



# Outcome Sheets

CLINICAL, ENGAGEMENT AND  
ADHERENCE, AND UTILIZATION/ROI

Q4 2016



# CLINICAL OUTCOMES

Measuring clinical outcomes is not only useful to clinicians, but provides a way to monitor the impact of services provided to patients. Organizations in the following studies, using Care Innovations' Remote Patient Management (RPM) system, saw vast improvement in their clinical outcomes. The organizations included Sutter Health, GE Aviation,

Alberta Health Services, and the American Heart Association, to name a few. Patients in these studies suffered from chronic diseases, including diabetes, chronic heart failure and COPD. The outcomes included less hospitalizations, decreased morbidity rates and improved quality of life.

## ST. VINCENT

### Study

Reducing Hospital Readmissions via Remote Patient Management

### Study Description

- St. Vincent implemented a remote care management program and utilized the Care Innovations® Guide platform to facilitate care delivered in the home.
- St. Vincent had a goal of reducing hospital readmissions for patients with congestive heart failure (CHF) and chronic obstructive pulmonary disease (COPD) in an effort to help them stay out of the hospital, away from the emergency room, and reduce the frequency of readmission. A total of 142 patients were recruited for the trial.

### Results

The key outcomes included:

- Readmissions in the intervention group were reduced by 64% compared to the study control group 2 readmissions in intervention group; 7 readmissions in control group, statistical significance  $p=.04$ .
- Patient Activation Measurement (PAM) levels of engagement were 18% higher for the intervention group. This is important because patients with higher PAM levels have 21% lower health care costs than patients with the lowest PAM levels, even after controlling for demographics and condition severity.

### Testimonial

The biggest individual success story from the project, according to the Principal Investigator, Dr. Snell, involved a woman in her early 50s with nine chronic conditions and 11 total admissions in 2011, which cost roughly \$156,000 that year. Over a seven-month span participating in the project, the woman did not return to the hospital once.

### Publication

Published on FierceHealthIT (<http://www.fiercehealthit.com>) 2012

## UNIVERSITY OF MISSISSIPPI MEDICAL CENTER DIABETES TELEHEALTH NETWORK

### Study

Improving type 2 diabetes self-management: remote monitoring technology facilitates patient engagement

### Study Description

This study was designed to measure the impact of connecting rural diabetics to chronic care managers utilizing a remote care management solution. The Mississippi Telehealth Network was established to demonstrate the effectiveness and cost savings of providing diabetes management in the home, with the ultimate goal of obtaining legislation that would reimburse for this intervention.

### Results

A total of 100 patients completed the study. There was a 1.7% average reduction in HbA1C for the intervention group. There were zero hospitalizations and emergency department visits during the time the patients were in the monitoring program. Health session compliance was 83%; medication compliance improved to 96%; 9 patients were diagnosed with retinopathy as a result of the intensive monitoring program; and 71 patients in the study lost weight. The estimated mileage saved from patients not having to come into the clinics for care was 9,454. The total cost savings for Medicaid for this population was \$339,184. Mississippi amended the Medicaid rules and regulations to further support telehealth as a result of this study. Mississippi was the first state to pay a transmission fee for telemedicine and Medicaid reimbursement has now been introduced based on the results of this study.

### Publication

Poster Presentation: Henderson, K., 2015, How Mississippi is Leading the Way in Innovation.

## SUTTER HEALTH INTEGRATED DIABETES EDUCATION NETWORK

### Study

Improving type 2 diabetes self-management: remote monitoring technology facilitates patient engagement

### Study Description

This randomized control study was designed to specifically include all structured SMBG (self-monitoring of blood glucose) elements. The purpose of the study was to evaluate the effectiveness of a telehealth intervention combining structured self-monitoring of blood glucose and nurse care coordination to improve outcomes in persons with type 2 diabetes, noninsulin-treated.

Specifically the researcher compared the effectiveness of a 12-week remote monitoring intervention with paired testing to usual care in individuals with elevated A1C. The primary aim was to compare mean change in A1C, the secondary aim was to compare mean change in self-management behaviors, self-efficacy, and diabetes knowledge.



The intervention group received the nurse care coordination the same as the usual care. In addition, they received a one-time training and education session on structured SMBG, specifically paired testing and setting small behavior change goals. They also had training on how to use the Guide tablet. On a DAILY basis, they received education FROM the Guide focusing on the AADE 7 self-care behaviors and rotated through an 84-day course, which was the same for everyone. Topics included healthy eating, monitoring, preventing complications etc. In addition, the participants uploaded their glucose data TO the Guide and data was transmitted to a research portal. There were WEEKLY virtual visits through secure messaging using the Sutter MHO PHR. These visits consisted of asynchronous feedback on their paired glucose testing values that were automated along with individualized feedback from the team. MONTHLY there were telephone calls with the disease management nurses where they reviewed the past month paired testing data, virtual visit feedback and then assisted with goal setting, behavior change, and if needed discussed medication and treatment changes.

## Results

- The difference between the Intervention group and Control at 6 months was statistically significant, the Intervention group rate of change in A1C was greater than control.
- A change in medication was significantly associated with A1C level.
- The number of paired glucose tests was not statistically significant on change in A1C but there was a trend toward improvement.

## Publication

Greenwood DA, Blozis SA, Young HM, Nesbitt TS, Quinn CC. Overcoming Clinical Inertia: A Randomized Clinical Trial of a Telehealth Remote Monitoring Intervention Using Paired Glucose Testing in Adults With Type 2 Diabetes. J Med Internet Res 2015;17(7):e178

# PROVIDENCE

## Study

Providence Observational Telehealth Trial Administered by Clinical Pharmacists

## Study Description

This was a 30 patient observational study managed by clinical pharmacists at Providence Medical Center in Portland, Oregon. The duration of the monitoring period was 4 months. The primary endpoint was change in HbA1c. Secondary endpoints included patient adherence, knowledge of chronic condition, improved glucose control, patient satisfaction and clinician satisfaction. Patient inclusion criteria was type II diabetics with HbA1c levels > 8%. The Providence Institutional Review Board approved this study.

