Partners HealthCare: Connecting Heart Failure Patients to Providers Through Remote Monitoring

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ABSTRACT: Partners HealthCare's programs in home telehealth have been driven by its Center for Connected Health, which has pilot-tested and implemented telemedicine and remote monitoring solutions. The center focuses on practical innovations that can change patient behaviors to realize better clinical outcomes. The center's Connected Cardiac Care Program has enrolled more than 1,200 patients since its introduction in 2006 and has experienced an approximate 50 percent reduction in heart failure hospital readmission rates overall for enrolled patients. The center estimates the program has generated total cost savings of more than $10 million since 2006. Human factors and social processes have been important in successfully introducing telehealth technology solutions into workflow and patient care. Technology has also had a positive impact on patient activation and engagement in self-care, helping to demonstrate to providers that this new program supports behavior changes that lead to improved care and quality outcomes.

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OVERVIEW

Partners HealthCare (Partners), an integrated health system in Boston, is undergoing a mission-driven, system-level transformation by aligning the organization with external forces shaping the future organization, financing, and delivery of health care. Its strategic initiatives center on making patient care more affordable and accountable through providing integrated, evidence-based, patient-centered care. Partners' strategy implementation group has been looking at performance improvement in a number of priority conditions. These initially included diabetes, acute myocardial infarction, coronary artery bypass graft surgery, stroke, and colorectal cancer, but other conditions will be added to the initial care redesign portfolio over time. Care redesign initiatives are working to move the organization from an episodic and specialty approach to a longitudinal, condition-based,

and patient-focused orientation. These include deter-mining how technology can contribute toward improv-ing care quality and cost-effectiveness and identifying strategies for their successful introduction into practice.

A key strategic priority at Partners has been to reduce 30-day readmissions to improve quality of care and patient satisfaction, and to minimize Partners' financial risk for potential reductions in Medicare pay-ments. Initiatives that work toward meeting those goals include: providing patients with critical information at discharge to promote safer transitions, using transitions teams and health coaches, participating in the Center for Medicare and Medicaid Services' care coordina-tion pilot demonstrations, and programs that connect chronic care patients with specialized outpatient care services.[1] Health information technologies, including patient-centered telehealth technologies, serve as a strategic tool across many of these process improve-ment initiatives. In the future, widespread use of con-nected health solutions at Partners will be driven by structural changes like new reimbursement models and the introduction of patient-centered medical homes.

Partners' Center for Connected Health (CCH)[2] leads the development of patient-centered telehealth solutions and remote health services for a variety of chronic health conditions, potentially leading to reductions in preventable readmissions. The shared goal of these telehealth solutions is to improve outpa-tient care management. Partners' experience with the implementation of technology into workflow and care management practices indicates that the technology has a positive impact on patient activation and engage-ment in self-care and plays a critical role in realizing better clinical outcomes. This evidence is critical in demonstrating to providers that this new program sup-ports behavior changes that lead to improved care and quality outcomes. However, Partners' experience indi-cates that organizations must be prepared for potential implementation delays imposed by the current fee-for-service environment's adverse impact on staff behav-ior. To overcome workforce resistance, organizations must demonstrate to clinicians and other staff that new programs will support care and quality outcomes.

BACKGROUND

Boston-based Partners HealthCare is an integrated health system. In addition to the two academic medical centers, Brigham and Women's Hospital and Massachusetts General Hospital, the Partners' system includes community and specialty hospitals, commu-nity health centers, a physician network, home health and long-term care services, and other health-related entities. The spectrum of care offered at Partners includes prevention and primary care, hospital and specialty care, rehabilitation, and home care services. As one of the nation's leading medical research orga-nizations and a principal teaching affiliate of Harvard Medical School, the nonprofit organization employs more than 50,000 physicians, nurses, scientists, and caregivers.

Partners' mission includes a commitment to its community and the recognition that increasing value and continuously improving quality are essential to maintaining operational excellence. Partners is also dedicated to enhancing patient care, teaching, and research and to taking a leadership role as an integrated health care system. The organization also prizes tech-nology adoption and innovation to drive improvements in operations, productivity, and patient care. Its success to date in the large-scale adoption of electronic health record (EHR) and computerized physician order entry (CPOE) systems attests to the organizational culture of openness, preparedness, and ability to adapt to change. Such attributes have helped to ensure that the rollout of new technologies is minimally disruptive and seamless to workflow.

