Leveraging tele-health (remote patient monitoring) to drive healthcare transformation – reduction of readmission rates

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July 19, 2013
Abstract

Readmission risks and the associated cost impact to healthcare providers have become an emerging crisis in the United States. With diminishing returns, providers are looking at various ways to reduce readmission risks (particularly in high risk areas such as congestive heart failures) through discharge process enhancement and remote patient monitoring. Remote patient monitoring is an emerging tool within the healthcare arsenal that allows real-time collection and transmission of patient health data to providers, empowering the patient to manage the care pathway. Multiple providers have adopted this evolving technology, as evidenced in the research paper. Some key case studies from across the nation are highlighted here. However, the regulatory and legislative environment continues to stymie the adoption and expansion of remote patient monitoring and telehealth. These specific gaps are analyzed and recommendations are provided within the paper to address these issues, in order to promote the adoption of telehealth as a critical tool for healthcare providers across the country. These solutions range from legislative changes that implement nationwide standards, practitioner licensing, and data security frameworks to incentives that promote public-private partnerships and investment in technology infrastructure. This paper provides the clear linkage between investment and return for healthcare providers, so that appropriate remedial measures for telehealth adoption are undertaken.

Keywords

Readmissions, Rehospitalizations, Medicare Fee-For-Service, Heart Failure, ACA, Telehealth and HF, Remote Patient Monitoring, Readmission Reduction Program.

Background of the problem

Readmission problem- Defining the current state and its impact in the United States

Health care policy makers and stakeholders use the three legged stool to compare the effectiveness of the United States health care system. Cost, Quality and Access represent these three legs. The healthcare system is plagued with significant problems in these areas. Most healthcare quality issues occur either due to over-use or under-use of services. Unplanned
hospital readmissions signal gaps in the quality of care contributing to rising costs of healthcare. The Center for Medicare and Medicaid (CMS) defines hospital readmissions as “An admission to a subsection (d) hospital within 30 days of discharge from the same or another subsection (d) hospital” (CMS.gov, 2013).

Literature suggests that rehospitalizations or readmissions are caused by the following factors (Karen. E. Joynt & Ashish. K. Jha, 2012; Lewis, Kirkham, Duncan, & Vaithianathan, 2013; Stone & Hoffman, 2010)

- Lack of relay of care instructions to the patient or post-acute care giver by the hospital discharge staff.
- Premature discharge owing to shortage of hospital beds.
- Inadequate communication, poor discharge planning or poor discharge instructions and failure to reconcile medication.
- Hospital acquired infections warrant readmission.
- Medical errors
- Lack of social support, poor socio-economic conditions and follow-up care. These may lead to behavioral non-compliance with after-care recommendations.
- Hospitals that have high volumes of patients with chronic conditions like heart failure. These patients have low mortality rates and are more likely than others to get readmitted (Karen. E. Joynt & Ashish. K. Jha, 2012).

According to the US Department of Health and Human Services (HHS) “Payment incentives to avoid readmissions” will be a strategic measure for quality of care improvement. A report on national strategy for quality improvement in healthcare, the CMS has singled out “hospital
readmissions” as a quality improvement national strategy. Through this the CMSs’ goal is reduce readmission rates to 20% by the end of 2013. These readmissions translate to “1.6 million hospitalizations and potential savings of $15 billion” as per a Health Care quality control report to Congress (HealthCare.gov, 2011). The Affordable Care Act has put forth the following strategies to address this important concern (Kocher & Adashi, 2011):

- The first initiative launched in 2011 is a 5-year $500 Medicare demonstration project called Community-Based Care Transition Program (CCTP). The premise of this program is that the partnership between hospitals and community-based organizations will help facilitate coordination of care transitions thereby reducing readmission rates. The stakeholders involved in this program are consultants prequalified by the Department of Health and Human Services (HHS). This program is unique because it operates on a national scale. For the best results possible, focus will be on high-risk beneficiaries, medically underserved communities and hospitals with a high readmission risk.

- The second initiative started in January 2012 is the Independence At Home Demonstration Program (IAHP), a 3 year $25 million effort. This is a highly directed, coordinated and continuous (24X7) intense multi-disciplinary program designed for the home-bound Medicare beneficiaries that are chronically ill. Subject to meeting cost and quality targets, healthcare providers like physicians, nurses, case managers, pharmacists and other health and social workers will be able to share revenue with the aid of novel payment models(Kocher & Adashi, 2011).
- One of the most important initiatives of the ACA is the multipronged Hospital Readmission Reduction Program (HRRP) which is said to generate savings by aligning payment with the outcome. In addition to reducing Medicare reimbursements by 1%-3% for FY 2013-2015, the HRRP is said to expand the public reporting of readmission rates on all hospital websites for patient conditions like AMI, Heart Failure and Pneumonia.

