



Microsoft®
HealthVault™

Connected Continuous Care

*How technology will transform chronic
disease management*

White Paper
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A diabetic truck driver begins his day 1,500 miles from home by checking his glucose levels. The glucometer he uses automatically uploads that reading to his Microsoft HealthVault record, and then shares it with his doctor. He then hits the road for a full day of driving, secure in the knowledge that his doctor is monitoring his condition. Based on the truck driver's trended health data, the doctor receives an alert that this morning's glucose level may cause issues. Within moments, a change in medication dosage is recommended and communicated back to the patient. No matter where in the country this mobile worker's job takes him, his doctor can actively monitor his medical condition.

This approach to chronic disease management is a reality for a number of patients who participate in innovative remote monitoring pilot programs. These programs are designed to fundamentally transform the care delivery model for chronic disease by helping consumers take more control of their ongoing care, and enabling collaboration between patient and provider.

Remote monitoring is increasingly recognized as having the capacity to enhance care for chronic conditions, with a potential to deliver savings and benefits for both patients and providers. For patients, this means fewer office and emergency room visits, fewer and reduced duration of hospitalizations, reduced patient travel time and expense, and increased access. For clinicians, it means more informed decision making, enhanced patient compliance, and more efficient outreach case management.

The results of studies to date are promising and show clear value in remote monitoring. This white paper will detail the challenges faced and solutions available to help healthcare organizations transform their practice of care for chronic disease management. The paper will also include best practices and lessons learned from organizations that have begun to leverage connected health as a new dimension in health information technology.



Current Model of Care Ineffective for Chronic Disease Management

As the prevalence of chronic disease rises at an alarming rate, the strain on the world economy and healthcare system cannot be relieved without the creation of innovative, cost-effective solutions that involve patients in proactively managing their healthcare.

Chronic disease management is in dire need of innovation. The costs are high, both from a financial and patient quality-of-life perspective—and expected to continue to rise. Seventy-five percent of all healthcare costs in the United States, 60 percent of healthcare costs in Canada, and 75 percent of healthcare costs in Europe stem from chronic diseases.¹ As the prevalence of chronic disease rises at an alarming rate, the strain on the world economy and healthcare system cannot be relieved without the creation of innovative, cost-effective solutions that involve patients in proactively managing their healthcare.

Effective chronic disease management requires extensive care outside the four walls of the provider's organization, calling for a combination of patient self-care and timely interventions from care providers to identify early warning signs of potentially acute problems that could require costly emergency interventions. The current healthcare system is poorly equipped to address these requirements.

Patient engagement required

Chronic disease management typically involves life style changes and careful monitoring of conditions. In general, people lead busy lives and are reluctant to engage in activities that can be seen as inconvenient, take time, and cost money unless they can see it brings them benefit. Frequent doctor's visits and maintaining records of activities and device readings are often viewed as a nuisance.

The need to shift from episodic to continuous care

The current model of care tends to support an episodic approach to disease management that can be counter to the goal of timely intervention. For example, clinicians may typically manage blood pressure through doctor visits that occur every six to 12 weeks. The time gap between these visits could mask an emerging trend that would illuminate a patient's worsening condition. Without appropriate interventions, the status of a chronic patient can quickly deteriorate from manageable symptoms into a more serious condition that requires costly emergency interventions.

Increasing healthcare workforce shortages

A rapidly aging baby boomer population coupled with the growth in the number of people with multiple chronic diseases will place increased resource requirements on the healthcare infrastructure. Healthcare organizations will need to provide better care for more people without a corresponding increase in available resources. For example, it is predicted that while

¹ Centers for Disease Control and Prevention, 2009



[Disease management] services typically are provided by third parties or insurers working outside and not in coordination with the patients' care provider.

the overall demand for direct care workers, such as nurse aides, home health aides, and paraprofessional caregivers, will increase by 34 percent, there is no corresponding increase in the numbers of people entering these professions.²

Disease management programs help, but leave gaps

Disease management programs are strategies typically used by employers and payers to reduce the costs of and improve the quality of care for patients who have chronic diseases.