Partners has launched efficient care redesign efforts for five conditions—diabetes, acute myocardial infarction, coronary artery bypass graft surgery, stroke, and colorectal cancer—that reflect its shift toward longitudinal, condition-, and patient-focused orienta-tion in care. The care redesign initiative is being led by Partners Community HealthCare (PCH), the manage-ment services organization for the Partners' network of physicians and hospitals. PCH encompasses more than 5,500 employed and affiliated physicians and seven acute care hospitals within the system. If opportunities

for using technology-enabled strategies to aid in rede-signed care have been identified, Partners' Center for Connected Health will lead the design and development of patient-centered telehealth solutions and remote health services. PCH will help introduce them into practice across the Partners' network.

PERFORMANCE IMPROVEMENT INITIATIVES THAT REDUCE PREVENTABLE READMISSIONS

A top strategic priority at Partners is to reduce 30-day readmissions to improve the quality of patient care and patient satisfaction and minimize risk for reductions in Medicare payments. In a survey of Massachusetts hospitals, more than 10 percent of patients were reported to have been readmitted for the same or unrelated complaints within 30 days.[3] Processes that ensure seamless transitions from hospital to other care settings are essential. These include improvements in educating patients and caregivers, reconciling medications carefully before and after discharge, communicating with receiving clinicians, and ensuring prompt outpatient follow-up. Exhibit 1 illustrates 30-day readmission rates for heart failure, acute myocardial infarction, and pneumonia at selected Partners' hospitals.[4] Partners is currently pilot-testing several programs addressing patient safety,[5] experience,[6] and quality,[7] with a goal of reducing 30-day readmission rates for patients at high risk of readmission. These include programs that target critical failures in communication and information

exchange during care transitions across settings and caregivers.

THE CENTER FOR CONNECTED HEALTH'S ROLE IN ADVANCING PATIENT-CENTERED TECHNOLOGY

In 1995, Partners established Partners Telemedicine to use consumer-ready technologies to enhance the patient–physician relationship and deliver remote care. This entity later evolved to become the Center for Connected Health. "Connected health" signifies new patient-centered technology strategies and care models that use information and communications technology—cell phones, computers, networked devices, and simple remote monitoring tools—to support the health care needs of patients in community-based settings without disrupting their day-to-day lives. CCH solutions help providers and patients manage chronic conditions, maintain health and wellness, and improve adherence, engagement, and clinical outcomes. To date, CCH has generated more than 100 scholarly publications and helped more than 30,000 patients. In 2011, CCH collected its one millionth vital life sign from program participants.[8]

CCH's programs use a combination of remote monitoring, social media, and data management applications to enhance patient adherence and engagement to realize improvements in care quality and cost outcomes. The center also supports mobile health initiatives, including a prenatal care text-messaging program

Exhibit 1. 30-Day Readmission Rates at Selected Partners Hospitals for Acute Myocardial Infarction, Heart Failure, and Pneumonia

	Brigham & Women's Hospital	Faulkner Hospital	Mass. General Hospital	Newton-Wellesley Hospital	North Shore Medical Center	U.S. National Rate
Acute myocardial infarction	21.1%	21.1%	22.1%	20.8%	18.6%	19.8%
Heart failure	23.7	27.0	23.7	23.8	22.8	24.8
Pneumonia	20.4	20.0	19.0	17.1	18.6	18.4

Partners HealthCare Data Period: July 1, 2007–June 30, 2010.
Partners HealthCare Source: Hospital Compare.
Reference Point Source: U.S. National Rate for Heart Failure, Acute Myocardial Infarction, and Pneumonia for Medicare Patients.

for expectant mothers, and wellness programs, such as Step It Up and Virtual Coach, that emphasize activity and exercise among elementary school children and overweight people, respectively. The center offers video-based, real-time consultations and an online second-opinion service, Partners Online Specialty Consultations. CCH recently spun off a health service company, Healthrageous, to provide self-management tools that offer personalized support and motivation in health and lifestyle management.

