The Science of Spread: How Innovations in Care Become the Norm

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I. Overview

CHANGE—WHETHER IN BIOLOGY, CONSUMER goods, or health care—generally begins in one geographic site or organization. These focal innovations, whether they are natural processes or human inventions, may wither and die or spread widely and make history. The spread of improvements in health care organizations is distinctly different from the diffusion of innovations in other areas of life.

For example:

- In 1918, a deadly influenza virus spread throughout the world, killing an estimated 50–100 million people within 18 months.

- Since the mid-1990s, a fungus known as "sudden oak death" has killed up to 1 million oak trees in California.

- In 1946, regular television broadcasting began in the United States; by 1953, 25 million American homes (half of all households) had a television set.

- In 2001, Apple, Inc., introduced the iPod, which sold more than 88 million units by January 2007.

However,

- Even though it was proven in 1601 that lemon juice prevents scurvy—a major killer of sailors in the British navy—it took until 1795 for the British navy to adopt this innovation.[1]

- An average of 17 years is required to translate new research evidence into practice.[2]

- Since 1993, with the publication of the Diabetes Control and Complications Trial, physicians have known that control of blood sugar levels reduces patients' complications. Yet in 2000, 63 percent of patients with diabetes were in poor glycemic control.[3]

Why do some innovations spread like wildfire throughout the population while others take endless time to catch on or never propagate beyond a few early adopters?

The influenza virus and sudden oak death have nothing in common with improved diabetes care. They are biologic agents that have found a favorable ecologic niche, allowing them to propagate freely and rapidly, overwhelming the resistance of their hosts.

Television sets and iPods are human inventions appealing to an innate human desire for entertainment. They exemplify a combination of marketing and unplanned person-to-person propagation: "My neighbor got a TV set and I want one." "My friends have iPods so I want one for my birthday." The only resistance to the spread of these inventions is the capacity of the consumer (the intended target) to afford the product. The consumer need not change old habits or give up longstanding routines to purchase these items.

Improving diabetes care is an entirely different animal. Patients with diabetes do not know that care innovation even exists, and the practice team that implements the innovation must give up old habits and longstanding routines to embrace the change. Pursuing improvement may require more work. It may lengthen someone's workday. It demands better teamwork among a group of caregivers, and teamwork is not a slam dunk. In contrast to Apple selling 1 million iPods, better diabetes care may cost a health care institution more money without enhancing revenues. In stark contrast to the 1918 influenza virus and the iPod, improving diabetes care lacks a powerful biologic or financial advantage and faces substantial host resistance.

In *Spreading Good Ideas for Better Health Care,* Paul Plsek writes that many organizations can boast of "islands of improvement," but that one rarely finds organization-wide improvement that has become the permanent way of doing business.[4] In addition to the inherent difficulties in spreading improvement, it is not clear to many improvement champions how to spread the "islands of improvement" into permanent, organization-wide practices.

This report summarizes some of the thinking taking place within the emerging science of spreading improvement and provides case studies of health care organizations that have achieved some success in the broad propagation of institutional change. Serious students of "spread," the shorthand term of art for such diffusion, might wish to consult Trisha Greenhalgh and colleagues' exhaustive review of the literature on spreading and sustaining innovations in health services.[5]

II. A Brief Summary of "Spread" Literature

Everett Rogers

In 1962, Everett Rogers published *Diffusion of Innovations,* a book that has become the classic work on this topic.[6] "Diffusion" is synonymous with "spread." Rogers begins the book's fourth edition (1995) with a description of a public health campaign to introduce water-boiling in a Peruvian village, aimed at preventing water-borne infections that are a frequent cause of infant mortality. Because the health worker who led the campaign was not able to gain the trust of the villagers, the campaign failed in spite of its obvious advantages.

Rogers finds that four main elements are needed for innovations to spread and take root:

1. The innovation needs to be better than the status quo, but at the same time compatible with the existing values and needs of the potential adopters. It should be simple to understand, and must demonstrate success on a small scale. Further, its results need to be evident to potential adopters.

2. A communication channel must exist through which the innovative idea is transmitted to potential adopters. This might be person-to-person or via mass media. Ideally, the change agents are similar in education and social status to the potential adopters.

3. Time is required for spread, which is measured by the number of people who adopt the innovation in a given time period. An innovation may be adopted, rejected, or adopted and then discontinued. The rate of adoption is described by the Rogers S-shaped curve, in which spread begins slowly, then takes off rapidly, and finally plateaus as the proportion of adopters reaches 80–100 percent. Rogers classifies people in the social system within which the innovation is taking place as innovators, early adopters, early majority, late majority, and laggards.

4. The structure of the social system can facilitate or impede the diffusion of innovations. The social system is the set of interrelated units that are engaged in activities with a common goal—for example, a health care provider organization. Social systems contain individuals and units. In health care, spread may be easier in integrated delivery systems than in collections of small independent practices. Other characteristics of social systems are the norms or culture of the system, and the existence of opinion leaders who support or oppose a given innovation.

The Tipping Point

In 2000, a book about spread became a national bestseller. Malcolm Gladwell's *The Tipping Point* compares rapidly diffusing innovations to epidemics and emphasizes that epidemics can rise or fall in one dramatic moment—the tipping point.[7] The tipping point concept, according to Gladwell, became popular as a description of "white flight" to the suburbs in the 1970s; when the number of African Americans in a neighborhood reached a certain level, the community would "tip" and most of the remaining whites would leave almost immediately. A technologic example offered by Gladwell is the adoption of the fax machine; introduced in 1984, sales were slow until the tipping point year of 1987, when 1 million faxes were sold. Cellular phones had their tipping point, as did television sets and iPods.