## Results

### Reduction in HbA1c Levels

The mean A1C at baseline for the 28 study participants was 9.8% (SD 2.08). The mean A1C decreased to 8.5% (SD 2.20) at study end. This was a statistically significant reduction ( $\Delta = -1.3\%$ ,  $p=0.001$ ).

The percent of participants with an A1C > 9% (poor control) decreased from 50% to 29%, and 21% achieved the American Diabetes Association A1C goal of < 7%. In contrast to the study participants, the mean A1C increased for the 17 patients who consented but did not participate in the study ( $\Delta = 0.1\%$ ).

### **Improved Control of Blood Glucose Levels**

Analysing the trends based on the collected data found the mean blood glucose values decreased significantly over the 16-week study period from 178 mg/dl (SD 67) at week one to 163 mg/dl (SD 64) at week 16 ( $p=0.0002$ ). The median and standard deviation values demonstrated similar trends. In addition, percentages of blood glucose values between 70-180 mg/dl increased over the 16-week period from 50% to 70%, while incidence of hypoglycemia remained low.

### **Improve compliance with the American Diabetes Association Guidelines for Diabetes Care**

A key indication of improved blood glucose control is determined by the patient's compliance with the American Diabetes Association (ADA) guidelines for blood glucose values. The ADA's lower control limit is 70 mg/dl and the upper limit is 130 mg/dl before meals. Compliance increased from 27% in week 1 to almost 37% in week 17.

## **Publication**

Klug, C., Bonin, K., Bultemeier, N., Rozenfeld, Y. Stuckman Vasquez, Johnson, M. & Cheitlin Cherry, J. (2011). Integrating Telehealth Technology Into A Clinical Pharmacy Telephonic Diabetes Management Program. Journal of Diabetes Science and Technology; 5(5): 1238-1245.

# ADVANCED TELEHEALTH SOLUTIONS: GE AVIATION

## **Study**

GE Aviation Telehealth Study for Patients with Diabetes Mellitus

## **Study Description**

Advanced Telehealth Solutions (ATHS) began a study in conjunction with GE Aviation to monitor and educate individuals with a diagnosis of Diabetes Mellitus utilizing the Intel Gigabyte monitor. The primary objective of the study was to reduce HgbA1c levels.

Secondary objectives included increasing participant's knowledge of Diabetes management, decrease the overall cost of care and increase medication compliance. Participants were asked to test their vital signs and their blood glucose levels a minimum of one time per week. Each week the participants received diabetic education. Every three months they were asked to complete the diabetes knowledge test. In addition, the participants HgbA1c was obtained at the beginning of the study and every six months for the duration of the study. A satisfaction survey was also conducted at 3 months and again at completion of the study.

## **Results**

- HbA1c: There were a total of 83 Participants enrolled in the program.
- 75 Participants (90%) submitted an initial A1c
- 8 Participants (10%) did not submit an initial or subsequent A1c and declined participation
- Average Beginning A1c: 9.47



- Average Ending A1c: 6.89 (Decrease of 37%)
- Average A1c of Participants on the Program 1 year: 8.6
- Average A1c of Participants on the Program 2 years: 6.8 (Decrease of 26%)

## BLOOD GLUCOSE

| YEAR ONE   | YEAR TWO   |
|--|--|
| 32% of Participants increased the frequency they checked their blood glucose to at least daily year one of the program | 34% of the Participants increased the frequency they checked their blood glucose to at least daily year two of the program |
| 32% of the total Participants decreased their average blood glucose readings by 24 points year one of the program      | 51% of the total participants decreased their average blood glucose readings by 23 points year two of the program          |

## BLOOD PRESSURE

| YEAR ONE   | YEAR TWO   |
|--|--|
| 52% decrease in Systolic B/P for Participants year one of the program  | 59% decrease in Systolic B/P for Participants year two of the program  |
| 34% decrease in Diastolic B/P for Participants year one of the program | 63% decrease in Diastolic B/P for Participants year two of the program |

## WEIGHT

- 18% of Participants lost greater than 5% of their body weight averaging a 20 lb. weight loss
- 37% of Participants lost less than 5% of their body weight averaging a 5 lb. weight loss
- Average weight loss of Participants on the program year one was 5% of their body weight
- Average weight loss of Participants on the program year two was 5% of their body weight

## DIABETIC KNOWLEDGE TEST

- 64 of 83 Participants (77%) took the DKT at least once
- 19 of 83 Participants (23%) did not take the DKT
- The average beginning DKT score was 16.6%
- The average ending DKT score was 18.4% (6.7% increase)

## SATISFACTION SURVEY

|  |                             |
|--|-----------------------------|
| The training I received prepared me to use the equipment                   | 91% Agree / Strongly Agree  |
| If I had any concerns, my Telehealth nurse was available to help me.       | 97% Agree / Strongly Agree  |
| My Telehealth nurse is aware of my health needs                            | 100% Agree / Strongly Agree |
| I feel this program has improved my ability to manage my health care needs | 97% Agree / Strongly Agree  |
| I am happy my employer provided this program as an added benefit           | 97% Agree / Strongly Agree  |
| Overall, I am satisfied with the Health Guide                              | 100% Agree / Strongly Agree |

## Participant Testimonials

- A1c decreased to 6.2 and Participant lost 30 lbs. during the program. Participant was able to decrease the dosage of their blood pressure medication, had a change in attitude toward their Diabetes and had an understanding that daily monitoring was very beneficial and desired that the Diabetes program would continue.
- A1c decreased to 7.0 and Participant found it helpful to have someone available to ask questions and receive support.

## Publication

GE Aviation Telehealth Study for Patients with Diabetes Mellitus; Final Report, December 2013.

# ALBERTA HEALTH SERVICES

## Study

My Home Health: A Virtual Care Management Pilot Program for Self-Management of Congestive Heart Failure

## Study Description

The Ivey International Centre for Health Innovation at the Ivey Business School, the Institute of Health Economics, and GE Healthcare collaborated with the Government of Alberta via Alberta Health Services (AHS) to conduct research exploring innovative models in which costs and healthcare challenges could be addressed through a virtual care management (VCM) model. The objective of the project was to explore the effectiveness of a remote monitoring model for patients with



congestive heart failure. The intervention was for a duration of 6 months, with a continued follow up for another 6 months after the intervention was completed.