CCH focuses on applying technologies to conditions that have standard clinical measures of success or offer a clear business case in terms of the potential cost savings or return on investment. For example, the Medicare payment reductions associated with 30-day

readmissions provides the heart failure program with a clear business case in terms of the negative financial implications from poor care outcomes. For management of diabetes, HbA1c is a well-accepted clinical marker used to measure success. One program that has been successfully piloted and implemented at scale across Partners is the Connected Cardiac Care Program (CCCP). It provides home telemonitoring and patient education over a four-month period to enable patients to collect frequent readings and become more engaged in their care.

Exhibit 2 outlines two connected models of care that are currently being deployed at Partners to address congestive heart failure, as well as diabetes and hypertension.

Exhibit 2. Connected Health Models of Care at Partners

The Diabetes Connect and Blood Pressure Connect programs offer patients and their care providers a way to track their blood sugar or blood pressure readings and to collaborate on establishing a shared care plan between office visits. These programs differ from the Connected Cardiac Care Program (CCCP), which uses a centralized telemonitoring model. Diabetes Connect and Blood Pressure Connect operate on a distributed model where each practice comes up with its own structure and protocols for managing patients. Nurses, certified diabetes educators, pharmacists, or primary care physicians can monitor patients' data. The driver to adopt is greater provider efficiency and quality outcomes, and less focus on cost savings. The programs help manage patients by providing structured data frequently and engaging patients actively in their care management. Both programs are available at several primary care practices affiliated with Massachusetts General and Brigham and Women's Hospitals, and through the Partners Community HealthCare network of physicians and hospitals.

Connected Health Program	Summary Description
Connected Cardiac Care Program	A centralized telemonitoring and self-management and preventive care program for heart failure patients that combines telemonitoring capabilities with nurse intervention and care coordination, coaching, and education. The daily transmission of weight, heart rate, pulse, and blood pressure data by patients enables providers to more effectively assess patient status and provide "just-in-time" care and patient education. The program has led to an approximate 50 percent reduction in heart failure–related hospital readmissions for participants.
Diabetes Connect *Blood Pressure Connect*	Provide practices with tools for the self-management and monitoring of patients with diabetes and hypertension. A recent clinical study with 75 enrolled patients found that participants in Diabetes Connect achieved an average drop in HbA1c of 1.5 percent, while 22.3 percent of participants enrolled in Blood Pressure Connect achieved a 10mmHg or greater drop in systolic blood pressure, compared with 16.7 percent among nonparticipants.

Source: Center for Connected Health.

Care Outcomes

Remote monitoring improves the health of ambulatory patients who have been recently hospitalized for heart failure and leads to reductions in hospital readmissions. A 2006 pilot study of CCCP with 150 heart failure patients, with an average age of 70, who had been admitted to Massachusetts General Hospital and received six months of follow-up care did not reach statistical significance. However, the results indicated a positive trend in reducing readmissions (Exhibit 3). Sixty-eight patients received usual care for heart failure; the remaining 82 patients were offered remote monitoring. Forty-two patients accepted and 40 declined to participate. The remote monitoring group had a lower rate of all-cause readmissions compared with usual-care patients and nonparticipants. Patients in the remote monitoring group also had fewer heart failure–related readmissions. However, all-cause emergency room (ER) visits were higher among the remote-monitoring group than for usual care and nonparticipating patients. This higher frequency of reporting to the ER may be a result of closer monitoring.

Process Efficiencies

Initial studies of CCCP that involved patients receiving skilled nursing care from a home care provider found that introducing telemonitoring not only affected care outcomes but also indicated a trend toward a decreasing need for nurse visits. The studies did not have a large enough sample to definitively demonstrate cost savings, nor did they indicate that telemonitoring would replace home visits. However, telemonitoring was seen as providing a critical adjunct to patient care and workload efficiency for nurses. The impact was significant enough to support adoption of telemonitoring as part of the care plan for heart failure patients. This led Partners in 2007 to fund the program's expansion systemwide for all heart failure patients that met the inclusion criteria. To date, more than 1,200 patients have been enrolled. Exhibit 4 shows that the proportion of enrollees in CCCP with one or more heart failure hospitalizations in the year following disenrollment was 13.3 percent compared with 39.8 percent one year prior to enrollment.