Multiple studies indicate positive clinical impact of these programs.^{3,4,5} For example, four New England hospitals found that in-home monitoring and coaching after hospitalization for congestive heart failure (CHF) reduced re-hospitalizations for heart failure by 72 percent and all cardiac-related hospitalizations by 63 percent (Chart 1).⁶

However, disease management programs have not lived up to their potential, and it is unlikely that the current state of the programs can scale to meet the rising incidence of chronic diseases globally because of the following challenges:

High touch. Most disease management services today rely on an expensive —high-touch approach, with specially trained nurses either calling or visiting patients on a periodic basis. This approach doesn't provide ongoing insight into patients' conditions, plus it depends on large-scale engagement of a shrinking healthcare workforce.

Fragmented care. These services typically are provided by third parties or insurers working outside and not in coordination with the patient's care provider. Fragmented care, communication, information, and work processes could put quality patient care at risk.

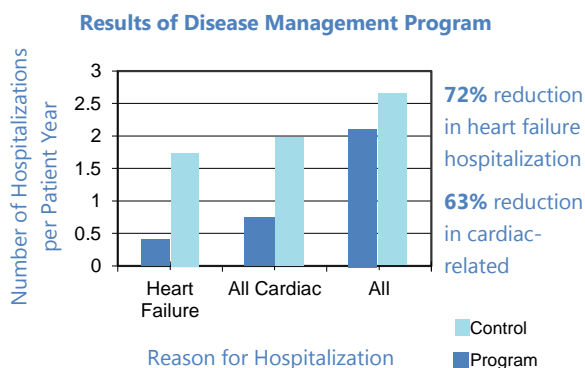


Chart 1. SPAN-CHF II: Tufts-New England Medical Center

² Institute of Medicine, 2008
³ Artinian NT, 2007 September - October
⁴ Beers, 1992
⁵ Coye M, 2009
⁶ Brookes, 2005



Without appropriate interventions, the status of a chronic patient can quickly deteriorate from manageable symptoms into a more serious condition that requires costly emergency interventions.

Low adoption. Disease management programs are not gaining traction with consumers. Employers report that less than 15 percent of eligible patients participate in the programs.⁷

Remote Monitoring Enables Continuous Care

The development of a new care paradigm for chronic disease management requires a solution that would cost effectively extend care to where the patient lived and worked, and provide a seamless transfer of clinically relevant health data to clinicians.

Studies indicate that remote, home-based physiological monitoring of patients with chronic disease can reduce costs and improve care quality. The New England Healthcare Institute reports a 50 percent reduction in hospital readmissions for patients with CHF who participate in disease management programs with remote monitoring, compared with those who participate in programs without remote monitoring.⁸ The report further estimates that remote patient monitoring could prevent 460,000 to 627,000 heart failure–related hospital readmissions annually.

The impact of high readmission rates

Considering the focus on hospital readmissions by Centers for Medicare and Medicaid Services (CMS) as a performance measure and reimbursement restrictions, remote monitoring programs that can reduce readmission rates can have a substantial impact on an organization's financial bottom line. As consumers increasingly turn to sites that disclose quality ratings, poor performance on readmission scores could play a factor in the patient's choice of facility and provider.

Enabling early intervention

Remote monitoring allows a provider to gain continuous insight into the patient's physiological, mental, and functional status, which can allow the early detection of changes in conditions. Timely interventions can prevent the need for unscheduled and preventable episodes.

Improving patient engagement

Remote monitoring provides clinicians with insight into whether the patient is complying with the program. If the patient is not uploading data readings on schedule, providers can be notified and reach out to correct the problem without waiting for the next office visit. Patients may be more prone to follow the care plan if they know they are being monitored.