Does *The Tipping Point* provide any lessons for health care improvement work, a variety of innovation far removed from faxes and iPods? In fact, Gladwell does provide an important insight for health care: the key role of individuals in the spread of innovation. Gladwell recounts the story of Paul Revere, who rode at night through the suburbs of Boston to warn of an imminent British attack. Revere was highly successful, persuading others to join in spreading the news. In contrast, William Dawes, who conducted a similar ride through other Boston suburbs during the same night, mobilized few. The difference, according to Gladwell, was that Dawes lacked the personality to persuade townspeople to resist. Revere's message tipped; the same message from Dawes did not. The individuals involved in spreading innovation matters greatly.

Another insight provided by Gladwell is the concept of "stickiness." As advertisers know, some messages stick, while others do not. One must package information to make it irresistible, or one's message will flop. Failure of the message to stick can lead to an improvement failing to spread.

Health care innovators love change. But except for the small number of early adopters, most people in health care settings (and most settings) are wary of change. If innovators simply extol the virtues of making a change, their message will fail to stick. For a message to stick, it must speak to the concerns of people who are neither innovators nor early adopters. Because innovators are so different from the majority, they must be highly sensitive to whether their message is sticky for the majority. An unsticky message might be: "This change will save money for the health care system." A sticky message might be: "This change will help get you home half an hour earlier each night."

The Tipping Point may have limited relevance to health care improvement because it generally describes unplanned diffusion; in health care, improving the care of patients with diabetes requires planned diffusion. Yet changes in health care can tip. Take, for example, the extraordinarily rapid and relatively unplanned diffusion of hospitalists, the new physician specialty caring for inpatients. Some health care changes that reach a tipping point are bad; for example, Vioxx, the anti-inflammatory medication—aggressively marketed by its pharmaceutical company—also turned out to increase the risk of heart attacks. Thus far, most health care improvements—which are more complex than the examples featured in Gladwell's book—have not achieved a tipping point.

Institute for Healthcare Improvement

The Institute for Healthcare Improvement (IHI) is the leading organization in the United States in spreading innovation in health care. IHI uses the word "spread" as a popular synonym for the more academic terms "diffusion" and "dissemination." For IHI, Everett Rogers' *Diffusion of Innovations* is the spread bible. Don Berwick, IHI's President and CEO, published an article

titled "Disseminating Innovations in Health Care," applying Rogers' concepts to health care.[8]

In 2006, IHI published a white paper titled "A Framework for Spread."[9] The paper makes practical suggestions on preparing for spread, writing an aim statement for spread, developing an initial plan for spread, and executing the spread plan. A more detailed discussion of spread can be found in the "Spreading Changes" pages on the IHI Web site.[10] The site provides some descriptions of organizations that have made progress in spreading improvements.

IHI proposes that spread is a leadership responsibility and makes specific arguments about how spread may be optimized:

- Top executives should designate an executive sponsor for spread, as well as a day-to-day spread manager.

- Spread should not take place until ideas for improvement have been tested in one or more pilot sites and the results demonstrate that the innovation is clearly better than what currently exists. Spreading the wrong set of changes would be a major setback.

- Once the leadership determines that a better idea should be spread throughout an organization (or spread to other organizations), a communication strategy is needed with a clear message and people (spread agents) capable of persuading others in the target population (the sites where the new idea would be implemented).

- To evaluate the adoption of the new ideas, measurement and feedback are necessary to allow the leadership and target sites to determine whether improvements are being made and to provide data that encourage successful sites and challenge slower adopters.

IHI's spread strategy has been misunderstood by a number of health care champions. (Innovators in health care improvement are generally called "champions.") IHI has organized much of its improvement work through learning collaboratives, which bring together improvement teams from different health care organizations for about 12 months to work on particular topics, such as diabetes care or reducing patients' waiting times for medical appointments.[11, 12] To test whether particular changes actually lead to measurable improvement, the improvement teams catalyze changes for a small pilot population of patients. These improvement teams are at times called upon to spread the improvement from the pilot population to all the patients in their organization. This spread strategy has proved extremely difficult, because the champions are busy with their clinical responsibilities and may not understand how to make their improvement message sticky for the less enthusiastic majority. It is important to remember that the majority is quite different from the early adopters, and need different messages and motivation to adopt an innovation.

IHI strategy, in fact, does *not* place the primary responsibility for spread on the collaborative improvement team. IHI's spread strategists understand that while pilot improvements are the work of the collaborative team, spread must primarily be the job of an organization's senior leaders. Organizations that have successfully spread improvement have done so through the involvement of senior leaders.

IHI has relied heavily on the learning collaborative to initiate improvement work in health care, but does not believe that collaboratives by themselves can spread improvement throughout organizations. Collaboratives focus on front-line teams with enthusiastic innovators (champions). They are often successful in spreading ideas from one organization to another, but have had less success in fostering broad improvement within organizations. Because the majority of people in organizations are not enthusiastic champions, a single-minded focus on champion teams is insufficient to spread improvement throughout an organization.

Paul Plsek

In *Spreading Good Ideas for Better Health Care,* Plsek cites Rogers and Gladwell to argue that once 10–20 percent of the target population has adopted an innovation, the tipping point has been reached and it is difficult or impossible to stop further diffusion of the innovation (an idea disputed below). Plsek also borrows from the "stages of change" concept that places people in the categories of precontemplation (not ready to consider a change), contemplation (willing to consider a change), action (ready to do something concrete), and maintenance (having made a change and striving to continue it). Plsek emphasizes that individuals in these different stages need different messages to assist in the spread of new ideas.

He also draws on the concept of the complex adaptive system, which describes systems such as health care institutions as containing a meshwork of relationships that makes behavior hard to predict, but adaptive in what the people in the system can do in response to changes in their environment. For example, 50 years ago primary care could be successfully practiced by a lone physician, whereas now the march of medical science, together with the uncertainties of reimbursement, have made primary care practice an almost impossible task. This change in objective circumstances is opening some adaptive primary care physicians to change, while others remain in the precontemplative phase. Different arguments are needed to address physicians at opposite ends of the readiness-to-change spectrum (a spectrum parallel to Rogers' early adopter–majority–laggard concept). The spread of innovation thus requires an analysis of the objective circumstances of complex systems and the subjective states of the actors in these systems.

