Medicaid HCBS/FE Home Telehealth Pilot

Final Report for Study Years 1-3
(September 2007 – June 2010)

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BACKGROUND

There is substantial evidence that national home care expenditures are growing faster than many other health care costs and are expected to soar as the U.S. population ages. One of the more commonly cited statistics is that in 2003 alone, Center for Medicare and Medicaid Services (CMS) figures indicated that home care costs totaled $40 billion,[1] an increase of almost 10% from 2002. In addition, over 60% of the funds available for home care come from public funds, putting a tremendous burden on the health care system and U.S. economy. Strategies for reducing this burden while maintaining or improving the quality of care—particularly for long-term, chronic diseases such as congestive heart failure, diabetes and chronic obstructive pulmonary disease (COPD)—are needed.

Home telehealth is one option for achieving the goal of reducing home care expenditures and improving clinical care. Numerous studies have demonstrated that home telehealth provides more close monitoring of patients, reduces hospitalizations and emergency department visits, improves daily living skills, increases home care providers efficiencies and reduces costs. Consider the following findings from multiple home telehealth research projects:

- A study of 281 Veterans' Affairs (VA) patients demonstrated a 66% reduction in ED visits, a 60% decline in hospitalizations, a 59% decrease in pharmacy, high levels of patient satisfaction, improved perceptions of physical health, and other positive results.[2]
- OASIS data from over 478 home health agencies in California indicated that tele-monitoring "reduced hospitalizations and emergent care visits while improving functional status when compared with a comprehensive clinical management program.[3]"
- For diabetes care, the average Activities of Daily Living (ADL) score for patients using tele-monitoring was 77.2% compared to 70.4% for those who did not use the technology.
- For COPD, the average score for home telehealth patients was 80.3% versus 71.8% for non-telehealth patients.
- A University of Missouri Telehomecare study found 20% fewer hospitalizations and fewer hospital days for an average cost savings of $2,250 per patient receiving telehealth monitoring. Overall, the cost savings represented a 28% cost reduction for a 6-month period.[4]
- An early study of grade 3-4 congestive heart failure (CHF) patients during a 2-year period was conducted using a within group design similar to what is proposed in the current study. With the CHF study, patient data was reviewed for 12 months prior to the introduction of home telehealth monitoring and for 12 months afterwards.[5]
- For these CHF patients, hospitalizations dropped from an average of 3.2 per year per patient to 0.8 per year, and average days of care per person per year dropped from 26 to 6. In addition, patients' self reported functional status on a 4-point scale improved from 1.4 to 2.3.

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[1] Table 2: National Health Expenditures Aggregate Amounts and Average Annual Percent Change. http://www.cms.hhs.gov/statistics/nhe/historical/t2asp

[2] Kobb, R., Hoffman, N., Lodge, R., & Kline, S. (2003). Enhancing elder chronic care through technology and care coordination: Report from a pilot. *Telemedicine Journal and e-Health*, 9(2), 189-195.

[3] Independent analysis of monitored/non-monitored patients, January 1, 2002 – March 31, 2004, Strategic Healthcare Programs, Santa Barbara, CA. Study conducted on behalf of HomMed.

[4] Dimmick, S. L., Burgiss, S. G., Robbins, S., Anders, M., Black, D., & Jarnagin, B. (2003). Outcomes of an integrated telehealth network demonstration project. *Telemedicine Journal and e-Health*, 9(1), 13-23.

[5] Intenstive home-care surveillance reduces the need for hospitalization in elderly patients with severe congestive heart failure. (1994). *Journal of the American College of Cardiology*, 433, 966-978.

Though existing studies have demonstrated a variety of health service and cost reductions, none of them combined cost analyses, nursing home deferrals and patient perceptions over an extended period of time. To address these shortcomings, the present Medicaid Home and Community Based Services/Frail Elder (HCBS/FE) pilot study was a collaborative effort between the Kansas Department on Aging, University of Kansas Center for Telemedicine and Telehealth and Windsor Place Home Health. It is the first known longitudinal assessment of home telehealth on E.D. visits, hospital visits, nursing home placements and the associated costs of these services for elders with a variety of chronic conditions and multiple co-morbidities. Patient perception data were also collected, particularly the extent to which patients felt more engaged in their health care via the telehealth monitoring.