- The fourth program by the ACA is the National Pilot Program on Payment Bundling (NPPPB). This 5-year voluntary effort overseen by the CMSs’ Innovation Center will test the Medicare bundled payment model for a single episode of care. This model facilitates revenue sharing between the participating healthcare providers like acute care hospitals, physician groups, skilled nursing facilities, home healthcare agencies, etc. and participating organizations while assuming any risks associated with extra cost incurred. The premise of this program is that the payment per episode of care incentivizes providers to coordinate care while sharing costs and reducing potentially preventable readmission rates. NPPPB is said to be able to achieve improved clinical efficiencies, Medicare cost savings, revenue sharing for healthcare providers and organizations.

Figure 1 shows a graph of 30-day risk adjusted readmission rates for top three chronic conditions contributing to high rates of readmission in the United States. The authors have based their calculations on the CMS data between 2002 and 2009 (Karen E. Joynt & Ashish K. Jha, 2012). As seen in the graph, readmission rates for heart failure, acute myocardial infarction and pneumonia have been consistently high over the 7 years. Because multitude of factors contribute
to increased readmission rates, focusing on one area alone will not yield favorable results. For instance, holding hospitals accountable for high readmission rates may solve problems only on one end of the spectrum. Legislative regulations, payment reforms and improved transitions of care will help in addressing the readmission issue on full-scale.

![Figure 1: National Trends in 30-Day Readmission Rates 2002-2009](image)

**Figure 1: National Trends in 30-Day Readmission Rates 2002-2009**

*Taken from (Karen E. Joynt & Ashish K. Jha, 2012)*

CHF has been documented as one of most common reasons for readmissions in the United States (Gheorghiade, Vaduganathan, Fonarow, & Bonow, 2013; Jencks, Williams, & Coleman, 2009; Jha, Orav, & Epstein, 2009). This unplanned hospital readmission of the 5.7 million Americans is costing the Medicare a hefty $17.5 Billion annually. The national healthcare spending as a percentage of the gross domestic product (GDP) has been steadily rising since the ‘60s and as of 2008, it amounted to 16.2% according to the National health expenditure data from the CMS (Sandman & Kovner, 2010). The ACA aims to reform the healthcare system’ quality of care and curtail health care spending by cutting costs. Through a variety of transitional care programs, the health reform’ primary focus has been to reduce readmissions for chronically ill patients (Naylor,
According to one of the papers from the American College of Cardiology, some commonly cited gaps in transition of care for heart failure patients’ fall under the following broad categories (Gheorghiade, et al. 2013, Table 5):

1. Physician Assessment-
   - Failure on part of healthcare providers to address and identify clinical co-morbid conditions related to Heart Failure prior to discharge.

2. Medication errors and adverse drug events-
   - Inadequate or lack of care education to patient caregiver/family.
   - Patients’ non-adherence to self-care, diet regimen, exercises, vital sign checks, weight management and medications.

3. Handoff communication post discharge
   - Poor communication or lack of it from physician providers to care givers like nurses, family, long term care team or nursing home care team.
   - Ignorance on part of care givers regarding heart failure care management.

4. Discharge planning
   - Discharge instructions missing, illegible or not detailed in order take the next course of action.

According the 2007 update of heart disease and stroke statistics, of all chronic conditions, heart failure patients cost the United States approximately $33.2 billion annually (Seto, 2008). Through the HRRP, the CMS hopes to promote healthcare quality and efficiency. As per reports published by the IOM and MedPAC, hospital readmissions point to gaps in care coordination or lack of it (Ross et al., 2010). As per the Affordable Care Act (ACA), readmission penalties for the FY 2013 will apply to three conditions namely heart failure, pneumonia and myocardial
infarction (Fontanarosa & McNutt, 2013). An article in New York Times reports that in the first year of the HRRP i.e. in October 2012, as many as 2217 hospitals incurred readmission penalty of which 300 of them are said to face maximum penalty the following year (Rau, 2012). A study on “30 day readmissions after hospitalizations” reported that readmissions among Medicare beneficiaries between 2007 and 2009 saw 1.3 million cases of hospitalizations and 24.8% readmissions in heart failure patients (Dharmarajan et al., 2013).

