



Using Biometric Remote Monitoring to Produce ROI, Decrease Resource Requirements and Improve Care Coordination

**ConnectedHealth Deployment Demonstrates Significant Per Patient
Savings**

ConnectedHealth

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The face of medical care is rapidly changing, and, for health care providers, achieving profitability now depends on managing costs - as opposed to the insurance-driven cost pass through model of days past. Policy changes penalizing health care providers who do not manage costs have been implemented. As a result, health care organizations are seeking ways to reduce physical hospital visits made by patients. A reduction in non-emergent, non-critical hospital visits would result in less costs being borne by the health care provider – costs that are steadily eroding their profitability. Reducing the cost of patient care by keeping patients that can be cared for remotely out of hospitals is a very attractive idea, and ConnectedHealth, a provider of health monitoring connectivity solutions, believes that wireless monitoring holds great potential as a patient care solution that will help to drive down costs and improve profit margins for health care providers.

Strong Market Drivers for eHealth Solutions

Health care providers agree and are already beginning to deploy remote monitoring and management systems in order to reduce hospital visits. Remote monitoring has multiple benefits for the patient, allowing them to more easily comply with their caregiver's instructions without the added effort of travelling to the health care facility. What if routine procedures such as glucose or blood pressure monitoring could be carried out from the comfort of home? Seamlessly connecting patients with caregivers has the potential of greatly benefiting all parties and, as such, it seems clear that the remote monitoring movement is set to gain widespread adoption. 'Unnecessary' hospital visits are the highest manageable costs faced by health care providers – and providers are very motivated to implement wireless patient monitoring.

Heritage Provider Network Deploys ConnectedHealth eHealth Platform, Reducing Cost and Improving Care

ConnectedHealth, with systems integration partner Cytta, completed initial Pilot Program installation with the Heritage Provider Network (HPN) Regal /Lakeside Medical Group, under the auspices of Dr. Terry Olson. HPN is a large full risk, capitated medical group located in Southern California. Under the terms of the Trial they completed a 90 day and more recently a 120 day Pilot Study to determine, 'if high cost patients, not well managed in traditional care coordination programs and traditional healthcare delivery systems, can decrease cost of care and improve patient satisfaction, through remote telemonitoring using the ConnectedHealth eHealth Platform and an intense case management process.'

Patient satisfaction and costs reductions were then measured. MHIMS provided assistance and advice in conjunction with Dr. Terry Olson's team. ConnectedHealth is delighted with the results MHIMS and Dr. Olson have achieved with our technology in the medical monitoring field. Their results are set out in the 6 month Pilot Study Whitepaper by Dr. Olson titled "Biometric remote telemonitoring to produce a healthy return on investment, decrease resource utilization, and improve care coordination" is attached as Appendix A.

Excerpts from Dr. Olson's Independent Report summarize the ConnectedHealth Technology Pilot Program as follows,

"The trial demonstrated the ability to quickly achieve cost savings, decrease resource utilization, improve care coordination, and increase adherence to evidence based guidelines."



"Care costs were reduced on average by \$11,078 for each trial participant through the trial [or \$1,846 per member per month]. This trial did not specifically address long term cost of care. However, these patients were selected for the inabilities of the existing healthcare system and care coordination programs to cost effectively address their short or long term healthcare needs. One trial participant noted he realized more value and benefit in 2 months of trial participation compared to his previous 17 months of participation in the best available care coordination services."

About ConnectedHealth's eHealth Platform

The eHealth Platform from ConnectedHealth addresses these barriers to adoption. It integrates into a health care provider's existing patient management systems and enables wireless patient monitoring – at a cost of 25 percent less than existing wireless health solutions. ConnectedHealth is the first to leverage standard connectivity technology to provide support for third-party devices (i.e., scales, glucose and blood pressure monitors). Over the past two years, adoption has been trending upwards due to: adoption of industry standards (Continua), coalescing wireless standards with medical device technology and standardization of PHRs and EHRs.

How It Works

The overall ConnectedHealth system is shown below. This provides secure, HIPAA-compliant connectivity from device to health care provider electronic record systems.