The data collection for the pilot occurred for all three years of the project beginning on September 1, 2007 and ending June 30, 2010. The ongoing research objective of the pilot was to assess the cost-benefit of home telehealth services across a variety of variables. Of particular interest were the longitudinal results of the pilot as participants progressed through all three years of study.

A group of clients was originally outfitted at the beginning of Year 1 and continued to participate in Years 2 and 3 while additional clients were added to the study each year. Individual study reports were completed at the end of Year 1 and Year 2. This report is an extension of those documents and aggregates the data from all three years.

METHODS

All enrolled participants were Kansas Medicaid HCBS/FE clients of the Windsor Place home health program. Windsor Place is located in Coffeyville in southeast Kansas. A few Windsor Place clients from areas closer to Kansas City and Lawrence were also selected due to the limited number of HCBS/FE clients located near Coffeyville that fit the selection criteria.

The HCBS/FE clients chosen for the study all had at least 1 hospitalization in the 12 months prior to their enrollment. Before receiving telehealth monitoring equipment, they provided signed Informed Consent for participating in the study and agreed to assist researchers with collecting their Centers for Medicare and Medicaid Services (CMS) claims data. These data were used to calculate the variables of interest in this study.

The research method used in the project was a within group, pre- and post-test design with data collection completed at the end of the project for both the baseline and intervention periods. The length of the baseline period was equal to the length of the intervention period for Year 3 clients. For example, if a client was on home telehealth monitoring for 223 days, the baseline period was also established as 223 days. For all 3 years, the baseline was capped at 274 days, or approximately 9 months. This was done to standardize the baseline period for the pilot in order to complete the appropriate statistical analyses. Similarly, the minimum length of time for both intervention and baseline was established at 90 days. This parameter was determined as the minimum length of time needed for participants to become comfortable with the equipment and for it to have any effect on their health care needs. The following research questions were evaluated in this project:

RQ1: Are hospital days reduced as a result of home telehealth monitoring?
RQ2: Are hospital visits reduced as a result of home telehealth monitoring?
RQ3: Are ED visits reduced as a result of home telehealth monitoring?
RQ4: Are costs due to hospitalizations reduced as a result of home telehealth monitoring?
RQ5: Are costs due to E.D. visits reduced as a result of home telehealth monitoring?
RQ6: Are total costs reduced as a result of home telehealth monitoring?

RQ7: What are client perceptions of home telehealth monitoring?
RQ8: Is the rate of nursing facility placement reduced as a result of home telehealth monitoring?
RQ9: How are clients' vital signs affected by home telehealth monitoring?

In addition to collecting CMS claims data for emergency department (E.D) and hospital utilization—and the associated costs—general client perceptions of the intervention were also gathered at the end of each of the three years. The 12 perception items listed in Table 2 assessed such issues as the patients' satisfaction with the technology, its effect on their health, safety and quality of life, and other items. Also for Year 3, the extent to which telehealth helped clients manage their vital signs within established parameters was assessed, as well as the nursing facility placement rate. These were expressed in this report as a percentage of sessions completed and a percentage of total participants, respectively.

Linear regression statistical models were used to analyze the comparison data for the project. These models are robust for the uneven parameters in this study, such as the varying lengths of time in the study across participants and the unequal baseline and intervention periods. In addition, variable data were calculated as rates of utilization, such as E.D. visits per day and hospitalizations per day, in order to account for the varying periods of analysis.

RESULTS

A total of 107 participants were enrolled in the pilot across all three years. Sixty-one of these remained active in the pilot at the end of July 2010, including 17 clients from Year 1, 24 from Year 2 and 20 from Year 3. The other 46 clients left the project for a variety of reasons. Fifteen passed away, 11 went to a nursing facility, 5 entered assisted living, 12 quit and 3 moved away. Active Year 1 clients had 1,032 days of intervention, Year 2 clients had up to 615 days and Year 3 clients had up to 271 days of intervention for inclusion. All 107 enrollees were included in the analysis as a result of using statistical methods that accounted for the varying lengths of time in the study.