The looming crisis for healthcare providers

- Affordable Care Act- Hospital Readmission Reduction Program (HRRP)

President Barrack Obama signed the ACA in March 2010. This law entails numerous cost control elements aimed to eliminate unnecessary costs to the system. Under the Medicare’s Diagnostic Related Group payments, hospitals are not economically incentivized to reduce readmissions. Hence through the HRRP, the ACA aims to reduce the Medicare reimbursement rates for all hospitals with excess readmissions by 1%. While this percentage sounds modest for larger hospitals, it is likely that “smaller hospitals operating on low profit margins will feel significant financial shortfall” (Joynt & Jha, 2013). The CMS calculates the risk-adjusted fee for all Medicare patients with conditions like heart failure, pneumonia, etc. The Congress aims to expand the list to include more conditions that could be potentially preventable through interventions. (Berenson, Paulus, & Kalman, 2012)

An independent congressional agency, the MedPAC reports that “the government spends $12 billion annually on preventable readmissions for Medicare beneficiaries” (Winslow & Goldstein, 2009). As per the law, the Congress has directed the CMS to penalize all health care providers with excess readmissions within a period of 30 days. According to Diamond; “readmissions or
rehospitalizations is a result of poor transition of care and care coordination” (Diamond, 2011). It is estimated that nearly 20% of Medicare patients are readmitted to hospitals due to lack of coordination between the patient and his health care provider or health care provider and the acute care giver. This lack of coordination and integration from the time of discharge and readmission period has resulted in frequent readmissions. This is especially true of population suffering from chronic conditions like diabetes mellitus, heart failure, pneumonia, chronic obstructive pulmonary disease and asthma where follow-up care post discharge is crucial. Current research findings report that readmission rates due to chronic conditions can be reduced if better coordination of care exists (Hernandez et al., 2010; Orszag & Emanuel, 2010). Among Medicare patients of all the medical conditions, people with heart failure (26.9%), pneumonia (20.1%), COPD (22.6%) and psychoses (24.6%) have the highest percentage of 30-day readmission rates. HF contributes to the highest proportion of all hospitalizations at 7.6% of all rehospitalizations (Jencks et al., 2009). A nation-wide survey that calculated the readmission rates reported that Massachusetts was among other states with high readmission rates in the range 20.2%-23.2%. These rates were calculated for all Medicare patients under the fee-for-service model that were discharged between 2003-2004 (Jencks et al., 2009).

The CMS through their HRRP is estimated to cut costs and improve quality of care delivered. Starting in 2015, Medicare could end up saving nearly $1.1 billion-$1.5 billion through this initiative. (Mittler et al., 2013). The recent policy changes put forth by the ACA will provide payment incentives and improved care coordination and transition. The road to reducing and preventing potential readmissions continues to be hazy but conservative estimates foresee a decrease anywhere between 5%-79% of all readmissions (Mittler et al., 2013). There is growing consensus that improved care coordination and quality of care across multiple care settings have
been beneficial and worthwhile to pursue. However in healthcare there is no one-size-fits-all strategy for hospitals to implement.