## Results

A total of 103 patients completed the 12 months study. This study found that the VCM program has the potential to improve patient, caregiver, and provider experiences of care, improve self-reported health outcomes over a relatively short 6-month period, and potentially reduce health system costs in the CHF population.

The researchers reported the following key results:

### POPULATION HEALTH RESULTS

- The population health impact was not limited to the duration of the program. Patients reported that one of the primary benefits of the VCM program was establishing a routine. Even after the program had ended, 79% of participants indicated that they were still using at least one element from the VCM program in their regular routine.
- Compared to the baseline, health related quality of life of patients increased at 6 months but decreased at 1 year, 6 months after enrolment in the VCM program was discontinued. This decrease in health status from 6 to 12 months may be due to the removal of the VCM after the first 6 months.

### PATIENT EXPERIENCES OF CARE RESULTS

- Patients believed that the VCM program yielded better patient care and health outcomes. In particular, patients felt more secure in having a healthcare professional readily available for any questions, more confident that any potentially dangerous health scenarios would be caught, and more certain that unnecessary or conflicting medications would be corrected.
- Patients felt that the technology was easy to use in the program. 86% of participants indicated that using the VCM was somewhat to not difficult.
- Patient ratings of the VCM were very positive, with 89% of participants indicating they would “probably” or “definitely” recommend the program to others, and 77% rating the program 8-10 on a 10 point scale (where 10 is most positive).
- Positive patient perceptions of the VCM program were long-lasting. At the 12-month mark, 6 months after the VCM program had ended, 89% of patients would still recommend to others.
- Participants’ responses to surveys demonstrated that the VCM program is more effective to, and valued by, participants with specific demographics. In particular, participants who had a more basic computer proficiency rated the program higher than those with more advanced proficiency. Similarly, individuals over the age of 64 were more likely to rate the program higher than those under 64.

### CAREGIVER EXPERIENCES OF CARE RESULTS

- Caregiver participants indicated that the VCM program reduced their caregiver burden. By empowering patients to self-manage more than they had in the past, many of the tasks that once had to be completed by caregivers could now be completed by the patient. The emotional burden was also reduced, as caregivers felt reassured that they were no longer “alone” in managing care, and had the support of regular monitoring and communication with health providers.
- Caregivers felt that the VCM program improved their awareness and knowledge surrounding CHF management. Both the

educational modules and regular conversations with the VCM nurse were highlighted as key beneficial resources for patient and caregiver education.

## PROVIDER EXPERIENCES OF CARE RESULTS

- Providers indicated that upon implementation of the VCM, their workload increased due to the extra patient education required to introduce them to the VCM. However, they also highlighted that this diminished over time, and ultimately resulted in a decreased workflow. Much of this decrease is due to the VCM program's ability to catch clinical problems as early as they present, so that less time-consuming preventative measures can be implemented immediately, avoiding major complications.
- Providers suggested that patient compliance increased as a result of the program, as patients were empowered to take responsibility for their own health.

## PER CAPITA COSTS RESULTS

- After enrollment in the VCM program, patients used less health services resulting in reductions in health care costs.
- Majority of the reductions occurred in the period from 0 to 6 months after enrolment in the VCM program when the intervention was going on.
- Reductions in hospital admissions accounted for most of the reductions in health care costs.

## Publication

Home Health: A Virtual Care Management Pilot Program for Self-Management of Congestive Heart Failure. Final Report. Ivey International Centre for Health Innovation and Institute of Health Economics, Edmonton, Alberta. February 2016.

# AMERICAN HEART ASSOCIATION

## Study

An Observational Study of Deployment of American Heart Association Heart Failure Protocols and Educational Content Within the Intel® Health Guide System Post Discharge.

## Study Description

- This was a single center, unblinded, non-randomized feasibility study of tele monitoring with embedded patient education. The University Hospitals Home Care Services program is a large home care agency in Ohio and was chosen for the study and was the source of referrals.
- This nurse-driven program was available to Medicare recipients who were discharged home and met eligibility criteria for home care services.
- The Institutional Review Board of the University Hospitals Case Western Medical Center approved the study. The purpose of this study was to examine short-term (60-day) health-related quality of life and re-hospitalization after implementation of the Care Innovations® Guide deployed with the American Heart Association guideline-based heart failure protocols for monitoring and managing clinical status, symptoms and delivery of relevant patient education to enhance patients' understanding of and management of heart failure.



- Utility was defined as days of activity and interaction of the patient with the monitor / days of actual monitoring possible.
- Adherence was defined as the percent of actual completed sessions from the number of scheduled sessions. Re-hospitalization data were acquired directly from patients or caregivers and primary care physicians.

## Results

### Improved Quality of Life

Health status was assessed by the Kansas City Cardiomyopathy Questionnaire (KCCQ) pre and post monitoring periods. The KCCQ is a 23-item, self-administered instrument that quantifies physical function, symptoms (frequency, severity and recent change), social function, self-efficacy and knowledge, and quality of life. The Care Innovations® Guide, when used by a clinician to deliver a heart failure program, improved health related quality of life, as evidenced by Kansas City Cardiomyopathy Questionnaire clinical scores increased significantly from 49±25 at baseline to 63±26 at 60 days ( $p=0.039$ ).

### Relationship of Compliance and Utility with Re-hospitalization

There was a statistically significant association noted between utility, adherence, and rate of re-hospitalization. Using generalized estimating equations, greater utility (days with activity per monitored days) but not adherence (completing scheduled sessions) scores were correlated with improvements in health status by KCCQ Clinical Summary score ( $p=0.013$ ) and Overall Summary score ( $p=0.0056$ ). Less patient utility and adherence were associated with re-hospitalization. Median adherence and utility for those not re-hospitalized (97.2% and 96.9%, respectively) were greater than for those re-hospitalized (67.4% and 82.2%:  $p=0.013$ ,  $p=0.006$ , respectively).

