Data and Information Set (HEDIS) measures of outpatient care has enabled consideration of patient outcomes extending beyond hospital boundaries. The credibility of PHC4 information has been maintained through a continued emphasis on timely and accurate data submission by hospi-tals, extensive data quality checks, and the use of rigorous risk-adjustment methods. PRHI will periodically commission updated reports from PHC4 to monitor changes in clinical outcomes across the region over time.

For patient safety, in contrast, no shared reporting structures for infections or medication errors existed previously among the region's providers. Every hospital used an internal standard for tracking these events, and methodologies varied. Partnerships between PRHI and the U.S. Centers for Disease Control and Prevention (CDC) and U.S. Pharmacopeia (USP) have been instrumental in implementing the most credible data collection platforms available.

Before the CDC's involvement, only five of PRHI's hospital partners used the National Nosocomial Infection Surveillance (NNIS) System. Special arrangements allowing PRHI hospitals of all sizes to report data to the NNIS system have provided opportunities to test how well this system adapts to use in smaller hospitals as well as how useful tracking infection data is for actually lowering rates of infection across an entire region. Likewise, PRHI's endorsement of USP's Medmarx, which standardizes medication error reporting using the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) error categorization index, has enabled improved regional data collection and analysis. Both systems meet industry standards for error reporting.[8]

Drawing on data provided voluntarily by hospital partners to these systems, PRHI develops and sends quarterly infection and medication-error reports to each participating hospital, including facility-specific and regional and national data. PRHI's operating committees, composed of representatives from participating organizations, are charged with defining reporting formats and standards, interpreting the data, and recommending and supporting appropriate interventions.

Several lessons are noteworthy. With respect to outcomes and error reporting, initial negative reactions from the clinical community can be turned around by engaging clinical

experts from competing institutions early in the process of data analysis and reporting. In addition, as PRHI's initial halting start in maternal and infant health clearly demonstrated, clinicians' ownership of the process is essential. For both mandatory and voluntary reporting, links between patient outcomes and processes of care are necessary for capturing the interest of the broader clinical community. Establishing a "no-blame" patient-safety culture in which to learn from errors is also essential; the support and engagement of hospital CEOs and other senior health care leadership here cannot be overemphasized. Finally, local media must be willing to focus on the process of regionwide health care improvement, not short-term outcomes for specific institutions.

■ **Linking patient outcomes to processes of care.** The next step in regionwide shared learning is to transform data collection into information sharing both within and across institutions. As PRHI's clinical initiatives demonstrate, the most effective way to do this is by linking patient outcomes to processes of care.

As disclosed in the PHC4 Advanced Cardiac Care Report, the region's in-hospital complication rate for coronary artery bypass graft (CABG) surgery ranged from 3.7 percent to 11.2 percent. The readmission rate for CABG patients ranged from 11.9 percent to 23.4 percent, with an average 17.0 percent readmission rate that was higher than the statewide readmission rate of 15.3 percent (a fact previously unknown to the region's clinicians and institutions). Statewide, developing an in-hospital complication was an important predictor for in-hospital mortality, length-of-stay, and, to a lesser degree, readmission after patient risk was controlled for.

In light of these regionwide findings, the thirteen major cardiac surgery groups in southwestern Pennsylvania came to recognize what they can accomplish collaboratively to improve cardiac care outcomes. Following the release of the PHC4 report, PRHI began working with these groups to create a common cardiac registry for measuring patient outcomes related to CABG surgery and the status of CABG patients. Drawing from an initial set of evidence-based goals derived from the Northern New England Cardiovascular Disease Study Group, PRHI partners have agreed upon eighty-nine data elements and definitions of specific processes of care that influence patient outcomes. They identified, in particular, mortality and incidence of atrial fibrillation following CABG as starting points for improvement.

Data are collected on each patient undergoing CABG surgery, thus forming a common platform to assess severity of illness, risk, and comparative outcomes and to provide the basis for working together to eliminate unwanted variations. Beyond traditional benchmarking, the cardiac registry is designed to disclose factors that contribute to the most common complications and, conversely, to the best outcomes. The Centers for Medicare and Medicaid Services (CMS) has contracted to underwrite the activities of the registry, including measurements of the impact on PRHI patient safety and learning-line activity in selected cardiac units.

In response to the commissioned PHC4 reports documenting large gaps in follow-up care for people with depression and high, increasing rates of diabetes hospitalization in the region, PRHI convened two working groups to develop a regionwide plan to optimize physician care for these two conditions. A critical aspect of this plan has been the alignment of local employers' goals with those of other PRHI participants: to achieve the best possible outcomes of care for the best value. Through the support of the Agency for Healthcare Research and Quality (AHRQ) and in collaboration with the American Medical Association (AMA), a regional network of employers and their associated primary care physician practices, health plans, pharmacy management companies, and clinical laboratories is working to validate a set of physician practice management tools developed by a national consortium of clinical experts in both diabetes and depression.[9]

The collaborative will provide patient-tracking tools, performance data, and relevant

clinical information to physicians and will offer support for workplace-based depression and diabetes awareness and early identification programs. Five local health plans have agreed to supply claims data to a pilot registry that will provide physicians with a list of all insured diabetics and the dates of their most recent HbA1c (glycosolated hemoglobin), lipid profile, and eye exams. If the pilot registry proves useful, it will be scaled up to include actual lab values and disseminated to a larger group of physicians. These efforts are intended to improve continuity of care for patients with (or at risk for) diabetes or depression.