The MedPAC reports that currently low-volume hospitals are not incentivized to reduce their readmission rates owing to the way in which readmission rates are computed. On the other hand, hospitals faced with maximum penalty rates feel their rates cannot be reduced enough to lower penalty rates (Commission, 2013). CNE objectives and evaluation form reports that Medicare is currently piloting the bundled payment through Acute Care Episode Demonstration project. With a view to generate high profit margins, Medicare is combining provider and hospital payments for all diagnosis related groups (DRGs) that have historically had high profit margins and heavy volumes. The CMS can extend and expand the same concept to chronic conditions like heart failure, diabetes, etc. through bundled payments for episodes of care (Hines, Yu, & Randall, 2010).
The baby boomer population continuing to age and with growing number of people with chronic conditions, the United States government is leveraging technologies like remote patient monitoring to assist in better care transition and also reduce readmission rates (Lawrence, 2010). The future of telemedicine sounds very promising under the new healthcare reform. This reform has created a spur for healthcare providers to improvise their care management for chronic conditions through changes in payment structure. Under the current fee-for-service payment model, healthcare providers are not economically incentivized to treat patients remotely. Research suggests that payment reform strategy may be effective in reducing hospitalizations (Nowicki, Zembroski, Pickering, & Nobel, 2012). On the same note, the federal government
should issue policy reforms to encourage health care providers across the entire continuum of care to apply innovative techniques in reducing or avoiding readmission rates. To counter the benefits of readmission reduction program, there is evidence to suggest the unintended consequences of payment reform. Nevertheless, in the best interest of transforming health care system the nation should adopt a value-based model which places quality and value over quantity and volume. These techniques include effective care coordination and transition program with the help of nurse care managers and leveraging telehealth to catch the problem early. In place of a fee-for-service model, healthcare providers should adopt bundled payment or payments based on episodes of care. According to this model, providers will receive payments for services for a single episode of care. This idea of tying providers’ payments to services provided encourages accountability of care and quality across the entire spectrum of care. In comparison to fee-for-service model, bundled payment model ensures that providers only provide the clinically necessary services. By bringing bundled payment structure in place of fee-for-service, the healthcare delivery model will transition from fragmented care to a model which encourages cost and quality control by bringing in shared accountability.

**Tele-Health to reduce readmissions**

*Remote patient monitoring to reduce hospital readmission rates*

Remote patient monitoring or home telehealth or telemonitoring has the capability to assist in better transitions of care for people with chronic conditions like heart failure and other co-morbidities. The benefits range from decreased hospital mortality rates, better quality of care and decreased healthcare spending for payers and federal government organizations like the CMS (Farberow et al., 2008).
The ACA incentivizes providers to reduce preventable readmissions. Hospitals are adopting innovative technologies to bring down their unplanned rehospitalization rates. However, 100% reduction in readmission rates is not feasible and is an indicator of poor quality of care because certain physical conditions warrant readmissions. Research indicates that hospitals that have invested in innovative technology enabling patient discharge planning and effective patient management have successfully reduced their readmission rates (Desai & Stevenson, 2010). Heart failure patients are highly susceptible to other co-morbid chronic conditions like diabetes, renal failure, pulmonary disease, hypertension, etc. Research suggests that remote patient monitoring is particularly useful in chronic disease management of heart failure and diabetes. A study conducted by Inglis SC and colleagues about telemonitoring for heart failure patients suggests that the use of telemonitoring resulted in a decrease of mortality and readmission rates in heart failure patients (Kim & Han, 2013). An encouraging review about the effectiveness of telemonitoring suggests that “monitoring vital signs enabled providers in the early detection of health deterioration” thus resulting in the reduction of hospital readmissions (Louis et al., 2003). RPM is a transformative technology that has potential to provide clinical intervention to chronic conditions and reduce net health spending. They remotely collect, track and transmit patient’s physiologic data either on a regular or intermittent basis. This data can be quantitative in nature like vital signs like blood pressure, pulse, blood glucose and weight or qualitative like reporting questions related to patient symptoms (Hines et al., 2010). The data gets transmitted to care givers like nurses or case managers who monitor patient information intermittently. If any part of the patient data seems out-of-the-ordinary, then the system sends triggers warranting immediate action. The Center for Connected Health, a division of Partners Healthcare conducted a study to evaluate the effectiveness of remote patient monitoring in improving the heart health of patients.
and reducing readmission rates. The lead author of the study and a research fellow at Harvard Medical School Dr. Kulshrestha reported that “The goal of this study was to include 150 odd heart failure patients from Massachusetts General Hospital, Boston to provide timely intervention and better management of care using telemonitoring”. The telemonitored group had 7 fewer readmissions for every 100 patients when compared to the non-telemonitored patient group. This Connected Cardiac Care initiative creates complete care coordination between stakeholders like patients and rest of the care givers like physicians, nurses and case managers and has the potential to change the readmission landscape for heart failure patients as per Remote Patient Monitoring (2008).

**Early adopters of remote patient monitoring**

*Case studies from the Veterans’ Association, Centura Health and Partners Healthcare*

Remote patient monitoring has been proposed as a solution to prevent premature clinical deterioration of patient condition post discharge. The results of numerous randomized control trials suggest that remote patient monitoring has helped improve patient care outcomes by reducing mortality rates, hospital readmission rates and hospital length of stay (Benatar, Bondmass, Ghitelman, & Avitall, 2003). Research suggests that although initial costs for setting up telemonitoring, are high there is substantial reduction in long term costs. These costs include nurse visits, rehospitalization costs and travel costs (Seto, 2008).