## Publication

Piña, I.L., Albert, N.M., Fonarow, G.C., Catha, G., Wayte, P., Plank, T., Bruckman, D., Holmes, P., & Kikano, G. (2011) An Observational Study of Deployment of American Heart Association Heart Failure Protocols and Educational Content Within the Intel® Health Guide System Post Discharge. In Press.





# ENGAGEMENT AND ADHERENCE OUTCOMES

Engagement and adherence to health programs for patients with chronic disease can prove challenging. These challenges can be overcome by implementing a remote care system with clinical check-ins, daily health measurements and education. To do so successfully, programs like Humana, implemented Care Innovations' Remote Patient

Management (RPM) system to create lifelong habits and to positively affect behavior change. The utilization of remote care by other organizations mentioned resulted in increased adherence to daily biometric monitoring, better medication compliance and a higher level of patient confidence knowing health professionals were readily available.

## UNIVERSITY OF MISSISSIPPI MEDICAL CENTER DIABETES TELEHEALTH NETWORK

### Study

Improving type 2 diabetes self-management: remote monitoring technology facilitates patient engagement

### Study Description

This study was designed to measure the impact of connecting rural diabetics to chronic care managers utilizing a remote care management solution. The Mississippi Telehealth Network was established to demonstrate the effectiveness and cost savings of providing diabetes management in the home, with the ultimate goal of obtaining legislation that would reimburse for this intervention.

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A total of 100 patients completed the study. There was a 1.7% average reduction in HbA1C for the intervention group. There were zero hospitalizations and emergency department visits during the time the patients were in the monitoring program. Health session compliance was 83%; medication compliance improved to 96%; 9 patients were diagnosed with retinopathy as a result of the intensive monitoring program; and 71 patients in the study lost weight. The estimated mileage saved from patients not having to come into the clinics for care was 9,454. The total cost savings for Medicaid for this population was \$339,184. Mississippi amended the Medicaid rules and regulations to further support telehealth as a result of this study. Mississippi was the first state to pay a transmission fee for telemedicine and Medicaid reimbursement has now been introduced based on the results of this study.

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| If I had any concerns, my Telehealth nurse was available to help me.       | 97% Agree / Strongly Agree  |
| My Telehealth nurse is aware of my health needs                            | 100% Agree / Strongly Agree |
| I feel this program has improved my ability to manage my health care needs | 97% Agree / Strongly Agree  |
| I am happy my employer provided this program as an added benefit           | 97% Agree / Strongly Agree  |
| Overall, I am satisfied with the Health Guide                              | 100% Agree / Strongly Agree |

## Participant Testimonials

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## PER CAPITA COSTS RESULTS

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- Patient Activation Measurement (PAM) levels of engagement were 18% higher for the intervention group. This is important because patients with higher PAM levels have 21% lower health care costs than patients with the lowest PAM levels, even after controlling for demographics and condition severity.

### Testimonial

The biggest individual success story from the project, according to the Principal Investigator, Dr. Snell, involved a woman in her early 50s with nine chronic conditions and 11 total admissions in 2011, which cost roughly \$156,000 that year. Over a seven-month span participating in the project, the woman did not return to the hospital once.

### Publication

Published on FierceHealthIT (<http://www.fiercehealthit.com>) 2012

## HUMANA

### Study

Creating Change through Remote Patient Care Management Addressing Cost-Quality-Access with Innovative Telehealth Technology

### Study Description

- Humana Cares developed an extensive support program for CHF patients in 33 states, which included daily biometric monitoring and education with the Care Innovations® Guide platform.



- The program was designed to affect behavior change and create lifelong habits among CHF patients who have had recent hospitalizations or ER visits. A total of 1400 patients were enrolled in the study.

## Results

The Care Innovations Guide platform was found to be an effective and valuable element of the Humana Cares CHF care management program as evidenced by:

- 80% adherence rate by members who opted to have daily biometric monitoring
- 94% of members said the Guide was easy to use, 90% said they felt more connected to their nurse, and 93% would recommend it to their friends
- Positive anecdotal feedback from members that the Guide has helped them develop positive lifelong habits and better manage their chronic conditions
- Enabled Humana to reach CHF patients in remote areas that may have otherwise gone unmonitored for long periods of time

## Publication

White Paper: Creating Change through Remote Patient Care Management Addressing Cost-Quality-Access with Innovative Telehealth Technology (2012)

# SCAN

## Study

SCAN Health Plan and HealthCare Partners Explore the Use of Remote Health Management Technology for Frail Seniors

## Study Description

This study focused on member satisfaction and operational practices for a Medicare Advantage HMO and a medical group collaboration to explore next-generation chronic care management technology. The operational pilot aimed at evaluating the acceptance of a remote health management technology and to understand the day-to-day operational requirements associated with implementing a remote health management model of care to seniors in the home. The pilot involved a partnership between SCAN Health Plan (SCAN) and HealthCare Partners Medical Group (HCP).

SCAN, founded in 1977 and headquartered in Long Beach, California, is a not-for-profit Medicare Advantage plan serving more than 115,000 members in Southern and Northern California Counties as well as in Maricopa County in Arizona. SCAN's membership consists of frail seniors with an average age of 76 years. Sixty percent of SCAN members have three or more chronic conditions. SCAN's mission is to enable seniors to live and age independently in the place of their choosing.

HCP is a medical provider operating under a fully-capitated contract with SCAN to provide healthcare services to SCAN members. Formed through a merger in 1992, and headquartered in Torrance, California, HCP employs and contracts with more than 1,100 primary care physicians and 3,500 specialty physicians serving more than 500,000 patients in the greater Los Angeles area. HCP has been named a top-performing California medical group by the Integrated Healthcare Association for the past five years.



The goal of the pilot was to provide holistic care for elderly patients, where SCAN and HCP shared a common interest in understanding the role of technology to improve the delivery of health care services to their patient populations that will result in positive patient outcomes, improved member retention and increased patient satisfaction.