The study group consisted of 85 women and 22 men. Ages ranged from 65 to 96 years, with an average age of 79. Hypertension was the single most common diagnosis with 19 clients having this condition. Ten people had congestive heart failure (CHF), followed by diabetes (9) and chronic obstructive pulmonary disorder (COPD; 5). The remaining 64 participants had multiple comorbidities of these four illnesses.

Utilization and Costs

For the first two years of the pilot, the observed variables trended downward but were not statistically lower. However, by the end of the third year, all six original variables were statistically different between baseline and intervention periods across the three years (Table 1). One variable—E.D. costs—was statistically lower for Year 3 participants only. These data mean that there is likely an effect of the telehealth intervention on the HCBS/FE study participants' use of health care services and the associated CMS costs. The E.D. visits and hospital visits statistic, though significant, was based on a low number of observations of these indicators. It is not clear why the results were significant after three years but not after one or two years. The most plausible explanation is that the longer period provided more participants and more data than the first two years alone, therefore giving more statistical power to the analysis.

Variable	Rate of Change	Significant Change?	p-value*
Hospital Visits	↓ by 38% per day	Yes	.0000
Hospital Days	↓ .028day/day or 10.23/year	Yes	.0014
Hospital Costs	↓ $72/day or $26,298/year	Yes	.0024
E.D. Visits	↓ by 67% per day	Yes	.0290
E.D. Costs	↓ $21.10 per day**	Yes	.0300
Total Costs	↓ $73/day or $26,663/year	Yes	.0004

Table 1: Comparison of baseline and intervention mean rates of pilot variables.
***Probability at the .05 level**
****For Year 3 participants only. Year 1 and 2 participants were not different from baseline.**

Participant Perceptions

HCBS/FE participants' perceptions of the intervention were positive during all three years of the study. These items were scored on a scale of one to four ranging from strongly disagree to strongly agree, respectively. Two of the items were reverse coded which resulted in lower mean scores but indicated a positive response. The other ten items were all positively scored with means ranging from 3.11 to 3.27 on a four-point scale. For example, patients felt that the technology improved their health care (3.23), would help them live longer in their homes (3.18) and helped them better manage their health care (3.18). In contrast, they did not want to go to the doctor rather than use the technology (2.30) and they were not distrustful of the technology (2.18). See Table 3. On average, the Year 3 results are nearly identical to Year 2 results (Table 2). Year 1 perception results were also very similar to Years 2 and 3 so were not included in this summary.

Item	Mean (On 1-4 scale)
This health monitoring technology improves my health care.	3.15
I would rather go to my doctor than use this technology.	2.08
This technology improves my life.	3.04
I am more involved in my health care as a result of this technology.	3.19
I do not trust this technology to help me with my health.	1.96
This technology will help me live in my home longer.	3.36
Using this technology has been a positive experience for me.	3.34
This technology is easy to use.	3.26
I am confident that this technology will help me if my health starts to decline.	3.26
I feel better able to manage my health care with use of this technology than I did before.	3.28
I have gone to my doctor at least once because of what I found out with the technology.	2.94
I would like to use this technology for as long as I can.	3.33

Table 2: Mean scores of perception items on 1 (strongly disagree) to 4 (strongly agree) Likert scale for all participants (Years 1 and 2) at the end of Year 2.

Item	Mean (On 1-4 scale)
This health monitoring technology improves my health care.	3.23
I would rather go to my doctor than use this technology.	2.30
This technology improves my life.	3.11
I am more involved in my health care as a result of this technology.	3.16
I do not trust this technology to help me with my health.	2.18
This technology will help me live in my home longer.	3.18
Using this technology has been a positive experience for me.	3.20
This technology is easy to use.	3.27
I am confident that this technology will help me if my health starts to decline.	3.23
I feel better able to manage my health care with use of this technology than I did before.	3.18
I have gone to my doctor at least once because of what I found out with the technology.	2.81
I would like to use this technology for as long as I can.	3.23

Table 3: Mean scores of perception items on 1 (strongly disagree) to 4 (strongly agree) Likert scale for all participants (Years 1-3) at the end of Year 3.