In Spreading Good Ideas for Better Health Care, Plsek offers tools that might help improvement champions analyze the systems and individuals that make up the spread target population.

Sarah Fraser

Sarah Fraser has served as a consultant to health care organizations in the United Kingdom's National Health Service. Her 2004 book on spread is a practical guide with a wealth of good advice.[13] She feels that health care improvement champions may misinterpret Rogers. While Rogers focuses on individuals accepting relatively simple innovations, spread in health care requires the adoption of complex behaviors. Rogers discusses discontinuous change—a Peruvian villager either boils water or doesn't. A person either buys an iPod or doesn't. In contrast, improvement in health care often requires many small changes; the changes are not discontinuous (all or nothing) but continuous—a series of many small changes. Moreover, while diffusion of innovation theory often deals with things, innovation in health care is concerned with ideas and behaviors.

Fraser also makes the point that innovators are not normal people. They love changing things, while most people are wary of change. Sometimes innovators cannot grasp how the majority views the world and thus are poor spread messengers—the William Daweses who fail, in contrast with the Paul Reveres who succeed. The majority are the people who hold organizations together—they do the day-to-day work. They don't run off to conferences or hold meetings at 7 a.m. They care for patients, day in and day out. If innovators look down on them because they are wary of change, spread is dead.

Fraser makes the key point that spreading innovation must reduce costs; otherwise, it is not sustainable. In particular, it must create a return on investment for the organization spreading the change. Reducing costs for an employer or insurer is fine, but unless the organization paying for the innovation is itself benefiting financially, the improvement will probably not become permanent.

Fraser also distinguishes between "let it happen" spread (iPods and MRI scanners) and "make it happen" spread, which is more difficult but more pertinent to health care improvement work.

Learning from others is an important spread activity. "Who else is doing this really, really well? Let's go visit them and find out how they are doing it." Allowing such visits requires giving host and visiting teams time off. While this general education is crucial, the specifics must often be tweaked or reinvented from one site to another because the available personnel, types of patients, and personalities of the caregivers differ from place to place.[14]

A Critique of the Spread Literature

In 2006, Fraser became impatient. Many health care statistics were intolerable, yet improvement was spreading at a snail's pace. In "Undressing the Elephant: Why Good Practice Doesn't Spread in Healthcare",[15] she confronts much of the accepted doctrine about spread.

- "Pilotitis" refers to champions or organizations making an improvement for a small number of patients, often with extra funds or extra personnel. The pilot project succeeds, but the conditions under which it succeeds are so different from the norm that it cannot possibly propagate, whereupon the change agents blame the "laggards" or "resisters" for the failure of the improvement to spread. The solution? Involve the majority of people from the start, listen to them, and have them help design the improvement.

- The "low-hanging fruit syndrome" refers to initially picking a population of patients whose care can be easily improved. The changes made, however, may not apply to the entire population. Changes should be tried on populations of patients for whom the change will have the greatest impact, rather than the population for whom change is quick and easy.

- Innovators often push an idea as a universal solution applicable to all organizations when in fact the idea may be fine for one organization but completely unworkable for another.

- The notion that a tipping point has been reached when 20–25 percent of people have accepted a change does not conform to reality. Improvement must be a continuous process.

- The blind acceptance of Rogers' categorization of people—early adopter, majority, and laggard—may lead to failure. "Laggards" may be the pragmatists who keep organizations going—the people who need to validate changes. The canyon that often exists between visionaries and pragmatists needs to be bridged.

- Spreading improvement requires continuous measurement.

- Without leaders, spread programs founder. Leaders must be courageous, curious, and passionate.

- Rather than using the phrase "spreading good practice," it might be better to say "implementing better ideas." This gets away from the concept that ideas are moving from an active person to a passive person and views every person as active in the work of implementation.

III. Examples of the Successful Spread of Improvement in Health Care

THIS SECTION DESCRIBES ORGANIZATIONS THAT have been successful in spreading "islands of improvement" into large-scale successful change. The descriptions include implementation of better ideas both *within* organizations and *among* organizations. These two geographies of spread overlap: spread within an organization means extending improvements in one unit of the organization to other units, while spread among organizations involves taking innovations in one organization and introducing them into other organizations.

Veterans Health Administration

The best example of spread within a large organization is the Veterans Health Administration (VHA) system.[16] For decades, the VHA was widely considered the health care system of last resort. The huge system had deteriorated so badly by the early 1990s that Congress considered disbanding it.[17] Yet by 2007, the nationwide system—with 154 hospitals and 8,875 clinics serving more than 5 million patients, run and financed by the federal government—had been dramatically improved. It now consistently outperforms hospitals and clinics in the private sector, as indicated by the following data.

The VHA reports its performance using quality of care indicators across a broad spectrum—breast cancer screening, beta-blocker use after heart attack, cholesterol and blood pressure control, smoking cessation counseling, and influenza immunizations for high-risk and elderly patients—that are better than commercial and Medicare HEDIS indicators.[18]

In their 2004 study, Steven M. Asch and colleagues sampled 596 VHA patients and 992 non-VHA patients. After adjusting for risk, they found no significant differences between the two samples in the age of the patients or the number of chronic conditions. The VHA patients received significantly better overall care, chronic care, and preventive care. Although the two samples did not differ significantly in acute care, the VHA generally performed significantly better across the whole spectrum of care: screening, diagnostics, treatment, and follow-up.[19]

For the past six years, the VHA has outranked private-sector hospitals on patient satisfaction in an annual consumer survey conducted by the National Quality Research Center at the

University of Michigan, despite the fact that the VHA spends an average of $5,000 per patient, versus the national average of $6,300.[20]

Quality of care expert Lucian Leape of the Harvard School of Public Health stated that "the VHA is a dramatic example of what can happen if you have the will and the leadership to make change happen."[21]

How did this remarkable transformation take place? The simple answer is leadership. A more complex answer helps to clarify the concept of spread.

