Barriers to Cost and Clinical Efficiency with Telehomecare and Proposed Solutions

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Abstract— **Efficiency gains are often promoted as a benefit of using technology. In home care, telehealth technology provides an opportunity for cost and clinical efficiency gains through the efficient use of monitoring technology in conjunction with in-person contact. However, most telehomecare programs use the technology in addition to the in-person visits. This study was a randomised controlled field study comparing the effects of a telehomecare intervention that substitutes for some standard home care services for patients following hospital discharge for heart failure with the effects of standard home care services alone. Contrary to study goals, findings revealed the patients in the technology group received more visits and a longer period in home care than the usual care group. As requested in the conference call for papers, the purpose of this paper is to describe the issues and barriers the team faced in implementing a substitution protocol and to propose solutions that may promote cost and clinical efficiency in future work.**

*Keywords-**telehealth; telehomecare; visit pattern; efficiency.***

I. INTRODUCTION

The emergence of telehomecare in the United States coincided with several important concerns: a growing population of people over age 65, an increasing incidence of chronic illness, a national nursing shortage, and dramatic changes in the financial structure in home care [1]. The enactment of the Balanced Budget Act of 1997 resulted in a major restructuring of how agencies are reimbursed for home care. Prior to this legislation the home care agency was reimbursed for each in-person home visit made to a patient's home. Since October 2000, Medicare, the major insurer for older adults and disabled persons, has reimbursed home care agencies through a prospective payment system (PPS), replacing the fee-for-service method. Depending on the medical diagnosis and other established characteristics, agencies receive a set amount of reimbursement per 60 day home care episode. Patients must receive at least five in-person nursing or physical therapy visits to receive the full amount of reimbursement, but, beyond that the agency is free to use other strategies to meet the care needs.

Given these changes, agencies now face the challenge of managing increasingly complex older adults in a highly constrained fiscal environment where patterns of care and reimbursement are based on client need and agency efficiency. Although challenging, this change has promoted new "freedoms." Home health providers and patients may collaborate to design a 60-day episode of care based on patients' needs, preferences, and mutually derived goals. This "freedom" provides the opportunity to adopt innovative ways, including the use of telehealth, to improve quality of care, enhance patient participation in their care, and promote efficiencies. If telehealth is a viable substitute to home visits and costs less on a per visit basis, then more care can be delivered, as needed, under the current PPS reimbursement mechanism. Under this system, telehealth becomes attractive as a substitute, as well as an addition to home health visits, rather than just being an added expense. Our study revealed several barriers to achieving efficiency. Published results from previous studies are reviewed, and then our study design; protocol; data collection and data analysis; and results are described, followed by a discussion of the barriers and proposed solutions.

II. STATE OF THE SCIENCE

The prospective payment system provides the impetus for home health agencies to explore substitution of in-person home visits with telehomecare visits. The potential for cost-savings makes the use of this technology an attractive strategy for health care insurers and home health providers. Several studies suggest that telehomecare visits will cost less per-visit than home visits based on tasks completed and projected savings in travel costs. On average, it takes clinicians 30 - 60 minutes to travel to patients' homes [2] and longer times are common in rural areas. This amount of travel is not only inefficient but it is also associated with an element of risk [3]. One rural telehomecare program reported $14,810 savings in drive time over 14 months [4]. Dansky, Palmer, Shea and Bowles [5] used data from their clinical trial to project potential savings if telehomecare was substituted for some in-person visits. They proposed that a substitution rate of 33% would

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save $318.00 per patient and a rate of 50% would save $700.00 per patient.

Despite its potential, few studies have evaluated the cost or clinical efficiency of telehomecare. No reported studies involved patients in determining the pattern of use of the technology in their plan of care and non have attempted to force a substitution pattern. Cost analyses have varied in quality with most being limited to reporting of anecdotal [4] [6][7] or projected data [5][8]. Available data from systematic reviews [9][10] provide mixed conclusions about whether telehomecare is a clinically and cost effective method for delivering health care services, and, major gaps in knowledge exist regarding the clinical and cost effectiveness of telehomecare when it is employed under the constraints of PPS, substitutes for some in-person nurse visits, and involves patients in decisions regarding its use.

III. STUDY DESIGN AND PURPOSE

The study was a randomised controlled field study comparing the effects of a telehomecare intervention that substitutes for some standard home care services for patients following hospital discharge for heart failure with the effects of standard home care services alone. The purpose of this paper is to describe the barriers the team faced in implementing a substitution protocol and to propose solutions that may promote cost and clinical efficiency.