According to (Diamond, 2011) poor transition of care is a bigger problem compared to hospital readmissions. The ACAs’ Readmission Reduction Program compels healthcare providers to evaluate and reconsider their transitional care policies including payment structures to ensure
smooth patient-care transitions post discharge (Moreño, 2013). The goal is to create a patient centered model for population-specific care transitions program.

I. Case study: The Veterans’ Health Association CCHT program

Healthcare organizations are leveraging interactive technology options like Remote Patient Monitoring to help patients and care givers navigate from one healthcare setting to another. With the aid of telephone lines, Interactive Voice Response systems, text messaging or direct access via internet, this technology collects admission, discharge and transfer data, patient care management information, physiological data and vital signs to enhance patient care coordination across multiple providers (Acierno et al., 2010). The Veterans Administration is a large integrated delivery healthcare system within the United States. They are the pioneers in home telehealth program. The Department of Veterans Affairs is using the Home-based Primary Care model to address the growing number of chronically ill patients in their veteran population. They have leveraged the Care Coordination/Home Telehealth (CCHT) program to provide better care transitions and reduce 30-day readmissions. The CCHT program is estimated to have begun between July 2003 and August 2007. The Office of Telehealth sponsored program CCHT collects and transmits patients’ biometric data which is then monitored remotely by care providers (A.Broderick, 2013). As an early adopter of RPM technology, the VHA has successfully evaluated, piloted and deployed this technology (Coye, Haselkorn, & DeMello, 2009). In 2002, the VHA led a RPM technology assessment program for congestive heart failure. The study was performed on two groups; the first group (using RPM) consisting of 281 veterans with CHF and the second group consisting of 1120 veterans (no RPM). For the group that was telemonitored, it was reported that there were 60% fewer hospital admissions and 66% fewer ED visits (Coye et al., 2009).
The care and policy setting of the VA is conducive for telehealth innovation and research. 
(Acierno et al., 2010) because of the following reasons:

- Universal EMR across the VHA network- VHA uses a standardized EMR across the entire span of its network enabling on-site and off-site care providers to share a common patient record. This EMR provides the functionality for many types of telehealth treatments.

- Federal regulations and policies- Since the VA is a federal government agency, they do not face issues with regards to cross-state licensure.

- Payment model- The payment model is capitated. Under the capitated system, providers have more flexibility and fewer payment restrictions usually put forth by third-party payers.

As of 2012, over 70,000 veterans were treated through the telemonitoring supported care management system. In addition to reducing hospital readmissions, the CCHT has reduced the average ‘hospital days of stay’ for chronic conditions like diabetes, heart failure, hypertension between 2004 and 2007 (Darkins et al., 2008).

Reducing VHA readmission rates across the entire network has been an important quality control metric. The focus is on the older population with chronic conditions which is highly vulnerable to other co-morbid conditions (A.Broderick, 2013). In 2009, the 30-day readmission rates for all conditions averaged 12.7% across the VHA healthcare network. According to the 2010 VHA Facility Quality and Safety report, 12 of their facilities reported high unadjusted readmission rates of 20.2% for congestive heart failure patients. Telemonitoring is facilitated by technologies like messaging and monitoring devices and videotelemonitors and videophones. The messaging
devices enable patients to answer questions about their condition while monitoring devices record vital signs and biometrics. The videotelemonitors help in setting up audio/video teleconferencing (A. Broderick, 2013).

Although the CCHT started off as a pilot initiative, its potential for offering improved care to a target population reinforced positive belief allowing for further expansion (A. Broderick & Lindeman, 2013). Under the CCHT, the patient’s home is the preferred site of care. This patient centered model has been key to preventing unnecessary hospital admissions and ED visits and has resulted in cost effective care outcomes for the chronically ill (A. Broderick & Lindeman, 2013). Private organizations can draw from the VHA home telehealth experience on multiple levels.

Rather than letting technology take the center stage, the VHA has modeled its CCHIT program after a patient-centered approach. The VHA telehealth success story can be adapted to Medicare/Medicaid dual eligible population under the fee-for-service payment model (A. Broderick, 2013).