The System Includes:

- **Health Gateway:**
Uses Android phone and ConnectedHealth SIM card for data connectivity, configured to automatically boot up and start Connected Health's Health Manager Application.
- **Continua/Bluetooth Medical Devices**
The Health Gateway communicates seamlessly with Bluetooth medical devices. Currently, the following medical devices will be supported 1) Bluetooth Weighing Scales 2) Bluetooth Blood Pressure Monitors 3) Bluetooth Glucose Meters and 4) Bluetooth Pulse Oximeters. Additional devices such as Spirometers, Pill Dispensers and pedometers are being added.
- **Android HMA (Health Manager Application "HMA")**
The Android HMA is an application developed by ConnectedHealth which will be pre-installed on the Android Phone. The role of the HMA is to act as a gateway routing data from medical devices in the Patient's home to a central Electronic Medical Record housed at a secure site, and accessible by the Managed Healthcare organisation.
- **eHealth Server**
The eHealth Server is the conduit between patient data transmitted from the HMA and the EMR system. Data from the Patients home is transferred via the cellular network, to the ConnHealth Server. Data is then packaged in the HL7 CCR format and transmitted via a secure VPN connection, to the customer's EMR servers.
- **Healthcare Provider**
Once the Patient's Personal Health Records are transferred and integrated into the patient's Electronic Medical Record, the data is then part of the data flow and is managed by the Healthcare Organization, according to their treatment regimens and work flow.

With ConnectedHealth's eHealth platform, the patient's glucose, weight, blood pressure measurements and other vital signs are constantly registered and automatically uploaded to the secure server for access by health care providers. The care giver can see measurements, analyze behavior over time, and send reminders for tests and treatments, and alerts in case of potential hazardous conditions.

Appendix: Pilot Program Results

Methodology

Twenty-seven (27) patients were identified through claims analysis with frequent use of primary care and specialty visits, Emergency Room visits, Urgent Care visits, Hospital admissions, two (2) or more co-morbidities, and little to no adherence to their current medical treatment plan. After further review, twenty (20) patients were enrolled in to this remote telemonitoring program trial. Resource utilization for the 180 days prior to enrollment in this pilot program was compared to monthly resource utilization during this trial. Patient and Provider satisfaction surveys were sent and interviews were completed with patients, care coordination staff, and physician providers who utilized the telemonitoring technology to determine their satisfaction with the program and case management. Recommendations were formulated at the completion of the trial.

This was a voluntary program which allowed patients to disenroll at any point during the trial. Patients who agreed to participate in the trial completed a 30 minute office orientation session to introduce the telemonitoring products and review the care coordination program. All HIPPA requirements were incorporated into program design and care coordination processes.

Patients participated in the trial from their home after completing the orientation session. Technology performance issues were resolved remotely and within the patient's home for 4 patients. Biometric measurements were available for blood glucose, blood pressure, weight, and pulse oximetry. Results were sent via Bluetooth technology through double FDA approved off the shelf devices and transmitted to the ConnectedHealth dashboard. Access to the dashboard and ability to send care alerts were available to all members of the care coordination team, patients, and designated physicians/family members/caregivers.

Care coordination was provided by nurse and physician services through the existing complex case management employees. Alert programming was established by the Medical Director in association with discussions with primary care provider, specialty providers, and evidence based care guidelines. Alert prompts were sent to nurse care coordinators via email and texts. Nurse coordinators contacted patients in response to alert prompts and on a regular schedule during the trial. Face to face patient interaction with the care coordination team was not required but often transpired during the trial. Patients were able to participate remotely, through face to face interactions in the care coordination clinic, or through face to face home interactions.

Results

Cost of care was reduced by \$221,570 for the 20 patients in this 180 day trial. This equates to an average of \$11,078 in cost reduction for each patient in the trial. Appendices 1-6 detail pre and post-trial costs of care and sites of utilization. Cost reductions were realized through reduced Emergency Room and Urgent Care visits, reduced specialty visits, and reduced hospital admissions. The reduction in hospital admissions was achieved largely through



reduced readmissions. The table below summarizes utilization for trial members. The use of ConnectedHealth Connect Ecosystem during this trial reduced utilization in the initial 90 days, but produced even more dramatic reductions in the second 90 day period. This supports the belief that patients began to learn how to better self-manage their conditions as they became familiar with the program and their care coordinators. The average reimbursement for a hospital inpatient DRG was estimated at \$22,000; Emergency room visits average \$1,200.00/visit; specialty physician visits average \$125/visit while urgent care visits average \$90/visit.