⁷ PricewaterhouseCooper's Health Research Institute, 2010

⁸ New England Healthcare Institute, 2009



Facilitating Provider and Patient Adoption of Remote Monitoring Programs

Technology alone does not ensure positive outcomes with a remote monitoring program. Organizations must pay careful attention to culture and change management as well to drive both physician and patient adoption. Strategies for success include:

Do a pilot study. To overcome provider resistance to change and prove value for the program, run a pilot study. Capture and promote results.

Engage skeptics. Invite the biggest skeptics to become involved in the program and materially participate in establishing it. Active participation often converts skeptics into advocates.

Leverage word-of mouth. Encourage peer-to-peer word of mouth to promote education, build awareness, and hasten adoption.

Don't overlook workflow. Smooth out workflow changes by integrating the new data into provider's existing methods of data access.

Supporting care integration

Remote monitoring programs have the potential for the exchange of data and communications across multiple disease states and multiple providers, as opposed to disease management programs that focus on a single disease.

Enabling Technologies

Technologies that enable care coordination and collaboration are key to transforming chronic disease care. At the heart of a new care model is data—the ability for patients to gather data on their condition in their own setting at their own convenience, and then provide that data to their care providers. The ultimate goal is to shorten the cycle time of intervention, resulting in better outcomes by reducing hospital readmissions and complications.

Home-based medical devices

The emergence of consumer health devices enables the seamless capture and sharing of information in real-world settings—whether at home, at the office, or traveling. By using home-based devices, patients have the flexibility to take measurements when it is convenient for them and their schedule.

While devices like blood pressure cuffs have been in the home for many years, these devices are becoming less expensive and more convenient. For example, with newer devices, patients can load data directly from the device to a computer or online. When devices automatically transfer data, more information can be captured with less effort, which makes it easier for physicians and patients to monitor trends.

There is a rapidly increasing interest by consumers to engage more proactively in their own care. For example, a study by Deloitte found that 68 percent of those surveyed were interested in home monitoring devices, with seniors (78 percent) and consumers with chronic conditions (75 percent) expressing most interest.⁹

Integrating into the physician's workflow

If the data captured and shared from a medical device creates an information silo, organizations will likely meet physician resistance. Integrating the captured data into the physicians' workflow will reduce the effort required to frequently monitor patient biometric data. For example, if a physician works within an electronic medical record, then they should not be forced to leave that application to review additional information in another application.

Frequent access to patient data can help physicians be more proactive in monitoring patient conditions and allow clinicians to understand which patients are at risk so that they can focus

⁹ Deloitte Center for Health Solutions, 2009



Relationship Management Approach to Chronic Disease Care

CitiusTech, a leading provider of healthcare technology solutions, has developed a solution that leverages the benefits of CRM, unified intelligence, and analytics to manage chronic disease. The Connect4Health framework, connects Microsoft HealthVault, Microsoft Dynamics CRM, and CitiusTech's Patient Registration Framework (registeR4Health) for collaborative disease and wellness management.

Connect4Health has prebuilt workflows for integrating evidence-based disease and care management guidelines for chronic conditions like diabetes. The solution uses HealthVault to integrate consumer health data and consumer health devices with the rich patient relationship management capabilities of Microsoft Dynamics CRM.

The framework enables physicians and health coaches to communicate with patients, monitor data from consumer health devices, and track patient self-management tasks.

applicable resources to ensure early diagnosis, treatment, and reduced cost of disease management. By combining remote monitoring with traditional in-office visits, physicians can transform the office visit to be more engaging and productive.

Building patient relationships

Concepts similar to customer relationship management (CRM) in other industries can be applied in healthcare to create more effective patient relationship management. By allowing clinicians to more efficiently establish ongoing patient relationships, CRM solutions help disseminate education, support preventive care, and improve overall patient well-being. By automating follow-up tasks and communications, and creating processes and workflows that can be engaged based on clinical data received from patient monitoring devices, a relationship management approach to caring for patients with chronic disease can further support transformation of the care process.