In the mid-1990s, Dr. Kenneth W. Kizer, then the Health Under Secretary for Veterans Affairs, installed an extensive electronic medical records system, decentralized decision-making, closed underused hospitals, reallocated resources, and instituted a culture of quality-aided measurement. Dr. Kizer had a great advantage compared to other health system leaders: an integrated system with a global budget in which quality and financial incentives are aligned, and a group of salaried physicians who could be required by top leadership to make needed changes. As an example of quality and cost alignment, the VA system has markedly reduced hospitalizations as a result of increasing its pneumovax vaccination rate from 29 percent in 1995 to 94 percent today.

EHR Helps Spread Improvements

An important tool for spreading improvement in the VHA is the electronic health record, or EHR.[22] The EHR can remind physicians and care teams about needed preventive and chronic disease studies throughout the entire system, not just in a few early adopter clinics. The electronic data allows for routine performance measurement that is both a quality-enhancing and a spread tool. In diabetes care, for example, processes of care, and HbA1c and LDL-cholesterol control, were better for patients in the VHA system than for patients in commercial managed care.[23]

One example of how the VHA system spread improvement is its adoption of advanced access. Advanced access is a scheduling system that allows patients who call for an appointment to get the appointment on the same day. It is an important innovation for patients with chronic conditions, because appointment delays are one important reason why patients with chronic conditions fail to receive proper management. As a result of this innovation, the national average wait time for an appointment at the VHA system fell from 60 days in 2000 to 25 days in 2004.[24]

The VHA started the advanced access process in 1999, when the organization's national leadership decided that appointment delays were an unacceptable quality problem. The central leadership initiated an internal collaborative of 134 teams from all 22 Veterans Integrated Service Networks (VISNs, or regions) throughout the United States. The collaborative demonstrated that teams in particular sites could improve timely access to care. Many organizations would have stopped at that point. But the VHA leadership understood that the great bulk of sites in the VHA system had been untouched by the improvement. Only through centrally mandated change could every patient seeking care in the VHA system benefit from advanced access. Accordingly, the top leadership mandated advanced access for each of the 22 VISNs.

The key strategy was to require local leaders to take on the task. Each VISN designated a spread team responsible for the improvement, including facility directors with organizational clout. As long as those local leaders could show improvement in average waiting time for an appointment, it did not matter how the leaders accomplished the change. Different VISNs achieved results in different ways. Some held regional collaboratives. Many had meetings in which pilot sites demonstrated how they achieved their successes. Information—how to initiate and sustain advanced access—was key, as were champions who could persuade the skeptics.

The VHA leadership did not tolerate the status quo. Their message was clear. "We're going to reduce delays in patients getting appointments." Everyone in the huge VHA system knew that this was a priority. Some providers viewed advanced access as more work; the leaders needed to match the messages they created to the concerns of the front-line providers and to enlist as messengers those providers whose day-to-day work was positively rather than negatively impacted by the change.

In some organizations, change bubbles up from the front lines. It is either seen as valuable and adopted by the leadership and successfully spread, or it is not embraced centrally and dies. In the VHA, advanced access did not bubble up from the base; the idea came from outside the organization, was adopted by central leaders, and mandated for the entire organization. While the change was chiefly top-down, a bottom-up aspect existed in which individual sites could re-invent how the change was accomplished to match their needs or desires. Moreover, even though the change was mandated from the top, little could be done about sites that resisted, which some did.

As a result of the VA work, a "Checklist for Spread" was developed.[25] It includes such questions (paraphrased here) as:

- Is improvement in this area a strategic priority for the organization?

- Is there an executive who is responsible for the spread of the improvement?

- Is there a person or team in the leadership group who will be involved in the day-to-day spread activities?

- Will the leadership supply resources needed for success (personnel, information technology, tools, etc.)?

- Has the advantage of adopting the change been documented and communicated in an easily understood package to all potential adopters?

- Is there a successful site that has implemented the change in a way that is scalable throughout the organization?

- Are there credible messengers who can persuade potential adopters to implement the innovation?

- Is there a clear plan to communicate the innovation throughout the organization and to assist different sites in making the necessary changes?

Humboldt–Del Norte Independent Practice Association

It is relatively uncommon for significant quality improvement work to take place in small primary care practices, because these practices have few resources and little time available for improvement work. It is even less common to observe significant quality improvement taking place in the primary practices of an entire community. Through the leadership of family physician Dr. Alan Glaseroff, however, improved diabetes care spread across the medical community of Northern California's Humboldt County over a brief three-year period. While the VHA example demonstrated spread within an organization, the Humboldt example represents spread among different organizations.

The Humboldt–Del Norte Independent Practice Association (IPA) was formed to give physicians clout in negotiating contracts with HMOs. The IPA includes 240 physicians, plus 140 mid-level practitioners and mental health providers working in 26 practices and five community health centers—virtually all the medical practices in the county. Some 84 of the physicians are in primary care.

Dr. Glaseroff employed the structure of the IPA to spread a diabetes registry that includes the majority of patients with diabetes in the county. The registry is most pertinent to the 84 primary care physicians, who care for most patients with

diabetes. Registries are critical tools for improving chronic disease care because they allow practices to look at all their patients with a specific chronic disease, to determine which patients need laboratory or other studies and bring them into care for those studies, and to focus additional resources on patients with poor disease control. Registries create a paradigm shift for physicians, helping them to consider the care of their entire panel of chronically ill patients rather than limiting their focus to individual patients who happen to have an appointment. Moreover, registry data can be fed back to physicians to inform them of how well they are performing, using such measures as the percentage of patients with diabetes in good versus poor control.