User Satisfaction

Eleven research studies were conducted at Partners-affiliated hospitals to measure patient perceptions of connected health technologies; namely, if patients feel empowered to better manage their care, if they have increased satisfaction with care, and if their overall health is improved.[9] Patients in CCCP reported the

Exhibit 3. Remote Monitoring CCCP Pilot Results at Six-Month Follow-Up				
	Control (n=68)	Intervention (n=42)	Nonparticipant (n=40)	
	Mean rate (± standard deviation)	Mean rate (± standard deviation)	Mean rate (± standard deviation)	P-value
Hospital readmissions				
• **All-cause**	0.73 (±1.51)	0.64 (±0.87)	0.75 (±1.05)	.75
• **Heart failure–related**	0.38 (±1.06)	0.19 (±0.45)	0.42 (±0.93)	.56
Emergency room visits				
• **All-cause**	0.57 (±1.43)	0.83 (±1.08)	0.65 (±1.0)	.10
• **Heart failure–related**	0.25 (±1.02)	0.26 (±0.49)	0.35 (±0.80)	.31
Length of stay				
• **All-cause**	10.64 (±9.7)	9.16 (±9.00)	13.2 (±13.4)	.85
• **Heart failure–related**	8.52 (±8.3)	10.57 (±12.5)	10.78 (±9.1)	.78

Source: A. Kulshreshtha, J. C. Kvedar, A. Goyal et al., "Use of Remote Monitoring to Improve Outcomes in Patients with Heart Failure: A Pilot Trial," *International Journal of Telemedicine and Applications*, published online May 19, 2010.

**Exhibit 4. Proportion of Connected Cardiac Care Program Enrollees
with One or More Hospitalizations**
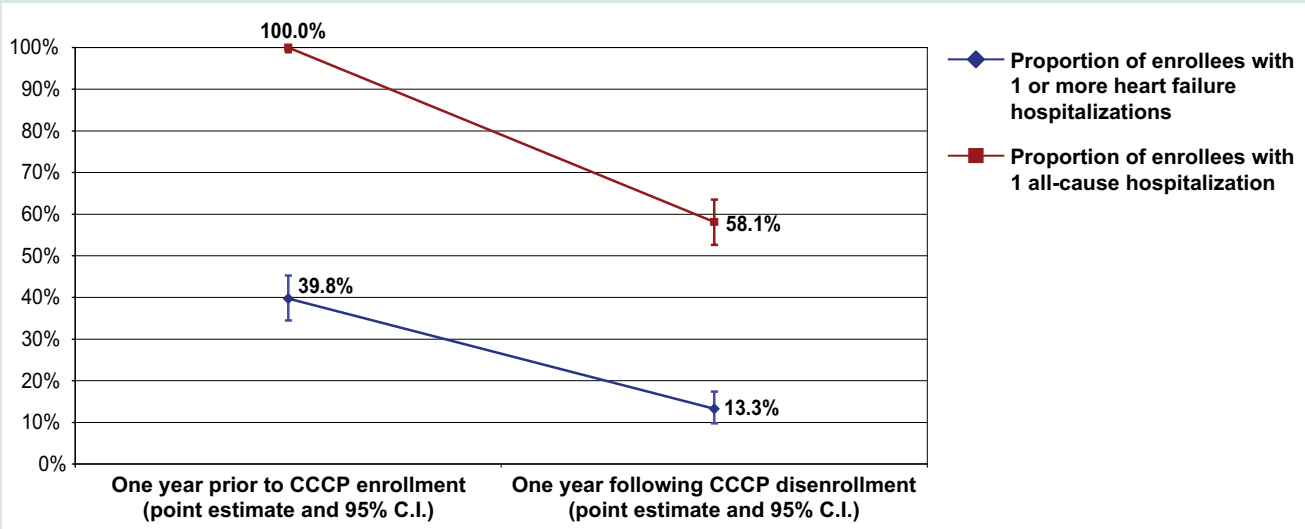
Data include 332 CCCP enrollments among 301 unique patients discharged from the CCCP program prior to July 1, 2009. Results are similar within more recent cohorts of enrollees discharged from the program prior to October 1, 2009, and prior to January 1, 2010.