Special note is made regarding 3 unavoidable hospital admissions with prolonged inpatient stays.

1. A member with no prior history of upper gastrointestinal bleeding developed abrupt hematemesis in addition to their diagnosis of end stage idiopathic pulmonary fibrosis. The member was admitted and spent 9 days in the hospital with a bleeding gastric ulcer.
2. A dialysis member with narcotic dependency, diabetes, and advanced degenerative spinal disease suffered a traumatic neck injury resulting in a 69 day stay and quadriplegia.
3. A member with idiopathic cardiomyopathy developed left ventricular assist device infection requiring hospital admission, LVAD removal, placement of an intra-aortic balloon pump and continued inpatient stay until a heart was found and heart transplantation completed. This resulted in a 73 day inpatient stay.

Summary of Trial results

	Pre-trial	Post-trial	Last 90 days of trial	Change	Cost Savings
Admits	28	17	3	9	\$198,000
Readmits	12	5	0	7	\$140,000
Bed Days	90	143	80	(53)	
ER Visits	44	26	4	18	\$21,600
UC Visits	12	4	1	8	\$720
Specialists	102	92	36	10	\$1,250
PCP	92	78	18	14	Capitated
Total Cost Savings					\$221,570
Cost Savings per Member over 6 months					\$11,078
Cost savings per Member per month					\$1,846

Value creation was identified in 4 areas during the trial:

1. Improved patient engagement and ability to self-manage care



2. Improved provider engagement

3. Patient loyalty

4. Improved care coordinating performance

Enrolment criteria identified patients who struggled to manage their health despite best available resources in our current healthcare environment. This trial demonstrated these patients were not able to self-manage their care. The patients visited the hospital, emergency room, and physician offices in search of a solution to their healthcare needs. Those efforts were previously costly and ineffective.

Trial participation and the use of the ConnectedHealth's eHealth Platform (white labelled as 'Cytta Connect') discovered these patients were rarely engaged or knowledgeable in self-management of their healthcare needs. Repeated use of available resources did little to address this deficit. The Cytta Connect Ecosystem in association with care coordination enabled the patient and team to identify and address barriers to self-management and adherence to evidence based guidelines. Barriers included knowledge deficits, outpatient monitoring deficits, absence of prompt and effective care plan revision when biometric guidelines were not met, and social factors.

Physician providers who participated in the trial voiced tremendous support for biometric remote telemonitoring. Physicians noted many of the previously reported home biometric monitoring was inaccurate, fabricated, or absent. Patients, physicians, and care coordination team members confirmed that biometric results were rapidly available and accurate. Sampling error or erroneous results reporting was not a problem. Physicians and care coordination team members noted their level of engagement and effectiveness was tremendously improved with accurate, timely, and frequent reports of blood pressure, blood sugar, weight, and oxygenation status.

As patients participated in the trial and received customized care coordination they became more engaged in their healthcare management and frequently voiced the admiration for effective service delivery. Patients commonly noted their neighbors, family members, church members, and others were amazed by the service delivered and wanted access to the trial. Patients noted they were not only more satisfied with the service delivered by the medical group but also noted they would never consider switching health plans or medical groups because they feared they would lose access to the ConnectedHealth Connect Ecosystem and care coordination.

The complex care coordination team noted their ability to effectively manage and their personal satisfaction was tremendously increased through trial participation. The team noted the absence of playing telephone tag with patients and the absence of erroneous home biometric self-reports by patients. The team noted that the ConnectedHealth Connect alerts required an active care plan which was clearly understood by the patient, the managing physicians, and the care coordination team. This was clearly absent prior to this trial. In addition, standing orders were required to promptly address care alerts so that blood pressure, blood sugars, weight, and oxygenation guidelines were met. The trial



demonstrated the absence of effective, real time care plan and medication revision in existing care programs. The absence of timely care plan revision in addition to unclear care plans produced significant care team dissatisfaction. This trial and ConnectedHealth Connect removed that dissatisfaction while improving care team performance.

Conclusions

This trial demonstrated the ability to significantly reduce costs for high risk patients through use of the ConnectedHealth Connect Ecosystem. The trial demonstrated the ability to quickly achieve cost savings, decrease resource utilization, improve care coordination, and increase adherence to evidence based guidelines. Adherence to evidence based guidelines is increasingly important as CMS 5 STAR ratings garner importance.