How did Dr. Glaseroff succeed in spreading the diabetes registry so widely in a short time period, given that most physicians had no familiarity with a diabetes registry?

First, Dr. Glaseroff made adoption of the diabetes registry easy for primary care physicians. The IPA built the registry and IPA personnel input clinical data into the registry so that the individual practices did not have to perform this work. The IPA taught medical assistants in physician practices how to use the registry. The IPA gave computers and free Web access to practices. A nurse practitioner from the IPA traveled to practices to assist them in making the workflow changes needed for improved diabetes care.

As a result, almost all the primary care physicians are now using the registry, which has resulted in a striking improvement in diabetes care in Humboldt County. In California's pay-for-performance system, the IPA had the third best record in the state—the only small IPA to achieve such results.

Second, the IPA tailored the messages used to persuade physicians to adopt the registry, employing different messages for physicians with differing concerns. Perhaps 20–25 of the 84 primary care physicians were early adopters, willing to take some chances in order to improve quality. For them, the message of improved quality was a sticky message. A larger number of physicians was persuaded by the message that the registry could make diabetes care easier.

The third message, for more reluctant physicians, took advantage of the pay-for-performance initiative that came to California in the past three years; virtually all physicians saw that the registry could help them obtain more pay-for-performance dollars. The three arguments—improve quality, make work life easier, and get paid more—were each persuasive for different segments of physicians.

Now that the registry is in wide use, further improvements are being spread; in particular, assisting patients to become more active partners in the management of their diabetes, encouraging patients to adopt healthier behaviors through goal setting and action planning, and addressing depression, which frequently accompanies diabetes and other chronic illnesses. The registry is also being expanded to include preventive services, as well as hypertension, hyperlipidemia, and depression.

The IPA did not begin its diabetes improvement work with a small pilot that would hopefully spread throughout the county. Rather, the IPA used a "big bang" approach—similar to the Institute for Clinical Systems Improvement's mass movement model (see below). To initiate the improvement work, the IPA called a community meeting attended by many physicians, and explained how the registry might work in their practice. The registry was rolled out to as many practices as possible, and the kinks were worked out in different practices at the same time. A nurse practitioner visited practices and listened to the successes and challenges of each practice. In addition, a leadership council met weekly to learn from the successes and to work to solve challenges.

The Humboldt County experience was a campaign rather than a collaborative. Like the 100,000 Lives Campaign discussed below, the IPA took an idea tested in other parts of the country and, using appropriate messages, persuaded practices to sign on. The IPA provided assistance and problem-solving advice. In contrast to a collaborative, which tries out untested concepts in a pilot site, the IPA's campaign targeted the entire primary care infrastructure of the county in one fell swoop.

Cincinnati Children's Hospital Medical Center

Cincinnati Children's Hospital Medical Center is a not-for-profit pediatric academic medical center with 475 beds and 15 patient care sites throughout the region. Cincinnati Children's is widely considered one of the leading health care organizations in the United States. The medical center has introduced a number of family-centered care improvements such as Family First Rounds, which allows family members to join physicians for clinical discussions at the child's bedside, rather than the traditional mode of doctors discussing hospitalized children among themselves and later informing the family members (who often feel left out). Families are involved in improvement work at the top leadership level and as part of specific improvement teams.

Cincinnati Children's regularly measures a wide variety of performance indicators, including adverse drug events per 1,000 doses; bloodstream infections per 1,000 catheter days; ventilator-acquired pneumonia per 1,000 ventilator days; surgical site infections per 100 procedure days; percent of eligible patients receiving evidence-based care for seven medical diagnoses; risk-adjusted cost per discharge; appointment waiting times for specialty outpatient clinics; and specific measures on quality of chronic disease care for attention-deficit hyperactivity disorder, autism, cystic fibrosis, diabetes, inflammatory bowel disease, juvenile rheumatoid arthritis, and asthma.

Cincinnati Children's received a Pursuing Perfection grant[26] and used this improvement process to reduce hospital admissions for several common childhood illnesses by 15 percent and to improve the care of children with cystic fibrosis. In surveys, about 90 percent of families state that they can get an outpatient appointment as soon as they want it, that they are involved in decisions about their child's care, and that they receive understandable answers to their questions.[27]

The medical center's acclaim was not earned overnight. For years, the organization's top leaders have stimulated an organization-wide culture of improvement. Improvement is a topic at board meetings and senior management conferences, and everyone in the organization is expected to support excellence. The CEO and board of trustees set strategic priorities for improvement based on feedback from families and front-line caregivers. The leadership provides front-line champions with the time and funds to visit and learn from other organizations. Each senior leader is responsible for one or two of the approximately 20 improvement teams, and their compensation is tied to achievement of their teams' goals. Financial analysts determine the fiscal impact of improvement projects.[28]

One area in which Cincinnati Children's has achieved excellence is the treatment of pediatric asthma.[29] The organization launched a physician-hospital organization in 1996. One aim of the PHO was to spread successful improvement models among primary care practices, including community physicians. The PHO included 165 primary care practices, ranging in size from one to 12 physicians. The Cincinnati Children's PHO asthma improvement initiative began in 2003 with the goal of improving asthma care to 13,000 children in 43 primary care practices (30 percent of the region's pediatric asthma population). A quality improvement team was organized in each practice; network meetings and conference calls promoted the spread of successful improvement

strategies. A measurement tool was developed to help practices assess their progress. Parents fill out a survey via computer or on paper in the waiting or exam room, and the physician completes the data. A data entry person in each practice enters the data. As of March 2006, the proportion of the asthma population who received a flu shot had increased dramatically to 63 percent. Some 87 percent of patients had an asthma action plan, and 97 percent of persistent asthmatics were on controller medications. Asthma-related hospital admissions over 12 months dropped to 12 per 10,000 patients (compared with 24 for non-PHO practices, and 27 nationally).