program increased their confidence and improved their understanding of heart failure and helped them avoid hospitalizations (Exhibit 5). Of the 20 participants in the pilot's remote monitoring group who returned the satisfaction survey, high levels of program satisfaction were recorded (93%). All patients reported that the equipment was easy to use, resulted in greater confidence to self-manage, and helped them stay out of the hospital. In general, once patients are enrolled in the program, less than 10 percent opt out of the program. Those that do drop out usually do so because of personal factors, such as preferences, and not as a result of problems with the technology. Diabetic patients report that blood sugar monitoring was most

Exhibit 5. Results of Connected Cardiac Care Program Patient Satisfaction Survey

- **98%** of patients reported learning more information about heart failure because of being enrolled in the CCCP

- **85%** reported they felt in control of their health because of the program

- **85%** reported they were able to gain control over their heart failure while in the program

- **82%** reported they were able to stay out of the hospital because of the program

- **82%** reported they were able to avoid the emergency room because of the program

- **77%** reported they will continue to check their weight daily

- **64%** reported they are confident that they can independently manage their heart failure

- **77%** reported they would like their treatment providers to offer this program to other heart failure patients

Note: A subset of CCCP participants returned the satisfaction survey (n=93).
Source: Center for Connected Health.

valuable when they were newly diagnosed or trying to regain control of their diabetes. Electronic communication between providers and patients outside of scheduled office visits was perceived as important in improving diabetes management.

THE CONNECTED CARDIAC CARE PROGRAM

CCCP is developing new ways to help patients at risk for hospitalization to manage their heart disease, by integrating technology into remote patient care and supporting self-monitoring. Contract changes to the Medicare payment structure for the home care industry—in which Medicare provided a prospective payment rate for up to 60 days of service—presented an impetus to create CCCP. Partners HealthCare at Home (PCAH), one of the region's largest home care providers, partnered with the Center for Connected Health to develop CCCP, and provides all of the telemonitoring nurses and clinical support for the program. PCAH, which is recognized as a top-performing agency by the Centers for Medicare and Medicaid Services, offers medical, therapeutic, and supportive home-based services for patients who are recovering from a hospitalization, managing chronic illness, or those who need assistance to remain in their own homes.

CCCP's core components are care coordination, education, and development of self-management skills through telemonitoring. Patients use equipment—a home monitoring device with peripherals to collect weight, blood pressure, and heart rate measurements, and a touch-screen computer to answer questions about symptoms—on a daily basis for four months. Telemonitoring nurses monitor these vitals, respond to out-of-parameter alerts, and guide patients through structured biweekly heart failure education (Exhibit 6). This concentrated effort is effective in meeting the primary goal of reducing hospital readmissions.

PCAH was initially interested in using telehealth under the new Medicare reimbursement model to leverage staff across more patients. Heart failure was targeted as a priority condition because of the high costs involved in caring for heart failure patients and the potential savings from preventing unnecessary admissions to hospitals. The support of Partners' senior leadership was critical to the program's expansion. In particular, the leadership's interest in connected health solutions as a way to augment care delivery system-wide and its commitment of funds to support the development of the program have been critical to scaling CCCP across Partners' network.

CCCP allows patients to monitor their physiological health on a daily basis and provides a virtual link to their health care team from their home. Daily monitoring, "just-in-time" teaching—based on the immediacy of interventions in response to monitored patient data—and weekly structured education sessions help patients become aware of their daily behaviors. This impact leads to changes in behavior and the development of new self-management skills. The CCCP team provides the technology, support, and training. It also installs equipment in patients' homes and shows them how to use it. PCAH and other clinical partners provide the expertise for successfully designing and implementing the technology for use in care practices.

There is no cost to patients to enroll or for use of the equipment. The program is open to all patients with a Partners' affiliated primary care physician or cardiologist. Patients are referred by hospital case managers, nurse practitioners, primary care physicians, cardiologists, and other clinicians. Since the inception of CCCP in 2006, the program has included eligible patients from across the Partners HealthCare system on an opt-out basis.