IV. SAMPLE AND SETTING

Eligibility criteria included hospitalization within two weeks for heart failure exacerbation, age 55 and older, receiving home care services, and able to see, hear, and stand on a scale. Patients were not eligible if they were on a heart transplant list, receiving hemodialysis, or in another disease management study. Eligible patients were provided with Institutional Review Board approved informed consent and enrolled by trained research assistants from an academic health system with three hospitals and received home care and the telehealth intervention at a Medicare certified not-for-profit home care agency. The agency provides approximately 140,000 nursing and therapy visits annually. Services include physical, occupational and speech therapies, social services, home health aide services and nursing care. The agency serves a five county, urban and suburban area and admits on average 200 Medicare patients per month, 20% of them are heart failure patients.

V. PROTOCOL AND TELEHEALTH EQUIPMENT

The study protocol directed specially trained home care nurses to install the telehomecare machine in the homes of consenting patients within two days of hospital discharge and to teach the patients and caregivers (if present and interested) how to operate the equipment. The telehealth equipment, manufactured by Carematix, included wireless blood pressure monitoring, pulse oximetry readings, blood sugar levels as needed, and body weight. In addition, videophones were installed to provide visual interaction between the nurse and patient. The patient and telehealth nurse were linked over ordinary telephone lines via a standard modem, the data was available via a website. The devices allowed a patient to take his or her own measurements. The measurements were visible to the patient and transmitted directly to the home health nurse. Readings that appeared outside of pre-set parameters were highlighted in color to alert the nurse for review. The nurse advised the patient to transmit their data by 11am each day. The nurse was also able to take the readings live during a video visit and interact face-to-face with the patient to answer questions and provide information about his or her medical condition. With the video interaction and daily monitoring, we felt confident we could use the technology in place of some of the in-person visits and based on previous studies where it was proposed that 45% of in-person visits could be achieved with technology [6], we proposed the following visit pattern.

VISIT PATTERNS FOR TELEHEALTH PATIENTS

Week 1: 2 in-home visits
Week 2: 1 in-home; 1 video visit
Week 3: 1 in-home; 1 video visit
Week 4: 2 video visits
Week 5: 2 video visits
Week 6: 1 video visit; decision point

Nurses determine if it is time to discharge the patient or whether the patient could benefit from two more weeks of telehealth monitoring and teaching. If discharged the nurse goes to the home (visit 5) to make the discharge visit and packs the telehealth equipment for return. If not discharged at week 6, the video nurse continues one video visit per week for weeks 7 and 8 then goes into the home for the final visit to either close the case or recertify.

VI. FIDELITY MEASURES

To assure fidelity to the telehealth substitution pattern a rigorous process was followed including initial education, six refresher classes, monitoring by the project manager, and one-on-one communication with the nurses. Upon admission the visit protocol was provided in writing to every nurse caring for a telehealth patient. The project manager monitored the visit pattern and was in telephone or email contact with the nurses throughout the home health episode encouraging that the visit protocol be followed. If the suggested visit pattern was not being followed, the project manager contacted the nurse directly to discuss why and reviewed the study protocol as well as notified the nurse's manager. In addition, the principal investigator and agency executive administration met regularly in an attempt to obtain the support needed for protocol adherence. The use of the equipment by the patients was also monitored and

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patients were called by the telehealth nurse to reinforce teaching and encourage patients to transmit their data.

VII. DATA COLLECTION

In addition to patient outcomes such as hospital readmission, emergency department use, self care and functional status [11], the cost and clinical efficiency of the telehealth intervention was measured by the number of nurse visits in each group, the mileage driven, and the percentage of patients re-certified for a second episode of home care versus being discharged to self care. The data was obtained from the home care agency records as recorded by the nurses on their billing and patient records.

VIII. DATA ANALYSIS

The total number of home visits was calculated from index home care admission to discharge. Patients kept on service for another episode of home care were counted as recertified and their visits and days were included in the total visit count and length of stay. Chi square was used to compare the groups on categorical characteristics and the independent sample Mann Whitney U test was used to compare numbers of visits, mean number of visits over the study period, and length of stay in home care. The two-sided Fishers Exact test was used to assess the association between group and recertification.

IX. RESULTS

Two hundred and seventeen patients enrolled in the study with 116 in usual care and 101 in the telehealth group. The average age was 71.3 (SD=10.2) in the telehealth group versus 73.5 (SD=9.6) for control patients, p=.092. Overall, study patients had high risk characteristics such as 69% rated their health as fair or poor, 32% had less than a high school education, 65% were African American, 39% had an annual income <$20,000/year, 69% were hospitalized at least twice in the 12 months prior to enrollment, 34% lived alone, and had an average of 6.4 co-morbid conditions.