Connecting with the enterprise

As patients are discharged from acute care centers, many are coping with chronic conditions and need to make life style changes to prevent a recurrence of the condition that prompted hospitalization in the first place. Most of these patients need to share information with multiple healthcare providers and family members who become increasingly involved in the post-acute care process or as the patient ages. Addressing this important information exchange is a key to transforming care delivery.

Microsoft Solutions Enable Remote Monitoring

The lack of interoperable connectivity standards among providers and the spotty adoption of electronic medical records are technological challenges facing the widespread adoption of remote patient monitoring.¹⁰ While the signing of the American Recovery and Reinvestment Act (ARRA) provides funds to accelerate the adoption of healthcare IT, the challenges surrounding data exchange standards are substantial.

If the healthcare industry waits until interoperability standards are set, data is cleansed, and consensus is achieved across the industry, providers may be challenged to survive the current healthcare environment. The risks and costs are now too great to continue to maintain the status quo for chronic disease management.

Microsoft HealthVault

Microsoft HealthVault is a web-based patient data storage and sharing platform that provides a single infrastructure for the seamless transfer of patient-controlled information. HealthVault helps reduce IT burden on provider organizations that are creating programs that use remote

¹⁰ New England Healthcare Institute, 2009



medical devices. For example, the HealthVault Connection Center supports 50 devices from nine vendors, allowing biometric data from multiple devices to be uploaded directly to a patient's HealthVault record without the need to create each interface. This reduces the number of interfaces required. Several provider organizations, including Cleveland Clinic and Partners Health, are implementing pilot remote monitoring programs based on HealthVault (see pages 8, 9, and 10).

Microsoft Amalga

Other patients that can greatly benefit from connected care are those who are recently discharged from hospitals. At this stage, connected care can help patients avoid complications and readmissions. The coordination of care across all primary and secondary care provider organizations is considered essential for early diagnosis and intervention of problems that can lead to readmissions. Microsoft Amalga aggregates data from within the enterprise (for example, surgery reports, imaging reports, discharge instructions, and medications), and sends it to the patient's HealthVault record. The patient can store, access, use, and share this personal health information with other clinicians and specialists anywhere, as determined by the patient.

Microsoft Dynamics

Disease management programs that offer outreach to patients with chronic disease show improved outcomes. Microsoft Dynamics provides the ability to automate this outreach without escalating costs and resource requirements, thus providing a high-touch and personalized patient management approach to improve patient education and understanding of disease management.

Toward a New Care Model

At Microsoft, we believe that two emerging trends will continue to promote interest and adoption of remote monitoring programs: the emergence of e-health and a shift from a provider-centric to a patient-centric approach. Technology tools like electronic medical devices and patient-controlled data platforms, like Microsoft HealthVault, give patients the power to better manage their healthcare and clinicians the ability to provide timely guidance to prevent acute problems. This is the essence of connected health.

Cleveland Clinic/Microsoft Pilot Promising; Home Health Services May Benefit Chronic Disease Management

Project with Microsoft HealthVault shows that technology may improve the way healthcare is delivered

The use of at-home medical devices to connect doctors and patients via the Internet can help patients and their physicians work more efficiently together to manage chronic conditions, according to research from Cleveland Clinic.

In December 2008, Cleveland Clinic and Microsoft collaborated on a pilot project that pairs the hospital's electronic medical records system with the software company's online HealthVault service to monitor patients' health conditions.

More than 250 participants enrolled—26 percent with diabetes, 6 percent with heart failure, and 68 percent with hypertension—making it the first physician-driven pilot project in the country to follow multiple chronic diseases in a clinical setting.

“The prevalence of chronic disease is rising at an alarming rate in the United States, absorbing an ever-increasing portion of the nation's healthcare dollars,” says C. Martin Harris, M.D., Chief Information Officer at Cleveland Clinic. “If we are to lessen this strain on our nation's economy and healthcare system, we have to change our thinking about how and where healthcare should be delivered, while developing innovative, cost-effective solutions that allow patients to proactively manage their healthcare.”