## Results

- Frail seniors were successful in using remote health management technology as part of their daily self-care management regimen, which included the use of video calls to communicate with their care managers.
- Frail seniors reported high satisfaction with the technology to help them manage their heart failure condition.
- Use of video calls enriched communication between patients and care managers and facilitated improved patient self-awareness and self-care management.
- Care managers reported a positive experience using remote health management technology to deliver a new model of care to the frail seniors.
- Care managers reported that the technology helped them do a better job monitoring their patients' conditions, identify which patients needed immediate attention and that video calls were valued over the traditional phone calls alone to help manage patients.
- Remote health management technology provided actionable and timely data to the care manager who, in collaboration with the specialty and primary care physicians, was able to intervene proactively to mitigate a decline in patient health status.

## Publication

Little, A, Meyers, B; SCAN Health Plan and Healthcare Partners Explore the Use of Remote Health Management Technology for Frail Seniors. White Paper, DHF\_0743-3.

# AMERICAN HEART ASSOCIATION (1<sup>ST</sup> STUDY)

## Study

An Observational Study of Deployment of American Heart Association Heart Failure Protocols and Educational Content Within the Intel® Health Guide System Post Discharge.

## Study Description

- This was a single center, unblinded, non-randomized feasibility study of tele monitoring with embedded patient education. The University Hospitals Home Care Services program is a large home care agency in Ohio and was chosen for the study and was the source of referrals.
- This nurse-driven program was available to Medicare recipients who were discharged home and met eligibility criteria for home care services.
- The Institutional Review Board of the University Hospitals Case Western Medical Center approved the study. The purpose of this study was to examine short-term (60-day) health-related quality of life and re-hospitalization after implementation of the Care Innovations® Guide deployed with the American Heart Association guideline-based

heart failure protocols for monitoring and managing clinical status, symptoms and delivery of relevant patient education to enhance patients' understanding of and management of heart failure.

- Utility was defined as days of activity and interaction of the patient with the monitor / days of actual monitoring possible.
  - Adherence was defined as the percent of actual completed sessions from the number of scheduled sessions.
- Re-hospitalization data were acquired directly from patients or caregivers and primary care physicians.

## Results

### Improved Quality of Life

Health status was assessed by the Kansas City Cardiomyopathy Questionnaire (KCCQ) pre and post monitoring periods. The KCCQ is a 23-item, self-administered instrument that quantifies physical function, symptoms (frequency, severity and recent change), social function, self-efficacy and knowledge, and quality of life. The Care Innovations® Guide, when used by a clinician to deliver a heart failure program, improved health related quality of life, as evidenced by Kansas City Cardiomyopathy Questionnaire clinical scores increased significantly from 49±25 at baseline to 63±26 at 60 days ( $p=0.039$ ).

### Relationship of Compliance and Utility with Re-hospitalization

There was a statistically significant association noted between utility, adherence, and rate of re-hospitalization. Using generalized estimating equations, greater utility (days with activity per monitored days) but not adherence (completing scheduled sessions) scores were correlated with improvements in health status by KCCQ Clinical Summary score ( $p=0.013$ ) and Overall Summary score ( $p=0.0056$ ). Less patient utility and adherence were associated with re-hospitalization. Median adherence and utility for those not re-hospitalized (97.2% and 96.9%, respectively) were greater than for those re-hospitalized (67.4% and 82.2%;  $p=0.013$ ,  $p=0.006$ , respectively).

## Publication

Piña, I.L., Albert, N.M., Fonarow, G.C., Catha, G., Wayte, P., Plank, T., Bruckman, D., Holmes, P., & Kikano, G. (2011) An Observational Study of Deployment of American Heart Association Heart Failure Protocols and Educational Content Within the Intel® Health Guide System Post Discharge. In Press.

## AMERICAN HEART ASSOCIATION (2<sup>ND</sup> STUDY)

### Study

Is Knowledge Given, Knowledge Gained? American Heart Association Heart Failure Protocols and Educational Content Within the Intel® Health Guide System.

### Study Description

In a small pilot sample, change in heart failure knowledge and accuracy of beliefs about heart failure were examined before/after a 60-day monitoring period with the Care Innovations® Guide (formerly named Intel® Health Guide), a remote patient monitoring system deployed with American Heart Association heart failure protocols and patient education. Patients were self-selected and met home care services criteria. After Care Innovations® Guide training, patients could assess educational content in scheduled sessions or independently.



## Results

### Improved Quality of Life

Heart failure knowledge was assessed using a 20-item true/false heart failure knowledge test (score range = 0-100%) and accuracy of heart failure beliefs was assessed using a 14-item survey; mean score  $\geq 3.0$  reflects accurate heart failure beliefs based on contemporary medical knowledge. Of knowledge survey items, 8 of 20 trended toward improved scores after using the Guide. At baseline (admission into the study), the patients' heart failure knowledge was moderately strong at baseline but heart failure beliefs were inaccurate. Baseline and follow-up mean heart failure illness beliefs scores were  $2.75 \pm 0.33$  and  $2.95 \pm 0.35$ , respectively; mean heart failure beliefs change, 0.208 (95% CI, 0.044, 0.372);  $p=0.015$  (non-paired).

## Publication

Albert, N.M., Piña, I.L., Fonarow, G.C., Catha, G., Wayte, P., Plank, T., Bruckman, D., & Kikano, G. (2011) Is Knowledge Given, Knowledge Gained? American Heart Association Heart Failure Protocols and Educational Content Within the Intel® Health Guide System. In Press.

# AMERICAN PHYSICIAN HOUSECALLS

## Study

Remote Patient Monitoring via Care Innovations® Guide as Implemented at American Physicians House Calls

## Study Description

American Physician Housecalls (APH) implemented the Guide for seriously ill patients with chronic conditions in the fall of 2010. APH used the Guide within its own unique care model of providing physician home visits. The Guide was added to assist its clinicians in the disease management of complex senior patients with multiple chronic illnesses. The goal of the program was to help keep patients healthy at home, and to decrease their utilization of higher levels of care. This included reducing hospital admissions and emergency room visits. A total of 50 patients participated in the pilot study.