On average, the telehomecare patients received 5 (SD 1.8) nursing visits during the initial home care episode (including recertification) and the usual care patients received 4.2 (SD 1.1), p = .013. Over the entire six month study period, telehomecare patients received on average 11 home visits (SD 8.9) and usual care patients received on average 8 home nursing visits (SD 4.6). Contrary to the study protocol goals, this was significantly more in person contact for the telehomecare patients than the usual care patients (p = <.001). Further, the telehomecare patients were recertified for an additional episode of home care significantly more often than usual care patients (24% compared to 9%, p = .003) and the length of the initial home care episode for telehomecare patients was significantly longer at 54 days (SD 41) compared to usual care patients at 35 days (SD 23), p=<.001.

X. DISCUSSION

A. Barriers to Cost and Clinical Efficiency

Although the study protocol called for a substitution pattern that should have resulted in the telehomecare patients receiving fewer in-person visits due to use of the technology that is not what happened. Several barriers prevented the nurses from using the technology efficiently including staffing levels, incentives and already low visit numbers; personal interest; and technology issues.

1) Staffing levels and incentives: The nurses' schedule is based on the expectation that they complete in-person visits for six patients per day. Productivity standards are measured against the number of in-person visits completed. The nursing shortage contributes to the problem because there are more patients than nurses to care for them. One might expect this would increase the impetus to turn to technology, but we are not yet seeing that. One possible reason why this technology was not adopted was the nurse's potential motivation to keep revisits on their schedules rather than defer to video visits. Video visits were meant to substitute for in-person visits but were not conducted by the field nurses. Substituting in-home visits with video visits could potentially reduce a field-nurse's caseload for the day. This in turn, could impact their productivity, but would more likely lead to the assignment of a new start of care for the nurse and potentially an additional patient to manage. Agency nurse-manager support of the technology implementation was low, which in turn, led to slow adoption by the field nurses for this project. Finally, timely delivery of telehealth equipment was problematic at times adding to the nurse's lack of ownership and interest in the technology. In addition, the numbers of in-person visits are already quite low leaving little room for substitution since Medicare rules require only five in-person visits by either nursing or physical therapy to qualify for full payment.

2) Personal Reasons: When this project began, the home health agency was using paper documentation and had not implemented an electronic medical record. This in turn, may have contributed the nursing staff's discomfort with technology – including telehealth equipment. This discomfort could have triggered the nurse's mistrust of the telehealth equipment readings and further distanced them from accepting and adopting the technology into their nursing practice. In addition, agency field nurses were asked to install the equipment, which could prove challenging at times due the unavailability of electrical outlets and phone jacks if large heavy furniture were blocking them. These experiences led many nurses to view telehealth as 'one more thing to do' despite its potential benefit to home health patients. Finally, the model of telehealth required the field

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nurse to share the patient with a telehealth nurse. Collaborating about the case took extra time and was not valued.

3) Technology Issues: The nurses did not have Internet access from the patients' home so it was not convenient to use the telehealth equipment while in the community. This required a telehealth nurse to operate back at the agency office for video visits and monitoring the biometric data. In addition alarms from the telehealth equipment were often false alarms yet caused time spent on phone calls or visiting to make sure all was well. Occasionally the equipment would not transmit the readings due to technical or connection problems and a visit was spent to fix the equipment. This was also a source of frustration and was time consuming for the nurses.

B. Proposed Solutions

Technology applications, like any new innovation, must fit into the workflow and benefit the user in order for adoption to be favored. Several proposed solutions may help overcome some of the barriers to cost and clinical efficiency.

1) Restructuring productivity and creating financial incentives: When telehomecare is introduced to a homecare agency management should consider redefining the productivity standards to include the use of technology. If management recognized the time and effort it takes to install, teach, and maintain telehomecare equipment as part of the nurse's workload adoption might improve. However, the financial incentives are not in place within home care to support such change. The benefit of telehomecare is reduced readmissions but currently the home care agency is not penalized financially for readmissions. They do run the risk of losing the patient to another agency once they come out of the hospital, but beyond that telehealth is currently an expense and return on investment has been difficult to achieve. Other third party payers than Medicare may reward the home care agency for improved outcomes, but the majority of home care patients are covered by Medicare.