■ **Sharing information to improve performance.** Using shared information to drive performance improvement is the third critical step in the regionwide shared learning process. PRHI's focus on regionwide reporting of medication errors and nosocomial infections is instructive in this regard.

For medication errors, a near-term goal has been to increase the total number of reported errors regionwide and to use this information to understand the causes of errors and devise solutions for preventing them. As of March 2003 thirty hospitals in southwestern Pennsylvania were reporting errors through the USP Medmarx system. The average number of errors reported per hospital in the first quarter of 2003 was 143, up from an average of 69 in the third quarter of 2001. During this same period (first quarter 2003), PRHI hospitals reported 7.1 percent of all errors in the Medmarx database reported during that span, thus demonstrating the value of regionwide reporting for furthering our national understanding of the causes of medication errors.

Based on a review of the types and systems causes of errors reported to Medmarx between July 2001 and March 2002, PRHI's Medication Safety Advisory Committee published the first in a series of safe medication practice guidelines focused on ensuring safe prescribing (such as preventing the use of unsafe abbreviations) and proper use of fentanyl transdermal patches (a narcotic analgesic). These regional initiatives are under way, and a third one designed to eliminate errors related to patient-controlled analgesia is under development.

In the case of nosocomial infections, PRHI hospital partners are using a modified version of the CDC's NNIS system to monitor infection trends over time, both individually and in comparison with other regional institutions and national benchmarks. Thirty-one hospitals across the region are submitting data on central line–associated bloodstream infections in intensive care units, and thirty-nine hospitals are or have committed to submitting data on methicillin-resistant Staphylococcus aureus (MRSA), an antimicrobial-resistant organism.

This information has been shared across facilities to assess regionwide progress with respect to patient-safety priorities for infection control and to evaluate the effectiveness of established prevention and intervention efforts. Such efforts include best practices focused on reducing infection rates associated with primary bloodstream infection, ventilator-associated pneumonia, and surgical-site infections for CABG and hip and knee replacements. With AHRQ support, PRHI will measure these initiatives' effect on improving regionwide performance in reducing medication errors and infections.

■ **Changing care processes to improve outcomes.** The final step in regionwide shared learning is using evidence-based knowledge to improve actual patient care processes in hospital units. Such efforts are now beginning to build momentum across both the clinical care and patient safety initiatives, and in some cases at their points of intersection where opportunities to improve care are increasingly evident.

For example, work to prevent the transmission of MRSA began in October 2001 in one hospital unit applying the TPS learning-line principles. The work included initiating a surveillance culture program to identify and isolate MRSA-colonized patients and implementing measures to ensure that health care personnel could follow standard infection-control precautions (masks, gowns, gloves, and hand washing). Preliminary results are encouraging: Compliance with infection-control

precautions has increased, and the infection rate has trended downward since the learning line was implemented. Additional process improvements not directly related to infection control have also been achieved. These include better on-time drug administration, reduced spending for gloves, reduction in nursing time spent in shift changeover, and dramatic improvement in patients' on-time arrival for physical therapy appointments. Other learning lines piloted in hospital pharmacy departments and intensive care and cardiac care units have begun to improve patient care processes, reducing missing and delayed medication doses and intercepting potential medication errors.

Designing A New Environment For Health Care

As PRHI's regionwide shared learning model continues to develop, data collection and analysis, information sharing, and problem solving will move increasingly toward real time. PRHI is working with the CDC on a beta test of the National Healthcare Safety Network, a next step for creating real-time reporting of process and outcomes data for infections. Automated data collection from clinical microbiology labs represents another step toward automating infection surveillance and predictive modeling. PRHI has also worked with USP on the development of a Medmarx Multifacility Module that enables the production of regionwide medication error reports on demand and with greater accuracy.

Through these changes and others, the pace of learning among PRHI's hospital partners is expected to accelerate from months to days to minutes. Initially, most organizations will be at Stage 1, where data on patient outcomes are paper-based, information sharing occurs regularly in regional working groups, and problem solving follows conventional forms of evidence-based practice, such as the implementation of clinical best-practice guidelines. Over time, the limitations of Stage 1 will pull organizations toward Stage 2, where leaders' com-

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mitment to rapid problem solving and real-time electronic data will hasten the process of information sharing and enable rapid, decentralized, root-cause problem solving. Ultimately, organizations will reach Stage 3, where real-time information connecting process to outcomes is used to continually improve everyday performance. As more organizations move toward this final stage, sustainable, regionwide improvements in patient outcomes are expected.