Evaluations of CCCP have been limited to before and after evaluations rather than randomized controlled trials. Such assessments have shown a positive, sizable effect in reducing readmissions, which increased the comfort level among Partners senior leadership with the intervention. There has also been ongoing iterative research using small groups of people to assess the intervention and identify the need for modifications. CCH has also been working with PCH to test effective adoption and the role of financial incentive mechanisms to facilitate spread. CCH's in-house

analysis estimates that the program has generated total cost savings of more than $10 million since 2006 for the more than 1,200 enrolled patients (Exhibit 7).

LESSONS LEARNED IN TAKING CCCP FROM PILOT TO SCALE

Partners' experience with connected health technologies and with successfully implementing telehealth-enabled programs across the provider network highlights the significant potential value of transforming care delivery, improving care outcomes, and lowering costs. Social processes are as important in ensuring program success as are the technical factors. Key social factors include leadership support and the championing of technology, the integration of patient data into the workflow to enable providers to more effectively assess patient status and provide just-in-time care and education, and using personal health data to help educate and motivate patients to make necessary lifestyle changes. Even though it has not always been met with immediate success, the organization has persevered to introduce telehealth-enabled care management solutions, to generate evidence of impact, and to use that evidence to advocate for broader deployment across the provider network. This experience imparts important lessons for the successful planning, implementation and deployment of telehealth-enabled care management programs at scale and for identifying future opportunities for continued program advances in patient care management.

Exhibit 6. Key Features of the Connected Cardiac Care Program

- ✓ Four-month home telemonitoring of congestive heart failure patients by a telemonitoring nurse
- ✓ Intervention by telemonitoring nurse based on physician orders
- ✓ Interactive patient education and lifestyle management
- ✓ Reports posted in electronic health record with email alerts to physicians and nurse practitioners
- ✓ No cost to the patient
- ✓ Open to patients with a Partners' affiliated primary care physician or cardiologist

Who is eligible?	Who is *not* eligible?
• Patients age 18 and older with a diagnosis of heart failure	• Patients currently receiving skilled home care services***
• Patients considered to be at high risk for hospitalization	• Patients with end-stage renal disease on dialysis
• Patients who have a Partners' affiliated primary care physician or cardiologist	• Patients with organ transplant
• Patients covered by Medicare, Medicaid, or certain patients in the safety net*	• Patients in hospice
• Patients able to speak and read English**	• Patients with an active cancer diagnosis
• Patients mentally competent and willing**	• Patients who reside in nursing homes
• Patients with a traditional phone line	• Patients who do not have a stable environment to conduct the monitoring
	• Patients with any physical disability that precludes use of telemonitoring equipment

* Limited funding available for some patients with commercial insurance.
** Or those with a primary caregiver willing to assume responsibility for telemonitoring.
*** Exception: Partners' Health at Home skilled Medicaid and commercial patients.
Source: Partners HealthCare System, Connected Cardiac Care Program, http://www.connected-health.org/media/224132/cccp summary 6 2 11.doc.

Exhibit 7. Reducing Hospital Readmissions with the Connected Cardiac Care Program

Program outcomes

✓ 51% reduction in heart failure hospital readmissions*

✓ 44% reduction in non–heart failure hospital readmissions*

✓ Improved patient understanding of heart failure and self-management skills

✓ High levels of clinician and patient acceptance and satisfaction

Savings**

A case study prepared by the Center for Connected Health outlines the following cost savings:

Cost of CCCP:	$1,500 per patient
Total savings from reduction in hospitalizations:	$9,655 per patient
Total net savings:	$8,155 per patient
Total savings:	$10,316,075 for 1,265 monitored patients since 2006

* N=332 patients
** This program targeted reductions in unplanned heart failure and non–heart failure related admissions. The savings realized factor involves the cost of running the program, including marketing, referral management, telemonitoring nurse support, and technology.
Source: Center for Connected Health.