2) Training and support: To overcome the personal barriers to technology adoption the agency must provide adequate training and ongoing technical support. Nurses want to care for their patients and when technology issues pull them away from patient care they become frustrated. It is important to choose the right team to conduct telehomecare. Identify the early adopters and enlist their help as champions, project leaders, and resource persons. Share data that demonstrates the patient benefit of telehealth. Nurses are motivated by achieving good outcomes of care, helping them see how technology can assist them with their goal may help. Finally, provide access to the technology from the field. Without Internet access the nurses are unable to monitor the patient's readings and feel disconnected from the telehealth program. In this situation a second nurse is needed to monitor and coordinate the telehealth data into the plan of care. This requires time and effort for communication, which could slow the response time, and trust between providers may take time to develop. If the field nurse could monitor the telehealth themselves via the web or smart phone alerts the responsibility and continuity of care would certainly increase.

3) Technology issues: The equipment must be reliable, simple, and easy to install and use. Care must be taken to screen patients carefully to provide the technology with those who are motivated to use it, need it, and are able to operate it. Delivery, set-up, pick-up, cleaning, and storage of the equipment are not tasks nurses are interested in. Consider methods to support nurses in their role of patient care such as shipping the equipment directly to the home, hiring technicians for installation and removal, and choosing equipment that is user friendly and wireless. Improvements in technology will hopefully lead to smart systems that recognize trends in patient data, decrease the number of false alarms, and provide decision support to improve care.

XI. CONCLUSION

Telehomecare is a common and growing technology used in community based settings. Several studies have demonstrated its usefulness for monitoring chronic conditions, teaching and promoting self care, and preventing hospital readmissions. The program requires an investment in equipment and personnel and most agencies use the technology in addition to usual in-person visits. Our attempt to push for a substitution pattern using technology to replace up to 45% of in-person visits was not successful. In spite of close monitoring and encouragement, many barriers and a lack of incentives prevented successful implementation of this strategy to promote cost and clinical efficiency. Issues related to staffing, technology, and incentives were barriers. Several solutions are proposed that require changes in policy and agency operations. Further research is needed to test these solutions for their impact on cost and clinical efficiency.

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REFERENCES

[1] Medicare Program. (2000, July 3). Prospective Payment System for Home Health Agencies. Federal Register, 65 (128), 41128-41214.

[2] Burdick, A.E., Mahmud, K., and Jenkins, J.P. (1996). Telemedicine: Caring for patients across boundaries. Ostomy Wound Management, 42 (9), 26-37.

[3] Denton, M.A., Zeytinoglu, I.U., Webb, S., and Lion, J. (1999). Occupational health issues among employees in home care agencies. Canadian Journal of Aging, 18 (2), 154-181.
[4] Dimmick, S. L., Mustaleski, C., Burgiss, S., and Welsh,T. (2000). A case study of benefits and potential savings in rural home telemedicine. Home Healthcare Nurse,18 (2), 125-135.
[5] Dansky, K.H., Palmer, L., Shea, D., and Bowles, K .H. (2001). Cost analysis of telehomecare. Telemedicine Journal and e-Health, 7 (3), 225-232.
[6] Wootton, R., Loane, M., Mair, F., Allen, A., Doolittle, G., Begley, M., et al. (1998). A joint US–UK study of home telenursing. Journal of Telemedicine and Telecare, 4 (Suppl. 1), 83–85.
[7] Whitten, P., Mair, F., and Collins, B. (1997). Home telenursing in Kansas: Patients' perceptions of uses and benefits. Journal of Telemedicine and Telecare, 3 (Supplement 1), 67–69.
[8] Pringle-Specht, J. K., Wakefield, B., and Flanegan, J. (2001, January). Evaluating the cost of one telehealth application connecting an acute and long-term care setting. Journal of Gerontological Nursing, 34-39.
[9] Inglis, S.C., Clark, R.A., McAlister, F.A., Ball, J., Lewinter, D., Cullington, S., Stewart, S., and Cleland, J.G. "Structured telephone support or telemonitoring programmes for patients with chronic heart failure," Cochrane Database of Systematic Reviews, vol. (8), pp. CD007228, Aug 4. 2010.
[10] Pare', G., Mirou, J., and Sicotte, C. (2007). Systematic review of home telemonitoring for chronic diseases: The evidence base. Journal of the American Medical Informatics Association. 14 (3), 269-277.
[11] Bowles, K.H., Hanlon, A.L., Glick, H.A., Naylor, M.D., O'Connor, M., Riegel, B.J., Shih, N.W., and Weiner, M.G. Clinical effectiveness, access to and satisfaction with care using a telehomecare substitution intervention: A randomized controlled trial. International Journal of Telemedicine and Applications. 2011 (in press).

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