II. Case study: Partners Healthcare: Remote Patient Monitoring of Heart Failure patients

The Partners Healthcare home grown telehealth program is driven by the Center for Connected Health. The rationale for technology adoption is to reduce their 30-day readmission and to mitigate financial risks associated with Medicare reimbursements. CHF was chosen as the primary focus because of the huge costs associated with care and potential savings as a result of reduced readmission rates (A. Broderick, 2013). They are leveraging process improvement health informatics tools like Telemonitoring to make transitions of care smooth. The Connected Cardiac Care Program (CCCP) uses a combination of remote monitoring, social media, mobile
technology and network devices to chronic conditions like heart failure, diabetes, etc. Poor care outcomes of these chronic conditions result in negative financial implications as per the HRRP (A. Broderick, 2013). The Partners Healthcare has successfully piloted and deployed the CCCP across its entire network. According to the Center for Connected Health, the CCCP is “A centralized care management and preventive care program for heart failure patients made possible by telemonitoring capabilities, nurse or care manager interventions, education and care coordination. Quantitative data like blood sugar levels, weight, heart rate, pulse are transmitted from patient to provider/s for timely intervention. The Center reports a 50% reduction in readmission rates for its heart failure patients.” As per a patient satisfaction survey for CCCP, 98% patients reportedly admitted to have become more aware of heart failure condition post enrollment, 82% credit the program for staying out of hospitals, 77% wanted to spread the word to other heart patients and 85% felt more in control of their health. A pilot study conducted on 150 heart failure patients over 70 years of age admitted to Mass General yielded a positive trend in reducing readmissions. Changes in the Medicare prospective payment structure created a spark for Partners Healthcare to begin the CCCP. The Partners HealthCare at Home (PCAH) has partnered with the Center for Connected Health to provide clinical support like telemonitoring team of nurses and care givers (A. Broderick, 2013). The CCCP is open to all patients seeing a primary care or a cardiologist affiliated to the Partners network. One of the key highlights of the program is that it offers a 4-month telemonitoring to its heart failure patients within the confines of their home. The outcome of CCCP is an impressive 50% reduction in readmission rates for CHF patients and 44% reduction in readmission rates in other patients (non-heart failure) resulting in net savings of $8,155 per patient. The savings as a result of reduced hospitalizations
were $9,655 per patient. (Reducing Hospital Readmissions with CCCP. Source: Center for Connected Health)

III. Case study: Centura Home Telehealth Care

Centura Health at Home is a non-profit home health organization which was founded in 1997. It is part of the Centura Health, the largest integrated healthcare system in Colorado. It provides a broad range of services to nearly 20,000 patients, some of whom are the aged in Boulder County, metropolitan Denver area, Canon city, etc. Centura Health has successfully adopted technologies like remote patient monitoring to reduce their readmission rates for chronically ill Medicare beneficiaries by 6%. According to Centura Health “their average 30-day readmission rate is pretty close to the national average of 20% and that 90% of their readmissions are preventable.” (Steinmetz, 2013)

Centura Health at Home pilot tested their home video-based intervention for a targeted Medicare managed care population in 2004. Today they are have over 1300 employees including nurses, social workers, physical therapists, speech and OT therapists serving the community. CHAH takes pride in being the first home health organizations in Colorado to introduce remote patient monitoring. The rationale for telehealth adoption is that nearly 70% of CHAHs’ Medicare patients require home care and there has been a sharp rise in enrolment. With Telehealth, home health nurses are able to monitor 60-70 patients as opposed to 5-6 patients during one-on-one visits. CHAH remote patient monitoring involves recording of body weight, pulse, blood pressure, etc. This telehealth program is coupled with clinical call center-based program designed for treatment groups that are not eligible for the Medicare home health benefit program. In order to test the clinical outcomes of patients’ monitored using telehealth, individuals with an
average age of 76 were recruited from two hospitals under Centura Health group. Of these patients, 44% were diagnosed for congestive heart failure. The recruited patients were grouped into two categories; first group of patients were remotely monitored and had 24X7 access to clinical call center while the second group used clinical call center solely as their telehealth strategy (Steinmetz, 2013). CHAH telehealth care program saw a 62% reduction in 30-day rehospitalization rates related to congestive heart failure, diabetes and chronic pulmonary failure. The telemonitored group had significantly lower readmission rates at 6.3% compared to the home care group at 18% (Source: CHAH, Reporting outcomes to the Center for Technology and Aging). CHAH is effectively leveraging telehealth technological interventions to cater its growing number of seniors’ suffering from heart failure and other co-morbid conditions. The Home Care Association of Colorado has passed the Telehealth Law 8.520 that allows direct reimbursements for all Medicaid patients enrolled under the home telehealth program. The current payment/ care policy changes in Colorado perfectly align with CHAHs’ long term strategy (Steinmetz, 2013) establishing telehealth as the standard of care at CHAH.