Nearly half of all Americans are now diagnosed with at least one chronic condition, accounting for 75 percent of the nation's healthcare spending.

“Although more research is certainly needed, the results of this observational study are promising, suggesting that at-home medical devices can help patients and doctors better track chronic conditions, coordinate treatment schedules, manage medication regimens, and schedule timely interventions,” says Harris. “Ultimately, such improvements make for more efficient healthcare, healthier patients, and possibly a reduction in healthcare costs.”

In the Cleveland Clinic pilot project, participants used at-home heart rate monitors, glucometers, scales, pedometers, or blood pressure monitors, depending on each patient's disease. These devices uploaded the patient's data to HealthVault, which then connected to the patient's personal health record at Cleveland Clinic (MyChart, by Epic Systems) and the electronic medical record system used by the patient's healthcare providers at Cleveland Clinic (MyPractice, also by Epic Systems).

The project found a significant change in the average number of days between physician office visits for patients. Diabetic and hypertensive patients were able to make doctor's office visits less often, increasing the number of days between appointments by 71 percent and 26 percent respectively, indicating that patients had better control of their conditions. Heart failure patients, however, visited their doctors more often, decreasing the number of days between visits by 27 percent, indicating that patients were advised to see their healthcare provider in a timelier manner.

“When treating heart failure patients, timely intervention is crucial when complications arise so that we can prevent serious problems that may require emergency room visits or readmissions,” says Randall C. Starling, M.D., M.P.H., Section Head of Heart Failure & Cardiac Transplant Medicine at Cleveland Clinic. “The ability to monitor weight, blood pressure, and activity levels of heart failure patients on a regular basis ensures more timely doctor visits and avoidance of more expensive interventions.”

With the use of coordinated secure health information technologies, some healthcare activities that have traditionally occurred only in a physician's office might one day occur wherever a patient may be, including at home or at work.

Partners Healthcare: Putting Patients in Charge

The Center for Connected Health (CCH), a division of the Boston-based Partners Community HealthCare wanted to create a flexible technology platform that could help patients manage chronic conditions. By using Microsoft products and a software-plus-services approach, the CCH developed the Connected Health Care Suite (CHCS). With the CHCS, patients have a powerful tool to monitor their conditions carefully while keeping in touch with healthcare providers.

The solution combines commonly used equipment, such as glucometers and web-based technology that allows a patient to upload medical information and then view it on a security-enhanced website. The result is an easy-to-use system that lets patients with chronic conditions play an active role in monitoring their health—making rapid adjustments in behavior, such as eating and exercise, to reduce the effects of their condition.

Douglas McClure, Corporate Manager for Technology and Operations at the Center for Connected Health, says, “We wanted to figure out how to capture data from a range of devices, including medical devices, such as glucometers and blood pressure monitors, along with patients’ home computers. Then, we wanted to determine how we could make that information easily accessible to both patients and healthcare providers in a dynamic, interactive way to improve healthcare outcomes.”

McClure and his colleagues at CCH decided to use a combination of software and web-based services to create the CHCS. It employs a number of Microsoft products and solutions, including Microsoft HealthVault. The CHCS has a range of features, such as support for comprehensive records systems, online access to data for patients and their doctors, online communications between patients and providers, and integration with a variety of medical devices and computers.

Collaboration between patients and doctors is a key part of the CHCS. For example, in the Remote Monitoring and Management of Diabetes Program, clinicians and patients share a web-based “workspace” where patient blood glucose measurements are combined with patient notes to foster an ongoing dialogue about the patient’s success in managing his or her disease. The notes feature is a big benefit, because it allows patients to annotate each blood sugar reading that is uploaded to the site. Patients can note what they ate just before the reading, or how much exercise they got.