Patient Activation and Engagement Are Critical to Program Success

With the decision by PCAH to use telehealth to leverage staff across more patients in response to Medicare reimbursement changes, CCH became a strategic partner to PCAH. CCH and PCAH collaborated in the design of the technology-enabled clinical program, the selection of the technology, and the staffing of the operational model. Both parties market and perform outreach of CCCP to patient referral sources. There was a low level of adoption in the initial phase of the program. Nurses at first saw CCCP as driving a wedge between them and their patients. They resisted the introduction of the program and the replacement of the more traditional high-touch approach to care. An important factor in overcoming that initial pushback from staff—and an important lesson for the adoption of patient-centered technology in general—is the positive impact the technology has once it's placed in patients' hands. With CCCP, patients felt more connected and nurses learned to develop relationships with patients accordingly with the help of technology. Another important insight in terms of adoption is that patients need to be aware that the provider is engaged in order for them to regularly use the technology as a self-management tool.

Automatic Enrollment of Patients Improves Clinician Involvement and Satisfaction

As the program was extended beyond home care throughout the Partners system, pushback came from other sources, primarily primary care physicians and cardiologists, such that physician referrals and enrollment into the program were challenged. The program struggled initially but the key watershed point came with the decision to change patient enrollment to an opt-out process. Once a patient is identified for enrollment in CCCP, clinicians are responsible for notifying CCCP that they do not want the patient in the program. As a result, enrollment has increased, readmission rates have declined, and satisfaction levels among doctors have increased as benefits in patient care became evident. The refusal rate to participate among doctors went from 10 percent to less than 1 percent.

Data Can Motivate and Empower Clinicians and Patients

Outcomes in controlled trials, as well as in before-and-after studies, have consistently demonstrated an approximate 50 percent drop in cardiac-related read-missions for patients enrolled in CCCP. One drive of that outcome is patients learning self-management skills and receiving constant feedback about how life-style factors affect health outcomes. Another is just-in-time care, whereby remote monitoring and intervention by nurses sends a strong message to patients that they are accountable. CCH's commitment to research allows the organization access to the data and studies to coun-ter resistance and arguments from clinicians about the impact on quality and patient experience. CCH is also able to prepare the business case and concomitant cost-savings argument. But the traditional business case approach cannot convey the full impact that other fac-tors, such as patient experience and staff satisfaction, have on improved health outcomes and higher quality of care.

New Technology-Enabled Solutions Do Not Fit Old Policy Frameworks

CCH faces challenges in optimizing the impact of connected health programs on care outcomes. The cur-rent fee-for-service environment can present a mental barrier for clinicians, and pilots involving financial incentives that reward provider engagement have not led to significant behavior change. Many doctors view the move toward a patient-centered medical home as requiring more staff, such as nurses and pharmacists, rather than an opportunity for leveraging technology in support of fewer staff. While the widespread use of connected health solutions will require structural changes in the form of reimbursement and new care models like the patient-centered medical home, a sig-nificant amount of work remains to be done in promot-ing the use of technology to leverage existing staff across more patients.

IMPLICATIONS FOR U.S. HEALTH CARE ORGANIZATIONS

Being in an integrated delivery network that owns a home care service business has allowed Partners to be ahead on the adoption curve with telehealth relative to other health systems. Organizations—particularly ones lower on the adoption curve—that are considering technology-enabled solutions will need to address the following issues: establishing acceptance that the tech-nology can clinically make a difference, identifying the method by which the organization will implement and integrate the technology, determining whether a one-size-fits-all approach will be feasible across the net-work or system, and evaluating whether the prevailing financial system can support an economical approach to scaling.

From an organizational readiness perspec-tive, it is critical to recognize the role of champions who understand workflow and also to understand the requirements for successfully integrating solutions into practice. To gain buy-in from staff, it is important to put the data in the hands of motivated individuals, like clinicians who want to help their patients. It is also important to aggregate external data, integrate it with clinical health information systems, and communicate it to patients and providers alike. Data cannot be main-tained in separate data silos and must be placed in the EHR to be meaningful and useful in clinical decision support. Patients need access to the patient portal, with the ability to retrieve clinical information and perform administrative functions. CCH has invested significant resources in developing a platform to support the inte-gration and management of data, which will also serve as a platform for the development and implementation of other applications.