■ **Limitations of the regionwide change process.** The ability of PRHI's model to achieve sustainable improvements in health care is limited by a number of factors. Reporting systems in general remain cumbersome and labor intensive. The lack of timeliness of public reporting forces retrospective review of outcomes that are distant in time from the delivery of care, thus inhibiting organizations' movement through the change process. (Such change is possible, however, with the near-real-time use of the risk adjustment tool mandated by PHC4, which every hospital in Pennsylvania has installed.)

The voluntary nature of reporting makes the denominator of the universe of errors difficult to grasp. A marker of success is a rise in the number of reported errors, even lacking a clear understanding of what the number should approach. Moreover, the magnitude of errors, especially in medication, can be overwhelming, making them difficult to capture as well as focus improvement upon.

Helping health care professionals to understand what should be classified as an error remains a challenge and will require reframing educational and cultural norms. To date, little work has been done to transform undergraduate, graduate, or postgraduate educational programs in the Pittsburgh metropolitan region. Also, the lack of a clear "safe harbor" with respect to confidentiality and peer review protection from liability issues creates additional barriers to error reporting.

Health care institutions' willingness to em-

brace the necessary structures to improve with greater speed is variable and remains a challenge. Large institutions, in particular, can "politicize" the improvement process, making regional success less likely. Building trust among institutions is a constant challenge, especially in the formative stages of the change process. Finally, maintaining a unified focus and pressure for action within the business community is a particular challenge. While external funding streams are important to early sustainability, work agendas must not be driven by funding imperatives alone.

■ **Policy changes needed.** The Institute of Medicine (IOM) has outlined a detailed set of policy changes that it believes will be necessary to improve the quality and safety of health care in the United States.[10] PRHI echoes the IOM's call to the federal government to take full advantage of its influential position to create a new health care environment in which regional learning organizations can flourish. PRHI's recommendations focus on three critical areas of policy reform: education and accreditation; public reporting and legal liability; and payment systems.

Education/accreditation. First, federal and state policymakers must foster the redesign of education and clinical training to support a culture of continuous learning in which health care professionals have the ability to identify errors and problems; develop and implement improved processes of care and measure their effectiveness in terms of outcomes; and work collaboratively in multidisciplinary teams. Experimentation with new teaching models that focus on improving error recognition, reporting, and corrective real-time action, along with changes in accreditation standards, will be required. Interdisciplinary professional education should be encouraged. State licensure requirements should include ongoing certification in patient safety and quality improvement, thereby ensuring that these components will be part of medical school and continuing medical education curricula.

Reporting and liability. At the same time, renewed efforts are necessary to make public reporting of patient outcomes a prerequisite to

practicing and providing health care. To this end, new approaches to legal liability are called for. These approaches must unequivocally protect health care organizations and practitioners engaged in the practice of uncovering or resolving quality and safety problems, while adequately ensuring providers' accountability. Unfortunately, safety reporting legislation now working its way through Congress contains protections that are not sufficiently clear-cut to engender the trust of health care workers. Further, policymakers may be failing to capitalize on an important opportunity to advance the prevention of medical errors through increased error reporting and associated shared learning. To offer one example, PRHI has suggested that a patient's recovery be limited to economic damages in cases where providers can show that they have reported an error to the patient, family, and health care community within twenty-four hours of its discovery. Only in cases where prompt reporting has not occurred should patients recover punitive damages.

Payment systems. Finally, payment and reimbursement systems must be reoriented to reward quality and performance improvement. PRHI has advocated for pay-for-quality demonstration projects that offer meaningful supplements to health care providers who achieve better patient outcomes through continuous learning and improvement. To encourage maximum voluntary participation in such efforts, reimbursements to the lesser performers should not be reduced during the pilot phase.

Concluding Comments

Over the past several years, PRHI has fostered a collaborative effort intended to improve health care quality and patient safety throughout its region. Organized and managed according to patients' needs rather than the needs of individual stakeholders, PRHI partners are working together across competitive barriers to form a learning laboratory in which mistakes are viewed as opportunities to learn. Data are gathered that link processes to outcomes regionwide, and the associated learning is shared among the region's providers to drive

what is hoped will be lasting change. PRHI collaborates with and learns from other regions seeking similar improvements in health care quality and safety.

PRHI's innovative approach to regional health care quality improvement is based on theoretical principles that have been proved effective in other industries. The initiative's work is still in the early stages of development, and research strategies are now being designed to evaluate its usefulness.

In the months and years ahead, PRHI will face many questions that are as yet unanswered. Will its clinical and patient safety initiatives lead to enduring, measurable, region-wide improvements in patient outcomes? If so, will they be cost-effective and sustainable within the current regional health care structure? Will these improvements be sufficient for PRHI's diverse stakeholders to continue to put aside their perceived self-interest for the benefit of the region? And can these successes, if achieved, be translated to other regions? Answers to these questions will continue to help guide policymakers in their efforts to reform health care across the country.

NOTES

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