Messaging is integrated with the patient’s electronic medical record to support ongoing discussions between patients and providers, and to deliver a more detailed medical record for future reference. Dr. Michael Myers, Medical Director for Hawthorn Medical Associates (HMA) in North Dartmouth, Massachusetts, says, “The CHCS system provides a tremendous biofeedback loop that benefits both patients and the medical professionals who are assisting with their treatment.” HMA, which employs about 400 people and 60 physicians, is part of the Partners Community HealthCare. Diabetes is a large part of the HMA practice, which has about 140,000 patients.

The relative simplicity of the technology for patients and the immediate feedback that is available on the system’s website can ultimately help more people take more control over their health. That, says Myers, can deliver enormous benefits to the healthcare industry as a whole. “More and more, we’re seeing patients who want to be in control of their illnesses and treatment programs,” he says. “This tool provides that capability. It benefits patients and practices such as ours because we can deliver a higher caliber of care to patients by using data that’s meaningful and actionable. That’s what improving healthcare is all about.”

Putting patients at the center of information exchange: Community Choice Health Record Bank, Powered by HealthVault

"The consumer-managed health record bank model will change healthcare as we know it, facilitating greater participation by consumers in their own care. This project represents an important step in demonstrating a different approach to addressing the key challenges of making comprehensive electronic medical records available at any point of care."

Jesús Hernández, Executive Director of Community Choice Healthcare Network

As healthcare transitions from paper-based to electronic records, there is a significant opportunity to develop models for more efficient sharing of health information. Health information is largely possessed and controlled by the physicians who provide care and the organizations, such as insurance companies, that pay for care. Federal and state laws provide the right for consumers to obtain paper copies of their records. However, getting these records can be challenging and time-consuming.

While technologies like personal health records and health information exchanges attempt to address some of the challenges around sharing health records, both fall short in enabling consumer access and control of their health data.

"What is often missing is data portability," says Hernández. "Consumers lack a crucial tool for taking an active role in their care. If a patient wants their health information, they need to go to every place where they've had medical treatment and get it on their own."

Washington State is showcasing an innovative model for national information exchange that has the potential to empower consumers and reduce healthcare risks and costs. The Community Choice Healthcare Network, a healthcare consortium in North Central Washington, is undertaking a pilot health record bank project as a feasibility study. A health record bank (HRB) is an emerging healthcare model that provides a more secure and protected place to deposit consumer health information electronically from multiple sources and, with the patient's permission, accessed by physicians in the course of providing care.

This pilot is one of the first patient-controlled HRBs in the United States and was funded in 2009 by the State of Washington Health Care Authority. The pilot HRB uses Microsoft HealthVault. Extensive program management was provided by CitiusTech, a specialist provider of healthcare consulting and technology services.

Consumers registering for the HRB create a HealthVault account. Data coming from multiple physician practices and hospital medical record systems is brought into HealthVault and then shared, with the patient's permission, with physicians. Consumers have the ability to choose which providers can "deposit" information into their accounts.

"HealthVault provides a single interface to diverse sources of data so patients have a unified view of their personal health information," says Manish Sharma, Business Manager – Consumer Health at CitiusTech. "It also acts as the consumer's information repository to store, manage, and share data, expanding consumer control over their own health information."

A future direction for the HRB is for the management of chronic conditions. "Chronic disease management is a priority for us," says Hernández. "What impressed us about HealthVault is the device connectivity and partner ecosystem that we can leverage later for remote monitoring programs."

The nation is watching the progression of this pilot, with some believing that HRBs can be the foundation for national health information exchange. "Eventually, these patient-controlled electronic medical histories could become hubs at the center of a national health information network that seamlessly connects not just doctors and patients, but also hospitals, pharmacies, labs, and health-insurance companies," says Hernández.



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Microsoft HealthVault is a privacy and security-enhanced online service designed to help patients build their health data asset over the course of their lives, giving them easy access to and more control over their health information. Patients can use HealthVault to store copies of their health records obtained from providers, plans, and pharmacies; upload information from health and fitness devices; share information with healthcare providers, coaches, and trainers; and access online applications. Visit www.HealthVault.com to learn more.

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