**Limitations to the adoption of Telemedicine as potential solution**

In order to fully realize the potential of telehealth as a solution to provide better transitions of care, providers must overcome internal and external roadblocks. Some factors that serve as impediment to Telehealth adoption are (Siegal, 2011; Whitten & Buis, 2007) licensure, data standards, patient privacy issues and security, lack of reimbursement, telecommunication infrastructure, sustainability and cost, provider perceptions/ organizational support, legal liabilities (Siegal, 2012) for providers like malpractice and data security issues, technical challenges (Lawrence, 2009) and shortage of qualified providers (DeVany, Rheuban, Tracy, Waters, & Whitten, 2008). According to a report from the Center for Telemedicine Law, one of
biggest barriers to telehealth is the lack of universal reimbursement from private payers. It is stated that “Neither Medicare nor private payers across 50 states offer universal reimbursements for telehealth services” (Whitten & Buis, 2007). Home telehealth is only reimbursed under prospective payment model and Medicare does not cover long-term telemonitoring services (DeVany et al., 2008). Most healthcare organizations have clinical providers with little or no experience in telehealth technologies like RPM. Lack of awareness and expertise in leveraging telehealth solutions result in delay of adoption. Resistance to adoption can be due to fear of the unknown, possible interruptions to current workflow processes and complexities involved in telehealth technologies (Coye et al., 2009). Healthcare providers do not see an incentive in adopting RPM technologies because of a clear lack of return on investment model to assess upfront and maintenance costs vs. long term benefit. There may be lack of functional interface and interoperability between the patients’ EMR and remotely monitored data. The payment models for integrated delivery systems like the VHA and home health based agencies like Centura Health are strategically aligned with their vision, which is to provide better transitions of care using telemedicine. Unlike the integrated delivery systems, hospital-based payment structures do not support innovative models of care like RPM for chronic conditions. Increased ED visits and rehospitalization rates generate huge revenues for hospitals. Hospitals adopting telehealth solutions to reduce their readmission rates will see direct losses in their revenues. This is cited as one of the key barriers to adoption of RPM according to a paper on RPM from Health Affairs journal (Coye et al., 2009).

**In light of the current health policy changes, is the future of Telehealth promising?**

Adopters of telehealth technologies like the Veterans Health Administration, Integrated Delivery Networks like Kaiser Permanente, Mayo Clinic and Centura Health have successfully piloted
telehealth initiatives to serve their older population with chronic illnesses. Their business model is perfectly aligned with their care mechanisms. New payment models like bundled care (payment per episode of care) have created a momentum for hospital chronic care management models (Lawrence, 2010). There has been a push from the federal government to increase network infrastructure for increased and faster connectivity in rural areas (as per the Telemedicine Enhancing Community Health Act, 2009) (Lawrence, 2010). According to Marc Holland, Principal of a New York based consulting firm “As per the American Recovery and Reinvestment Act 2009, FY 2011 will see a multi-million dollar push to improve broadband infrastructure to facilitate telemedicine activities in remote and rural areas” as cited by (Lawrence, 2010). Restructuring of reimbursement models together with reduced cost of in-home technology is likely to create a spike in home based monitoring. The Center for Technology issued 5 grants for organizations implementing “Home Telehealth”. The New England Healthcare Institute (NEHI) is one of the institutes to receive a $100,000 grant to implement a “Home telehealth” project to care for older adults with chronic heart failure in the Greater Boston area (NEHI and remote patient monitoring, September 2010). Researchers in favor of remote patient monitoring point out that in 25 years, this technology has the potential to reduce our health care costs by a whopping $200 billion (NEHI and remote patient monitoring, September 2010).