However, recognizing that not all systems are equal in the U.S. health care delivery system, CCH's experience also points to common pitfalls to avoid rather than just best practices to adopt. A common mistake is attempting to shoehorn a connected health program into the traditional care model. Technologies such as telemonitoring can be disruptive to workflow and represent a change in the way care is delivered.

Organizations often tend to view connected health solutions as simply requiring a technical interface to existing programs rather than a redesign of the care delivery model. Partners' experience indicates that connected health requires a different mind-set to program design and execution. Otherwise, there is a low likelihood that it will change practice and lead to desired outcomes. Looking forward, Partners is developing a predictive algorithm as a screening strategy of a hospitalized patient's risk for readmission. This will help contribute toward a more aggressive segmentation of the population and tiering of the program to meet the needs of more acute patients on discharge and to manage them so they can exit the program.

Dedicating staff members to the implementation and oversight of the program is more critical than the technology itself in understanding why programs sometimes fail. But often, many technology-enabled solutions in health care fail to recognize the need for solutions that are social in nature rather than solely technological. In the current fee-for-service environment, organizations have to also be prepared for the delays that payment system can impose on staff behavior. Organizations must show clinicians that connected health programs will support care and quality outcomes, while planning workflow changes very carefully and taking the time and making the effort to work methodically and systematically through issues that may arise. Finally, it takes time to integrate technology into health delivery and to allow staff to adapt to the new work model. As a result, structure, coordination, planning, and setting goals, as well as expectations, for the program are critical preparatory steps for success.

HOW THIS CASE STUDY WAS CONDUCTED

This case study was developed through interviews with staff from Partners HealthCare and the Center for Connected Health and a review of both organizations' websites. From the Center for Connected Health, we would like to acknowledge Dr. Joseph Kvedar, director; Rob Havasy, project specialist; Regina Nieves, connected cardiac care coordinator; and Khinlei Myint-U, corporate manager, product development and communications; At Partners HealthCare, we would also like to acknowledge the contributions of Alex Baker, former chief operating officer, Partners Community HealthCare. Partners' quality, safety, and efficiency measures are available at High Performance Medicine (http://qualityandsafety.partners.org/).

The other organizations profiled in our *Case Studies in Telehealth Adoption* series are the Veterans Health Administration's Care Coordination/Home Telehealth program and Centura Health's Centura Health at Home program. To read them, along with a synthesis of findings from all three case studies, visit our website at http://www.commonwealthfund.org/Publications/Case-Studies/2013/Jan/Telehealth-Synthesis.aspx.

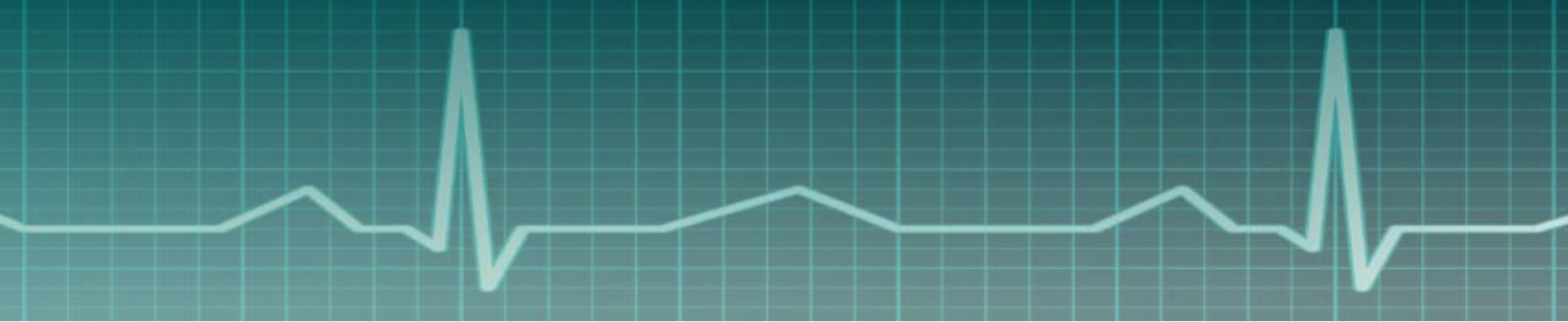NOTES

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