The Effect of a Randomized Trial of Home Telemonitoring on Medical Costs, 30-Day Readmissions, Mortality, and Health-Related Quality of Life in a Cohort of Community-Dwelling Heart Failure Patients

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ABSTRACT

Background: Telemonitoring has been advocated as a way of decreasing costs and improving outcomes, but no study has looked at true Medicare payments and 30-day readmission rates in a randomized group of well treated patients.

Objective: The aim of this work was to analyze Medicare claims data to identify effects of home telemonitoring on medical costs, 30-day rehospitalization, mortality, and health-related quality of life.

Methods: A total of 204 subjects were randomized to usual-care and monitored groups and evaluated with the SF-36 and Minnesota Living With Heart Failure Questionnaire (MLHF). Hospitalizations, Medicare payments, and mortality were also assessed. Monitored subjects transmitted weight, blood pressure, and heart rate, which were monitored by an experienced heart failure nurse practitioner.

Results: Subjects were followed for 802 ± 430 days; 75 subjects in the usual-care group (316 hospitalizations) and 81 in the monitored group (327 hospitalizations) were hospitalized at least once ($P = .51$). There were no differences in Medicare payments for inpatient or emergency department visits, and length of stay was not different between groups. There was no difference in 30-day readmissions ($P = .627$) or mortality ($P = .575$). Scores for SF-36 and MLHF improved ($P < .001$) over time, but there were no differences between groups. The percentage of patients readmitted within 30 days was lower with telemonitoring for the 1st year, but this did not persist.

Conclusions: Telemonitoring did not result in lower total costs, decreased hospitalizations, improved symptoms, or improved mortality. A decrease in 30-day readmission rates for the 1st year did not result in decreased total cost or better outcomes. (*J Cardiac Fail 2014;20:513−521*)

Key Words: Home telemonitoring, 30-day readmissions, health related quality of life, cost of care.

The Center for Medicare and Medicaid Services (CMS) is under considerable pressure to restrain costs for the delivery of health care services to beneficiaries covered by its programs. CMS has funded a number of demonstration projects, including the Medicare Coordinated Care Demonstration Project[1] and the Community-Based Transitional Care Project,[2] designed to reduce hospitalizations, emergency department (ED) utilization, and cost and to improve self-care activities. A key target diagnosis for CMS efforts is heart failure. Heart failure has long been an expensive diagnosis for both Medicare and Medicaid, and much of the expense is tied to hospitalizations and length of stay. To decrease both hospital stay length and early unplanned readmission, efforts have developed to improve discharge planning. These include disease-management programs and addressing transitions to community-based care, home care, inpatient rehabilitation, and skilled nursing facilities.

A popular component of many disease management programs is home telemonitoring using noninvasive physiologic monitoring of weight, blood pressure, and heart rate. Bodyweight monitoring has long been a part of the standard of

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Table 1. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
1. Hospital admission within the past year	1. HIV/AIDS
2. Able to give informed consent	2. Cancer (other than stable prostate cancer)
3. Hs a telephone	3. Bed-fast patients or patients in skilled nursing facilities
4. Enrolled in Medicare Part A and Part B	4. Dementia or Alzheimer disease
5. Systolic or diastolic dysfunction	5. Active drug use
	6. Open wounds that require regular dressing changes
	7. Weight >300 lb

self-care for patients with heart failure. Patients are taught to record their weight daily and to bring the record to clinic/office visits, to call regarding specific changes, or to use a ''sliding scale'' for diuretic doses based on weight change. Initial studies of home telemonitoring were limited by short periods of follow-up, historical comparisons, evidence of inappropriate ''usual care'' in the control group, and charges and estimated savings instead of actual costs of care. Subsequent studies attempted to address individual limitations of earlier studies, but no single study addressed these limitations in a comprehensive way. In addition, 30-day readmission rates have not been analyzed.

The Medicare Coordinated Care Demonstration Project for Home Telemonitoring of Heart Failure (MCCD) was designed to address a number of shortcomings of the early studies of home telemonitoring. As one of the projects, we hypothesized that centrally monitoring weight, blood pressure, and heart rate, and being able to act on that information quickly, would prevent many hospitalizations related to fluid overload. We had the opportunity to look at actual identifiable Medicare claims data for a cohort of subjects to ascertain true payments. Furthermore, we looked at the effect of home monitoring on 30-day readmission rates, mortality, and health-related quality of life measures in control and treatment patients receiving excellent heart failure care.

Methods

Sample and Procedures

From June 2001 through January 2005, 206 subjects were recruited from the heart failure services at the University of Maryland Medical Center, the Baltimore Veterans Administration Medical Center, and a number of private cardiology practices in the Baltimore/Washington DC metropolitan area. The project was approved by the University Institutional Review Board, and a Health Insurance Portability and Accountability Act waiver was granted to search a computerized report of heart failure admissions to identify potential subjects. Table 1 lists the inclusion and exclusion criteria. These criteria represent an effort to minimize the contribution of other chronic entities that may be associated with increased hospitalization, resource utilization, or inability to participate in the monitoring activities.

Randomization Visit

At the randomization visit, a heart failure research nurse coordinator performed an in-depth history, medication review, chart review, brief physical examination, and the Mini-Mental Status Examination (MMSE).[3] The Medical Outcomes Survey Short Form (SF-36)[4] and the Minnesota Living With Heart Failure Questionnaire (MLHF)[5,6] were administered in face-to-face interviews to decrease the amount of missing data. All subjects were given written material about heart failure and self-management activities. The subjects were randomized to monitored (telemonitored) or usual-care (control) group.

Monitoring Protocol

Remote monitoring of daily weights, blood pressure, heart rate, and 15-second heart rhythm strip was performed with the use of the Philips Electronics E-care System. Each piece of equipment had a unique unit number that was associated with a specific subject. Data transmitted wirelessly by the hub was encrypted and then decrypted by the server software when received and assigned to the database file for the subject. The transmitted data were then compared with individually assigned parameters based on the subject's admission and subsequent evaluations. Readings that were outside these parameters were flagged for the nurse practitioner who did the monitoring. This nurse practitioner, who had extensive experience in the management of heart failure patients, contacted the subject to gather more information. If appropriate, she adjusted medications, which were usually diuretics. Compared with many earlier studies, most patients were already on target doses of evidence-based medications. There were no specific protocols regarding the management decisions, and decisions were based on the nurse practitioner's experience and/or consultation with the subject's cardiologist. If no flags were noted over a period of 1 month, the subjects were called just to maintain contact, provide encouragement, and answer any questions they might have.

Follow-up

All subjects were followed until death or the end of the project on December 31, 2006. The SF-36, MLHF, and medication review were repeated at 6 months and 1 year. All patients were given ready access to routine specialized heart failure care, being provided with phone numbers and outpatient visits as clinically appropriate.

Medicare Claims Data

Medicare Medpar and Denominator files for all subjects from June 1, 2001, to December 31, 2006, were merged with the MCCD data files for analysis to identify hospitalizations during the study period. Variables added to the data analysis included dates of death not already recorded, numbers and dates of hospitalizations, lengths of stay, and a breakdown of claims and payments by Medicare. Times were calculated from the date of randomization.