**Recommendations to enhance adoptions of telehealth:**

As detailed above through several case studies, it is clear that adoption of telehealth can have a positive impact in reducing readmission risks across key categories. However, there are several regulatory and legislative policy limitations that continue to inhibit wider adoption by all healthcare providers. With technological advancements in cloud computing, data analytics, data
integration, and sensor technology improving by large leaps and bounds, removing these policy barriers would drive telehealth adoption and impact to new heights. Some of the recommended policy changes can be captured as follows:

- **Insurance laws (including reimbursement mechanisms) needs an overhaul:**

  Medicare and Medicaid account for substantial percentages of healthcare provider revenues. However, as indicated earlier under the current reimbursement structure, most advanced telehealth services that address many of the readmission risk categories lack reimbursement coverage. Long term monitoring and home telehealth are currently not covered under the fee-for-service model. One of the major overhauls that can be done immediately is to remove the limitations in coverage areas from just rural areas to a wider population (particularly inner cities that have difficulty in accessing a primary care provider, but are excluded currently from getting reimbursement) (BroadbandExpanded, n.d.-a). In order to speed up telehealth adoption on a national scale, “the Federal government must include telehealth reimbursement as a component of the payment reform” (DeVany et al., 2008).

- **Bringing privacy laws into the modern era and standardizing them across the nation**

  Current health policies were created by individual states to address the adoption of electronic health records across multiple healthcare providers. However, telehealth adoption requires sharing of data across state lines and perhaps even internationally. Current laws prevent such sharing and make the adoption of telehealth prohibitively expensive (to comply with privacy regulations and laws). It is essential that these individual state laws are harmonized into one national framework that will ensure privacy is maintained, while promoting wider adoption (U.S. Department of Health and Human
services, 2008). There are several gaps in the Health Insurance Portability and Accountability Act (HIPAA) that allow disclosure of patient information without their consent, require non-clinical providers such as camera operators to comply with complex laws, and do not address situations where the clinical personnel is unknown to the patient or on-site healthcare providers. Several solutions for these gaps have been brought by “Connecting for health” (BroadbandExpanded, n.d.-b) which seeks to empower users with full access, but also control over privacy of their medical information.

- Enhance security standards are placed to ensure that telehealth services are secure and risk averse

As data warehousing and sharing becomes widespread online and across global networks, the idea of a hacker or date thief getting hold of this information is frightening. Current transmissions standards are primitive and have not kept up with the evolving technology risks. More secure wireless technologies and enhancement in broadband bandwidth are a critical component to enhancing security profiles of telehealth technology. Individual barcoding technology i.e. unique identifier for each patient is being integrated with cardiac sensor networks that remotely monitor patient’s heart profiles. By integrating this technology, the patient profile can be activated only by a user who knows the barcode identifier. Adoption of fiber-optic broadband networks that allows users and providers to share data in secure packets through VPN technology will greatly enhance security and user confidence (BroadbandExpanded, n.d.-c)

- Physician licensing reform
One of the major inhibitors in telehealth adoption is current restrictions around physician licensing that restrict physicians from treating patients in geographic locations that they are not licensed to do so. Though telehealth originated as an intrastate solution, cloud computing and wireless data networking have greatly expanded the use of telehealth across the nation (BroadbandExpanded, n.d.-d). Based on this, it is essential that the country moves away from an individual physician licensing model to a national model (with an eventual goal of international licensing)

- Increase deployment of broadband networks to un-served or under-served areas through policy changes and investment incentives:

In order for telehealth to become another pillar in delivery of healthcare, broadband networks need to become common place across every nook and corner in the country. Illinois Rural HealthNet (IRHN) is a high-speed, 3100 mile fiber optic network linking hospitals and clinics in rural areas to a statewide IT network. This allows transmission of healthcare data and information across multiple providers are immense speeds (promoting real-time care and access for patients). This model needs to serve as a benchmark for the federal and state governments to invest in such systems to connect rural areas with state and nationwide networks.

The connected nation model that succeeded in driving broadband availability and utilization across Kentucky for healthcare information exchanges has already been adopted by 4-5 additional states. This innovative model was a result of private-public partnerships (investment and legislation working hand-in-hand). This sort of “standards setting” partnership is critical in driving broadband network access even across most remote areas.
Finally, demand is a cure-all for all ills. By enhancing education of the benefits that broadband networks provide to non-users and making them clamor for these systems will greatly spur governments and the private sector to take initiative to invest and implement. Targeting the senior population in particular is critical, as they constitute the major profile of non-users that derive maximum benefits from a broadband network promoting telehealth (BroadbandExpanded, n.d.-e).

Finally, incentivizing the private sector to support the deployment of broadband networks through university grants, tax-breaks for network owners, government stimulus for investment bolsters the wider and quicker expansion of broadband networks across the nation.
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