## Results

### Drive Appropriate Utilization

Hospitalization and emergency room visits are of interest when assessing innovative health care systems. During the time period from November 1, 2010, through April 20, 2011, for the 50 patients in the study, there were 14 inpatient hospitalizations and eight emergency room visits. For the entire study population, this equates to an overall annual rate of about 0.85 hospitalizations per patient per year and 0.48 emergency room visits per patient per year. The table below presents a study of the national Medicare population of hospitalization rates for chronically ill populations for comparison, since a matched control group was not created for this pilot study.



| NUMBER OF CHRONIC CONDITIONS IN THE MEDICARE STUDY | AVERAGE NUMBER OF INPATIENT DISCHARGES PER YEAR IN THE MEDICARE STUDY |
|--|---|
| None   | 0.12  |
| One  | 0.35  |
| Two  | 0.78  |
| Three or More                                      | 1.76  |

### Improve Medication Compliance

In the APH study, during a follow up call, diet education, symptom review, and/or chronic disease management education was provided to the patient. If a patient's condition deteriorated, the RN would contact the physician, review the case, and discuss possible medication interventions. Other interventions including a follow up visit, a specialty consult, imaging studies, lab work, or referral to a higher level of care were also considered. The table below reviews the number of vital signs measured by the Guide in a given month. It gives the breakdown on how often a nursing assessment occurred, and how often a medication adjustment occurred during a given month.

| MONTH    | # ACTIVE PATIENTS | # OF VITAL SIGNS MEASURED | % OF VITAL SIGNS OUT OF THRESHOLD | % OF ABNORMAL VITAL SIGNS FOLLOWED UP ON BY PHONE | % OF PHONE ASSESSMENTS RESULTING IN MEDICATION ADJUSTMENT |
|----------|-------------------|---------------------------|-----------------------------------|---|---|
| November | 27                | 2143                      | 41% (n = 888)                     | 13% (n = 135)                                     | 17% (n = 24)  |
| December | 31                | 1709                      | 40% (n = 690)                     | 16% (n = 138)                                     | 18% (n = 25)  |
| January  | 35                | 1986                      | 42% (n = 825)                     | 14% (n = 132)                                     | 10% (n = 13)  |
| February | 36                | 1632                      | 42% (n = 683)                     | 18% (n = 139)                                     | 9% (n = 13)   |
| March    | 40                | 2258                      | 39% (n = 875)                     | 12% (n = 120)                                     | 15% (n = 18)  |
| April    | 41                | 2270                      | 38% (n = 853)                     | 13% (n = 140)                                     | 19% (n = 26)  |

## Publication

White Paper: Remote Patient Monitoring via Care Innovations® Guide as Implemented at American Physicians House Calls; DHF-4409 Rev 1-2.0-APH White Paper, Care Innovations®.

# UTILIZATION/ROI OUTCOMES

Remote Patient Management (RPM) not only improves clinical outcomes and engagement, but can also lead to an improved ROI. Patients with chronic disease, receiving remote at-home care, are less likely to utilize an emergency room and the inpatient care services of a hospital. For example, a study performed at the

University of Mississippi Medical Center resulted in a savings of \$339,184 after 100 patients started receiving remote care. During this time, there were zero hospitalizations and zero emergency room visits. Other organizations saw similar drops in inpatient and emergent stays.

## LOTHIAN

### Study

NHS Technology Adoption Centre: Telehealth in Lancashire

### Study Description

This was a study undertaken by NHS Central Lancashire and NTAC during 2010/11, where Telehealth technology was introduced to monitor patients who suffer from Chronic Obstructive Pulmonary Disease (COPD). The goal was enablement of community clinicians caring for patients with COPD to track and maintain patients in their own home by way of remote monitoring. This was done through video consultation and patient recorded metrics.

The COPD remote monitoring system was used by community matrons, respiratory care nurses and palliative and community care nurses, who provided advice/treatment to monitor patients, with the aim of: 1) improving self-management, 2) increasing patients' understanding of their condition, 3) effective support during exacerbations, and 4) reducing hospital admissions for COPD patients.

### Results

Overall, the COPD Telehealth pilot study undertaken by NHS Central Lancashire was highly successful and demonstrated favorable outcomes and the achievement of a number of goals in patients, NHS staff and the healthcare system. Evidence from the NHS Central Lancashire study suggests that Telehealth technology has the potential to improve efficacy in the NHS through:

- A reduction of 21% in non-elective admissions for the 17 patients involved in the study, which constituted five fewer emergency admissions and saved £2725 plus MFF (HRG DZ21A) for the NHS.
- A 25% reduction in the length of hospital stay.
- Reducing the number of Accident and Emergency contacts that did not require hospital admission.

### Publication

The NHS Technology and Adoption Centre, C LANCS Lothian Project, Telehealth in Lancashire© December 2011



## FRASER HEALTH

### Study

Fraser Health (British Columbia, Canada) used new technologies to help COPD patients 'BreatheWELL at Home'

### Study Description

Fraser Health launched the BreatheWELL at Home initiative in Burnaby and New Westminster. It was a program designed to educate COPD patients on how to better manage their disease, including learning what can trigger a flare-up and understanding how to take medications properly. Fraser Health Authority used an innovative patient-centered approach involving collaboration, education and home health technologies to provide improved care for patients with chronic obstructive pulmonary disease, or COPD.

### Results

The BreatheWELL at Home program contributed to a 35% reduction in the total number of ER visits related to COPD from the previous year. The total number of acute admissions dropped by 51% and the average length of stay of those admitted was cut by 48%. The total number of acute re-admissions fell by a remarkable 54%.

The program's goal was to reduce ER visits and admissions as well as length of stay by 25%. In the 18 months since the launch, actual outcomes had exceeded expectations. Fraser Health immediately expanded the program to include residents in Langley and Chilliwack. The collaboration yielded impressive results.

### Testimonial

Paula Young, director of infrastructure, primary health care at Fraser Health says the most meaningful outcome has been for the patients themselves. Some didn't realize they even had COPD and would end up in the hospital multiple times a year. Now, they have learned how to manage their condition in the comfort of their care facility or home and dramatically reduce their ER visits, she says.

### Publication

White Paper: Hospitals of Distinction, Fraser Health uses new technologies to help COPD patients 'BreatheWELL at Home'

## UNIVERSITY OF MISSISSIPPI MEDICAL CENTER DIABETES TELEHEALTH NETWORK

### Study

Improving type 2 diabetes self-management: remote monitoring technology facilitates patient engagement

### Study Description

This study was designed to measure the impact of connecting rural diabetics to chronic care managers utilizing a remote care management solution. The Mississippi Telehealth Network was established to demonstrate the effectiveness and cost



savings of providing diabetes management in the home, with the ultimate goal of obtaining legislation that would reimburse for this intervention.