Much of the improvement was attributed to improved patient/parent self-management skills and collaborative goal-setting between parents and providers, using the asthma nurse educator model with planned care done during a pre-visit session and post-visit follow-up care. Another key tool is the asthma registry for the entire PHO, which identified specific patients not engaged in perfect asthma care, allowing practices to contact those patients and make the necessary improvements in care. The PHO found that the keys to the spread of excellent asthma care included:

- Identifying the population and creating a registry;

- Collecting data and feeding it back to practices;

- Self-management skills training for families;

- Collaboration among practices;

- Practice-level and PHO-level leadership; and

- Pay-for-performance—financial rewards for practices with improving asthma measures.

The importance of registries in chronic disease management is widely recognized, but the role of registries in the spread of improvement is less evident. Cincinnati Children's viewed its Web-based PHO asthma registry as a spread tool. Practices could see their own data compared to that of other practices; those that lagged behind were stimulated to improve. Pay-for-performance strengthened that incentive.

Cincinnati Children's President and CEO Jim Anderson makes clear what should be expected of top leaders:

"One should not tolerate processes that do not work. If you fix them, the savings more than offset the costs, and the outcomes are such that the marketplace finds them very attractive. Thus, not only can you deliver a higher-quality product at a lower cost, but also you can charge more for it. The business case is pretty compelling. There is no business reason not to tackle the issues. Coupled with the fact that this would produce better medical outcomes… there is simply no reason other than cultural barriers or inept management for us to continue in an environment where we deliver care that is not as good as it could be."[30]

"When I meet with other CEOs from other institutions, I am concerned that (the quality movement) does not seem to have much traction. There are exceptions, but in my experience, not many are committing to the revolution. I think people feel beaten down by day-to-day challenges, and are not looking at the opportunity for transformation as one that can be productively pursued. I realize that it is a big job, but we just need to do it."

A message from Cincinnati Children's warns that improvement does not take place in a year or two. It takes time and a sustained commitment. Improvement work exemplifies the unity of opposites: impatience to get things done and patience to keep getting things done.

Institute for Clinical Systems Improvement

In 1993, Minnesota's Institute for Clinical Systems Improvement (ICSI) was created in response to a Minnesota employers' group request for quality improvement within provider organizations.[31] ICSI's founders were HealthPartners Medical Group, Mayo Clinic, and Park Nicollet Health Services. ICSI is funded by Minnesota's health plans.

ICSI is all about spread. Dr. Gordon Mosser, until recently ICSI's executive director, describes a common story: a champion brings forth a new idea, senior management approves, the innovation is implemented in one hospital unit or clinic site, and no other units or sites pick it up. ICSI's purpose is to overcome that scenario. ICSI promulgates spread both within and among organizations.

ICSI's first several years focused on the creation of clinical practice guidelines and the development of concrete quality metrics to measure each provider organization's performance. During those first years, ICSI had three members— HealthPartners, Mayo, and Park Nicollet. ICSI's strategy was to start with these prestigious provider organizations, hoping that others would choose to join this elite club. Thus the initial spread strategy was to challenge providers to emulate the highest performers in the state, and to engage provider organizations through the development of practice guidelines and quality measures.

ICSI uses the word "propagation" rather than spread, in part because propagation is an agricultural term that would have traction in an agricultural state. Propagation can take place both within an organization and among organizations. ICSI is concerned with both.

Spread among organizations. The most important plank in ICSI's spread platform is the requirement to adhere to certain performance standards to join ICSI and remain in the organi-

zation. Membership in ICSI requires a commitment to engage in four improvement projects each year. Each project needs to be of substantial importance and must be tracked with performance measures. These commitments must be made by an applicant organization's highest senior leadership.

ICSI's Board of Directors, which includes representatives of member provider organizations, health plans, and consumers, chooses two ICSI-wide improvement topics each year; two of each member's improvement projects are the ICSI-wide topics, with the other two chosen by the member organization. ICSI-wide topics have included the prompt access to appointments; and the care of patients with diabetes, depression, and congestive heart failure. Over the years, a few medical groups who joined ICSI were unable to meet their commitments and were asked to leave the institute.

The ICSI model for propagation of improvement, then, is a disciplined model in which membership in ICSI is voluntary, but for providers joining ICSI, improvement work is mandatory.

ICSI's Tipping Point

ICSI reached a turning point—one could call it a tipping point—around 2000. In its first several years, provider organizations joined to be at the table with Minnesota's most prestigious providers. After 2000, not being in ICSI branded a provider as second-rate. Moreover, as public reporting of quality and pay-for-performance were widely embraced by Minnesota's health plans, provider organizations experienced external pressure to improve. ICSI remains cautious in accepting new members, not wishing to dilute its high standards.

Discussions have taken place within ICSI's leadership regarding the definition of success. Currently, ICSI's culture rewards trying to improve; if a provider's performance measures do not change, there are no consequences as long as a sincere effort was made. A more stringent requirement would involve ICSI setting goals; for example, the percent of patients with diabetes in a provider organization achieving HbA1c levels below 7. ICSI would evaluate an organization based on movement toward the goal. Thus far, ICSI has not made measurable improvement a requirement.

In addition to ICSI's requirements for conducting improvement work, ICSI provides mandatory training for all new members' improvement leaders. Training involves a one-day meeting three times a year, monthly conference calls, coaching sessions, and homework. ICSI trainers also travel to medical groups and work with line participants. Sessions cover the science and methods of improvement, including measurement, and specific topics such as improved access, the use of clinical practice guidelines, the Chronic Care Model, and building care teams.

Improvement work often uses the collaborative process, with a number of organizations joining an "action group" on, for example, improved access, diabetes, or depression. Member organizations can conduct improvement work on their own or join an action group; those that join are required to send in measures every month, and can be ejected from an action group if they fail to report their measures. In action groups, members can share forms, protocols, and successes with one another—a process helpful in spreading innovation.