Care costs were reduced on average by \$11,078 for each trial participant. This trial did not specifically address long term cost of care. However, these patients were selected for the inabilities of the existing healthcare system and care coordination programs to cost effectively address their short or long term healthcare needs. One trial participant noted he realized more value and benefit in 2 months of trial participation compared to his previous 17 months of participation in the best available care coordination services. A quite handsome return on investment is present if the care coordination system is priced at less than \$2,000 per year.

This trial also demonstrated that home biometric monitoring using the Cytta Connect Ecosystem can be easily introduced, dispensed and utilized in the home setting. Care team training was easily completed. ConnectedHealth Connect was easy for patients and care coordinators to learn and effectively use. Technical troubleshooting was prompt and effective.

Improved patient engagement and ability to self-manage care will become increasingly important and require new resource allocation because CMS will soon require Stage II Readiness participation. Through repeated collection and review of biometric data patients learn how to titrate medications and adjust behaviors to achieve target goals which is a cornerstone of CMS 5 STAR performance and CMS Stage II Readiness. Patients and the care coordination team are prompted by alerts to evaluate and to intervene in real time. This produces a patient who is more engaged and prospectively aware of how they must modify behaviors and medications to meet target metrics through self-management. Additionally, improved achievement of target metrics produces significant provider and care team satisfaction. Efforts of both become both more effective and more efficient.

Effective use of the Cytta Connect Ecosystem requires the managing physicians to develop and communicate care plans and standing orders to adjust medications to achieve target goal. Too often the goals of care and associated care plans including medication administration are poorly communicated or not present. Patients travel through various sites of service and levels of care without a clear understanding of the expected behaviors and medication usage to be executed in the home setting. ConnectedHealth Connect in conjunction with care coordination resolves this deficit and allows for care plan and medication revision as the patient disease processes change in the home environment.



Through repeated measurement and with focused care coordination the patient learns how to better manage their health care needs. This produces a patient who is more engaged and prospectively aware of how they must modify behaviors and medications to meet target metrics. This also produces a more satisfied patient, physician, and care coordination team.

This trial discovered patients view Cytta Connect and remote telemonitoring as a special benefit to patients who are encouraged to retain their relationship with Heritage to continue to access and build their personal health database. Patients develop a special relationship with their care coordination team. The patients viewed ConnectedHealth Connect and care coordination activities as a value rather than an intrusion because information and advice generated by the trial were specific to the patient and time sensitive.

This trial enabled physicians and care coordinators to more effectively manage a larger number of patients. Current care coordination ratios can be expanded by 20% using biometric remote telemonitoring through reduced telephone tag and elimination of unfocused, subjective, generic discussions with patients. Instead specific biometric data, medication usage, review of the active care plan, and comparison to target metrics produces a focused discussion. Patients and care coordinators are taught through rapid cycle improvement to Plan, Do, Study, and ACT. Barriers to successful self-management are identified and addressed. Patients now learn how to revise and update their care management in the home setting rather than a physician office, emergency or hospital room followed by an attempt to translate and implement the care plan in their home setting upon discharge. Patient contacts have become value oriented with immediate return on investment to the care coordinators and patient.

Next Steps

We believe the success of this remote telemonitoring program on managing high risk patients can be replicated and offered to forward thinking, at risk healthcare organizations. The telemonitoring success requires careful patient selection, structured patient enrollment and focused care coordination which have been developed and tested. Ongoing success requires structured patient assessment, patient and provider engagement, alert parameter selection with provider input with standing orders in response to alerts. ConnectedHealth and MHIMS provides coordination between the providers and systems to introduce and educate on the use of the telemonitoring program to reduce ER and hospitalizations usage with increased patient involvement and increased positive outcomes in health self-management for high need members. We can identify high cost members and offer this program to non-high cost patients who are discharging from the hospital but at high risk for readmission due to their inability to effectively self-manage their care in the home setting.

When compared to other remote telemonitoring services available, the Cytta Connect Ecosystem is clearly the most cost effective, patient friendly system available.

Although the pilot study was completed, ConnectedHealth continued to provide their products which demonstrated additional cost savings and dramatically reduced utilization past the initial 180 day pilot.