## Results

A total of 100 patients completed the study. There was a 1.7% average reduction in HbA1C for the intervention group. There were zero hospitalizations and emergency department visits during the time the patients were in the monitoring program. Health session compliance was 83%; medication compliance improved to 96%; 9 patients were diagnosed with retinopathy as a result of the intensive monitoring program; and 71 patients in the study lost weight. The estimated mileage saved from patients not having to come into the clinics for care was 9,454. The total cost savings for Medicaid for this population was \$339,184. Mississippi amended the Medicaid rules and regulations to further support telehealth as a result of this study. Mississippi was the first state to pay a transmission fee for telemedicine and Medicaid reimbursement has now been introduced based on the results of this study.

## Publication

Poster Presentation: Henderson, K., 2015, How Mississippi is Leading the Way in Innovation.

# ALBERTA HEALTH SERVICES

## Study

My Home Health: A Virtual Care Management Pilot Program for Self-Management of Congestive Heart Failure

## Study Description

The Ivey International Centre for Health Innovation at the Ivey Business School, the Institute of Health Economics, and GE Healthcare collaborated with the Government of Alberta via Alberta Health Services (AHS) to conduct research exploring innovative models in which costs and healthcare challenges could be addressed through a virtual care management (VCM) model. The objective of the project was to explore the effectiveness of a remote monitoring model for patients with congestive heart failure. The intervention was for a duration of 6 months, with a continued followed up for another 6 months after the intervention was completed.

## Results

A total of 103 patients completed the 12 months study. This study found that the VCM program has the potential to improve patient, caregiver, and provider experiences of care, improve self-reported health outcomes over a relatively short 6-month period, and potentially reduce health system costs in the CHF population.

The researchers reported the following key results:

### POPULATION HEALTH RESULTS

- The population health impact was not limited to the duration of the program. Patients reported that one of the primary benefits of the VCM program was establishing a routine. Even after the program had ended, 79% of participants

indicated that they were still using at least one element from the VCM program in their regular routine.

- Compared to the baseline, health related quality of life of patients increased at 6 months but decreased at 1 year, 6 months after enrolment in the VCM program was discontinued. This decrease in health status from 6 to 12 months may be due to the removal of the VCM after the first 6 months.

## PATIENT EXPERIENCES OF CARE RESULTS

- Patients believed that the VCM program yielded better patient care and health outcomes. In particular, patients felt more secure in having a healthcare professional readily available for any questions, more confident that any potentially dangerous health scenarios would be caught, and more certain that unnecessary or conflicting medications would be corrected.
- Patients felt that the technology was easy to use in the program. 86% of participants indicated that using the VCM was somewhat to not difficult.
- Patient ratings of the VCM were very positive, with 89% of participants indicating they would “probably” or “definitely” recommend the program to others, and 77% rating the program 8-10 on a 10 point scale (where 10 is most positive).
- Positive patient perceptions of the VCM program were long-lasting. At the 12-month mark, 6 months after the VCM program had ended, 89% of patients would still recommend to others.
- Participants’ responses to surveys demonstrated that the VCM program is more effective to, and valued by, participants with specific demographics. In particular, participants who had a more basic computer proficiency rated the program higher than those with more advanced proficiency. Similarly, individuals over the age of 64 were more likely to rate the program higher than those under 64.

## CAREGIVER EXPERIENCES OF CARE RESULTS

- Caregiver participants indicated that the VCM program reduced their caregiver burden. By empowering patients to self-manage more than they had in the past, many of the tasks that once had to be completed by caregivers could now be completed by the patient. The emotional burden was also reduced, as caregivers felt reassured that they were no longer “alone” in managing care, and had the support of regular monitoring and communication with health providers.
- Caregivers felt that the VCM program improved their awareness and knowledge surrounding CHF management. Both the educational modules and regular conversations with the VCM nurse were highlighted as key beneficial resources for patient and caregiver education.

## PROVIDER EXPERIENCES OF CARE RESULTS

- Providers indicated that upon implementation of the VCM, their workload increased due to the extra patient education required to introduce them to the VCM. However, they also highlighted that this diminished over time, and ultimately resulted in a decreased workflow. Much of this decrease is due to the VCM program’s ability to catch clinical problems as early as they present, so that less time-consuming preventative measures can be implemented immediately, avoiding major complications.
- Providers suggested that patient compliance increased as a result of the program, as patients were empowered to take responsibility for their own health.

## PER CAPITA COSTS RESULTS

- After enrollment in the VCM program, patients used less health services resulting in reductions in health care costs.



- Majority of the reductions occurred in the period from 0 to 6 months after enrolment in the VCM program when the intervention was going on.
- Reductions in hospital admissions accounted for most of the reductions in health care costs.

## Publication

Home Health: A Virtual Care Management Pilot Program for Self-Management of Congestive Heart Failure. Final Report. Ivey International Centre for Health Innovation and Institute of Health Economics, Edmonton, Alberta. February 2016.

# ST. VINCENT

## Study

Reducing Hospital Readmissions via Remote Patient Management

## Study Description

- St. Vincent implemented a remote care management program and utilized the Care Innovations® Guide platform to facilitate care delivered in the home.
- St. Vincent had a goal of reducing hospital readmissions for patients with congestive heart failure (CHF) and chronic obstructive pulmonary disease (COPD) in an effort to help them stay out of the hospital, away from the emergency room, and reduce the frequency of readmission. A total of 142 patients were recruited for the trial.

## Results

The key outcomes included:

- Readmissions in the intervention group were reduced by 64% compared to the study control group 2 readmissions in intervention group; 7 readmissions in control group, statistical significance  $p=.04$ .
- Patient Activation Measurement (PAM) levels of engagement were 18% higher for the intervention group. This is important because patients with higher PAM levels have 21% lower health care costs than patients with the lowest PAM levels, even after controlling for demographics and condition severity.