To summarize, ICSI has been successful in spreading improvement from one organization to another by becoming the only game in town and by requiring a serious commitment to improvement as the ticket to get into the game.

Spread within organizations. Since most improvement is initiated at a pilot site within a larger organization, the problem of spreading the improvement from the pilot to the entire organization is a universal one. According to Dr. Mosser, a former director of ICSI, five models (sales, parallel play, central driver, billboard, and mass movement) describe how different provider organizations in ICSI have worked on intra-organizational spread.

The *sales model* involves the pilot site having a champion who is effective at persuading others in the organization. After the pilot site achieves a successful improvement, the champion goes to other sites in the organization to describe the improvement and to persuade others to adopt it. This model is particularly applicable to organizations with strong autonomous physicians who resist change mandated from central leadership.

The *parallel play model* is relevant to academic provider organizations, which generally contain physician leaders who do not accept data unless it comes from a randomized controlled trial. In this model, several pilot sites work on the same improvement project; if they all produce similar results, the skeptics have more difficulty undermining the improvement.

In the *central driver model,* top leadership decides what the organization needs and chooses pilot sites with a strong probability of success. When the pilots achieve results, the top leadership mandates the change for the rest of the organization.

The *billboard model* relies on broadcasting news of success in the pilot site; this model accepts that different units are autonomous and may or may not adopt the improvement.

The *mass movement model* does not rely on sequential propagation from early adopters to the majority; instead, change is promoted by leaders approaching all units at once through inspirational messages and mass communication.

All these models require improvement work to come from an organization's senior leadership, who can decide which spread model, or combination of models, might work best. Ideally, senior leadership decides on a spread model at the beginning of improvement work, not after a pilot site has completed its work.

In ICSI's experience, certain improvement campaigns worked better than others. Advanced access was successfully adopted and sustained by a number of medical groups because the methods developed by advanced access founder Mark Murray were concrete, understandable, and measurable. In contrast, some chronic disease improvement work was more difficult because the Chronic Care Model does not prescribe a step-by-step formula for improvement. The ICSI provider organizations most successful in improving chronic care were those that implemented a registry, assigned personnel to run the registry, and used the registry to ensure that every patient received all indicated care. Improvement is easier to propagate if simple, concrete steps can accomplish the change.

Improving depression care has been a recent campaign for ICSI, using the PHQ9 questionnaire to screen for depression, and having a trained person designated to follow up. The former change is easy; the latter is difficult because health plans do not reimburse for such follow-up. Propagating simple changes is necessary for spread, but if personnel are not available or there is no business case, it may not be sufficient for success. A recent ICSI initiative has been to work with health plans to develop new reimbursement codes to pay for evidence-based depression care.

ICSI leadership realizes that a "culture of quality" must be adopted in order to "till the soil" to allow propagation. Traditional organizational culture is based on physician autonomy. If clinical practice guidelines dictate that a physician use certain medications and order certain diagnostic studies, what happens if the physician does not comply? Under current organizational culture in most health institutions, nothing would be done. Public reporting and pay-for-performance might create incentives for such physicians to change their ways, but few organizations would require that the guidelines be followed. ICSI has discussed the possibility of *requiring* physicians to "do the right thing," but has not mandated such a drastic culture change. ICSI is developing a curriculum to train its member organizations on issues related to organizational culture. Spreading a culture of quality is far more complex than spreading a diabetes registry.

ICSI is one of the nation's most successful improvement organizations, fostering spread both within and among health care provider organizations. ICSI's regional focus on the entire state of Minnesota is a model for similar efforts in other regions. Rarely, however, have other regionally focused improvement efforts adopted ICSI's high bar—requiring serious improvement work as a condition for membership.

IHI's 100,000 Lives Campaign

In December 2004, the Institute for Healthcare Improvement (IHI) launched the 100,000 Lives Campaign, a national initiative to reduce preventable deaths for hospitalized patients.[32] On June 14, 2006, Don Berwick, IHI's President and CEO, announced that the campaign had prevented an estimated 122,300 deaths in 18 months.[33] While some dispute the precise numbers, the campaign had unquestionably been highly successful.

Fewer than 20 IHI staff led the 100,000 Lives Campaign. How did such a small number of people create improvement in more than 3,000 hospitals, accounting for 75 percent of acute care beds in the United States? The experience of the 100,000 Lives Campaign is an important example of spreading improvement widely and rapidly.

IHI developed partnerships with many organizations to achieve its goals. Nationally, the campaign was supported by the Association of American Medical Colleges, American Medical Association, American Nurses Association, Center for Medicare and Medicaid Services, Centers for Disease Control and Prevention, The Leapfrog Group, Kaiser Permanente, the Veterans Health Administration, University Health System Consortium, Joint Commission on Accreditation of Healthcare Organizations, and others. In addition, IHI worked with collections of regional organizations called "nodes." These nodes aggregated organizations in most states, often including state hospital associations, quality improvement organizations (QIOs), state and local medical societies, state nursing associations, business groups, unions, and large hospital systems. IHI also applied the principle that some organizations are early adopters of change, and called upon early adopter hospitals to serve as mentor hospitals, assisting other hospitals in their geographic areas to make improvements. The success of the campaign, then, depended on activating many organizations to partner in the effort.

Another strength of the campaign was its simple, focused, and persuasive improvement goals. In the terminology of *The Tipping Point*, the messages were "sticky." The campaign targeted six changes for which research evidence demonstrated improved outcomes: rapid response teams, care for patients with acute myocardial infarction, medication reconciliation, preventing central line infections, preventing surgical site infections, and preventing ventilator-associated pneumonia. IHI provided practical tools that hospitals could use to quickly implement changes in these six areas. Hospitals were free to use these tools however they wished.