Vital Sign Management

The percentage of sessions that participants' vital signs were within established parameters was a new variable added for Year 3 of the pilot. Table 4 highlights this aspect of the study. Participants' vital signs, on average, were within established limits for 83% of their sessions, with weight being the most consistent (91%) and blood pressure being the most inconsistent (75%). No baseline or benchmark data are available to which this result can be compared so no conclusion about this result can be offered.

Vital Sign	Sessions Within Parameters	Total Sessions	% of Sessions
Blood Pressure	22,476	30,114	75%
Pulse Oximetry	19,631	22,272	88%
Blood Glucose	14,115	17,166	82%
Weight	16,419	17,993	91%
Totals	**72,641**	**87,545**	**83%**

Table 4: Vital signs within parameters as a percent of total sessions.

Nursing Facility Placement

Another new variable added for Year 3 was the rate of nursing facility placement of pilot study participants compared to rate of placement of the general HCBS/FE population. According to the SFY POC Discharge reports from 2008-2010, HCBS/FE consumers were admitted to nursing homes at an approximate rate of 7.7% annually for the 3-year period. By comparison, the pilot study participants for the same period entered nursing facilities at a rate of 6.13%.

DISCUSSION

The results of this home telehealth pilot project demonstrated that home telehealth intervention reduced the rate of emergency department utilization, inpatient hospitalizations and the associated Medicare costs for HCBS/FE clients. The cost savings of a hospitalization alone ($26,298 per patient annually) compared to the cost of the equipment ($816 per patient annually) are substantial. In addition, the annual rate of nursing home placement during the three-year period was lower than the observed rate for all Kansas HCBS/FE clients. Patient perceptions of the intervention remained positive and stable over time. A number of methodological issues likely affected these findings.

First, CMS data were used to identify claims and costs associated with the HCBS/FE clients during this pilot. However, CMS claims are fluid and complex, thus making it difficult to longitudinally track client claims. Investigators employed several data-cleaning strategies to mitigate any claims discrepancies and provide reliable results, but actual dollar figures may vary somewhat from what is reported here. Nonetheless, it is unlikely that any variations affected the final results of this pilot.

Similarly, a second issue is that Medicaid, private insurer and self pay services and associated costs were not tracked in this pilot project. These payments were likely a small portion of the participants' claims and would be supplemental payments in both study conditions. Thus, like the CMS claims it is unlikely that costs associated with these additional payment mechanisms substantially affected the outcomes of this pilot. Though the dollar amounts may differ, the statistical outcomes may not.

Third, not all clients completed their sessions daily as required for the study and it was difficult to track the reasons for the missed sessions. In some cases, it was because the client was hospitalized or otherwise away from home. In other situations, it was apparent that clients simply skipped the sessions. Unfortunately, investigators and home care managers had little influence on compliance with daily sessions. It is unclear how these missed sessions affected the outcomes of the study.

Next, even though hospital visits and E.D. visits were significantly lower during the intervention period than the baseline period, the overall incidence (number of observations) of these visits was very low throughout the study. In general, statistical models based on low numbers of observations are less reliable than models based on large numbers of observations. Therefore, these findings should be viewed conservatively.

Fifth, while the current pilot evaluated the annual nursing facility placement rate of pilot participants compared to all Kansas HCBS/FE clients during the same period, this is not an ideal measure for deferral rate. Instead, it is recommended that the average length of time that an HCBS/FE client is in the program before being placed in a nursing facility is tracked and compared to clients on the home telehealth intervention. This is a more stable and valid measure of nursing facility deferral than annual number of placements.

As with any pilot study, this pilot served its intended purpose of determining whether further study is warranted and what methodological issues should be revised. Specifically, this project yielded a number of positive findings that indicate the effectiveness of home telehealth for HCBS/FE clients and a number of lessons learned. These experiences should be applied to a larger, randomized and controlled trial (RCT). An RCT is the highest standard of health care research and would enhance the internal and external validity of the research. When applied to a follow-up home telehealth project, the results would be conclusive and could be used to inform the future development of home telehealth services.