## Testimonial

The biggest individual success story from the project, according to the Principal Investigator, Dr. Snell, involved a woman in her early 50s with nine chronic conditions and 11 total admissions in 2011, which cost roughly \$156,000 that year. Over a seven-month span participating in the project, the woman did not return to the hospital once.

## Publication

Published on FierceHealthIT (<http://www.fiercehealthit.com>) 2012



## AMERICAN HEART ASSOCIATION

### Study

An Observational Study of Deployment of American Heart Association Heart Failure Protocols and Educational Content Within the Intel® Health Guide System Post Discharge.

### Study Description

- This was a single center, unblinded, non-randomized feasibility study of tele monitoring with embedded patient education. The University Hospitals Home Care Services program is a large home care agency in Ohio and was chosen for the study and was the source of referrals.
- This nurse-driven program was available to Medicare recipients who were discharged home and met eligibility criteria for home care services.
- The Institutional Review Board of the University Hospitals Case Western Medical Center approved the study. The purpose of this study was to examine short-term (60-day) health-related quality of life and re-hospitalization after implementation of the Care Innovations® Guide deployed with the American Heart Association guideline-based heart failure protocols for monitoring and managing clinical status, symptoms and delivery of relevant patient education to enhance patients' understanding of and management of heart failure.
- Utility was defined as days of activity and interaction of the patient with the monitor / days of actual monitoring possible.
- Adherence was defined as the percent of actual completed sessions from the number of scheduled sessions. Re-hospitalization data were acquired directly from patients or caregivers and primary care physicians.

### Results

#### Improved Quality of Life

Health status was assessed by the Kansas City Cardiomyopathy Questionnaire (KCCQ) pre and post monitoring periods. The KCCQ is a 23-item, self-administered instrument that quantifies physical function, symptoms (frequency, severity and recent change), social function, self-efficacy and knowledge, and quality of life. The Care Innovations® Guide, when used by a clinician to deliver a heart failure program, improved health related quality of life, as evidenced by Kansas City Cardiomyopathy Questionnaire clinical scores increased significantly from  $49 \pm 25$  at baseline to  $63 \pm 26$  at 60 days ( $p=0.039$ ).

#### Relationship of Compliance and Utility with Re-hospitalization

There was a statistically significant association noted between utility, adherence, and rate of re-hospitalization. Using generalized estimating equations, greater utility (days with activity per monitored days) but not adherence (completing scheduled sessions) scores were correlated with improvements in health status by KCCQ Clinical Summary score ( $p=0.013$ ) and Overall Summary score ( $p=0.0056$ ). Less patient utility and adherence were associated with re-hospitalization. Median adherence and utility for those not re-hospitalized (97.2% and 96.9%, respectively) were greater than for those re-hospitalized (67.4% and 82.2%;  $p=0.013$ ,  $p=0.006$ , respectively).

## Publication

Piña, I.L., Albert, N.M., Fonarow, G.C., Catha, G., Wayte, P., Plank, T., Bruckman, D., Holmes, P., & Kikano, G. (2011) An Observational Study of Deployment of American Heart Association Heart Failure Protocols and Educational Content Within the Intel® Health Guide System Post Discharge. In Press.

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Remote Patient Monitoring via Care Innovations® Guide as Implemented at American Physicians House Calls

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American Physician Housecalls (APH) implemented the Guide for seriously ill patients with chronic conditions in the fall of 2010. APH used the Guide within its own unique care model of providing physician home visits. The Guide was added to assist its clinicians in the disease management of complex senior patients with multiple chronic illnesses. The goal of the program was to help keep patients healthy at home, and to decrease their utilization of higher levels of care. This included reducing hospital admissions and emergency room visits. A total of 50 patients participated in the pilot study.

## Results

### Drive Appropriate Utilization

Hospitalization and emergency room visits are of interest when assessing innovative health care systems. During the time period from November 1, 2010, through April 20, 2011, for the 50 patients in the study, there were 14 inpatient hospitalizations and eight emergency room visits. For the entire study population, this equates to an overall annual rate of about 0.85 hospitalizations per patient per year and 0.48 emergency room visits per patient per year. The table below presents a study of the national Medicare population of hospitalization rates for chronically ill populations for comparison, since a matched control group was not created for this pilot study.

### NUMBER OF CHRONIC CONDITIONS IN THE MEDICARE STUDY

### AVERAGE NUMBER OF INPATIENT DISCHARGES PER YEAR IN THE MEDICARE STUDY

|               |      |
|---------------|------|
| None          | 0.12 |
| One           | 0.35 |
| Two           | 0.78 |
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## Improve Medication Compliance

In the APH study, during a follow up call, diet education, symptom review, and/or chronic disease management education was provided to the patient. If a patient's condition deteriorated, the RN would contact the physician, review the case, and discuss possible medication interventions. Other interventions including a follow up visit, a specialty consult, imaging studies, lab work, or referral to a higher level of care were also considered. The table below reviews the number of vital signs measured by the Guide in a given month. It gives the breakdown on how often a nursing assessment occurred, and how often a medication adjustment occurred during a given month.

| MONTH    | # ACTIVE PATIENTS | # OF VITAL SIGNS MEASURED | % OF VITAL SIGNS OUT OF THRESHOLD | % OF ABNORMAL VITAL SIGNS FOLLOWED UP ON BY PHONE | % OF PHONE ASSESSMENTS RESULTING IN MEDICATION ADJUSTMENT |
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## Publication

White Paper: Remote Patient Monitoring via Care Innovations® Guide as Implemented at American Physicians House Calls; DHF-4409 Rev 1-2.0-APH White Paper, Care Innovations®.

Condition prevalence and per capita utilization for 2005, by number of chronic conditions. Schneider, KM, O'Donnell, BE, Dean D, Prevalence of multiple chronic conditions in the United States' Medicare population, Health and Quality of Life Outcomes Volume 7, Number 1, Dec 2009, pp 1-11.)\*

\*Note that for the Medicare study, only six chronic condition variables were used for analysis. The diseases represented included cancer, chronic kidney disease, chronic obstructive pulmonary disease, depression, diabetes, and heart failure.