Some nodes drew upon regional collaboratives to assist in the improvement effort. Others organized monthly conference calls or educational sessions among participating hospitals. Regional

newsletters were another spread tactic. The nodes supported the campaign by raising funds, assisting hospitals in implementing the changes, and ensuring that data was regularly reported to IHI. Some nodes are continuing to work on region-wide improvement even after the initial phase of the campaign has been completed.

The 100,000 Lives Campaign is quite distinct from the typical collaborative. Collaboratives bring together front-line teams to test and implement improvements. In contrast, the 100,000 Lives Campaign worked through top leadership. Collaboratives generally apply the Model for Improvement—testing changes through PDSA cycles—to discover what works. The 100,000 Lives Campaign focused on improvement that had already been tested; the campaign leaders knew what worked and disseminated this knowledge broadly. Hospitals did not necessarily understand the Model for Improvement or the PDSA concept. A collaborative is actually a pre-spread methodology, using front-line champions to discover how to make improvements. The 100,000 Lives Campaign, in contrast, was a spread methodology focused on six areas for which the improvements were well known and tested. The campaign recognized that spread should not take place until the improvement methods have been carefully tested and are proven solid.

Because the 100,000 Lives Campaign was so large, the IHI leadership could not work directly with each organization; many of the details were delegated to nodes and mentor hospitals. IHI's role was to inspire and organize each region and to provide simple "how-to" materials to all participants. In a sense, the campaign was more top-down than the traditional collaborative; rather than encouraging teams to find their way, IHI decided on the goals and told the participating hospitals how to attain them. The message was sticky, the product was simple, and the goal—saving lives—was universally accepted.

IV. Conclusion

THE EXAMPLES CITED IN THIS REPORT PROVIDE reasons to be optimistic that improvement can move from small pilot sites to entire organizations, or can be successfully implemented organization-wide from the outset under certain conditions. But this optimism must be tempered. The organizations described here were chosen because they demonstrate success, but they are also few and far between. The concept that improvement will spread by itself once a tipping point has been reached is often not true for health care organizations. In many cases, "islands of improvement" remain isolated, or revert over time to former practices. Nonetheless, these examples, plus the literature of innovation spread, can provide some useful lessons about the ways entire organizations can implement improvements in health care.

Leadership. Champions may initiate improvement, but it depends on top-level organizational leaders to create an institutional culture ready to accept change, and to spearhead the spread of particular improvements. Only senior leadership has both the authority and the breadth of vision to do so.

Senior leaders can spread improvement through a number of different strategies. They can mandate changes, use various forms of persuasion, offer financial incentives such as internal P4P programs, and, if sufficiently adept as messengers, can inspire people throughout the organization. Purely top-down approaches are common in large organizations, often beginning with a pilot program and then mandating its spread to the entire organization. This approach usually works best if different sites in the organization can customize the innovation to fit their particular needs, and if many people in the organization have received thorough training on the innovation.

Improvement collaboratives with front-line teams are only one step in an improvement process. Organization-wide change requires commitment at the top. If spread is the work of senior leaders, they need to understand the issues and believe in them. Begging for senior leadership support doesn't work; the senior leaders need to be educated about the improvement so that they see its value.

Champions. Innovation champions are often thought of as the engines of change within organizations. But a small improvement team led by champions is unlikely to spread

improvement throughout a large-scale organization. If the champions are also front-line care providers, they will have neither the time nor the authority to propagate improvements organization-wide. The proper role of these champion-led teams is to experiment with and adjust innovations, and to serve as messengers to explain new ideas to potential adopters. To the extent that senior leaders need to believe in an improvement and understand the issues surrounding it, champions can be invaluable in the leadership education process.

Enthusiastic champions are essential to the initiation of improvement work. But champions are quite different from the average front-line caregiver; they often create success by working 18 hours a day. Over-reliance on champions can destine an innovation for failure. It creates unrealistic expectations about what can be achieved in a certain time period by front-line providers.

Front-line caregivers. In general, good ideas come from the front lines of an organization because people there know how things work (or don't work). Moreover, their ideas about innovations are crucial because they are the people who will be implementing them.

Champions may have a highly developed desire to innovate, but most people do not. Thus, arguments and messages that appeal to innovators or early adopters may not be sufficient for the majority of front-line workers. Instead, arguments need to speak directly to their daily experience: for example, the innovation will make your work easier, will improve publicly reported performance measures, or will increase pay-for-performance bonuses. In this context, Rogers' division of the population—early adopters, the majority, and laggards—may be counterproductive. Resistance to innovation by people working daily to care for patients means that their ideas need to be heard and addressed, not dismissed as heel-dragging.

Macrosystem vs. microsystem change. A balance is needed between macrosystem reform and microsystem improvement. Changing health care organizations one by one will take decades or longer. A thoughtful improvement-fostering payment change by Medicare and large private insurers could stimulate improvement in every health care organization in the country overnight. On the other hand, provider organizations need the knowledge and will to harness a financing change to create real improvement (rather than trying to game the system).

To sum up the lessons that can be taken from the theoretical and practical work discussed in this report, innovations in health care can spread most easily if:

1. Innovations fit with the culture and values of the majority of potential adopters. Physicians, for example, may have a culture of doing a good job for patients but also a culture of physician autonomy in decision-making. At times, improvement requires confronting rather than accommodating the prevailing culture. Spreading improvement in such circumstances is a significantly greater challenge.

2. Innovations can be clearly shown to improve measured performance for several groups of patients in several sites.

3. Top leadership actively promotes (and sometimes mandates) not only adoption of the change but also acceptance of the ideas underlying it, while allowing individual sites within the organization to customize implementation as long as measured performance improves.

4. New ideas are framed and presented by individual messengers in a way that makes them "sticky" for the majority of people in the organization.

5. New ideas make day-to-day work easier for the potential adopters.

6. A financial "business case" for the innovation can be made for the organization that is to adopt it.

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