

Heart failure remote monitoring



Effective care management in a Medicare population

Today 5.8 million Americans live with heart failure (HF) and the number is projected to increase by 46 percent — to approximately 8 million — by 2030.^{1,2,4,6} HF is defined by the American Heart Association (AHA) as a chronic progressive condition in which the heart is unable to pump sufficient blood to meet the body's needs for blood and oxygen.¹ Among older adults, HF is one of the most prevalent and costly diseases, primarily due to the weakening of the heart with aging chronic conditions and acute de-compensation leading to costly hospitalizations. Overall, 20 percent of American adults are likely to develop HF in their lifetime.^{1,2,3,5} HF significantly impacts the health care system and patient outcomes, and contributes to the unsustainable rising costs of care. Therefore, it is clear that addressing HF warrants more effective disease management strategies.

Remote monitoring at home, primarily intended for early detection of deterioration or changes in HF symptoms, has been associated with reduced readmissions and mortality within six to 12 months of discharge among HF patients.² HF programs have expanded by providing Bluetooth-enabled scales to help program staff members monitor potential exacerbations in symptoms, such as unexplained rapid weight gain.¹⁰ Bluetooth technology enables the scales to transmit weight information to an electronic database and evaluate whether additional medical intervention or guidance is needed.

Purpose

Our primary study objective was to examine the impact of using a remote weight-monitoring scale on medical expenditures, inpatient costs and inpatient length of stay (LOS).



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Study population

The study sample was taken from a population of Medicare Advantage members from a large national health plan identified as qualified candidates for HF program participation. Members actively engaged in the program were classified by a series of clinical case management elements that included:

- Verbal agreement to participate
- Evidence of telephone contact with the program staff
- Electronic case management file
- Minimum of six months continuous program enrollment

Members included in the **non-engaged control group** needed:

- Valid program referral (e.g., originating from a claims-based algorithm identifying members with a recent acute inpatient hospitalization for HF, triggering telephonic outreach)
- No evidence of telephone contact by the program staff
- No participation in previous program (for example, unable to be reached after three attempted calls)

Both engaged and non-engaged members were required to have six months of continuous health plan coverage prior to engagement or referral, which served as the baseline period. All members were also required to have at least three months of heart failure program enrollment and six months post engagement health plan enrollment, which served as the measurement period for all study outcomes.

Study design

This study compared engaged members to a propensity-matched cohort of non-engaged members to evaluate the impact of a HF disease management program on several key outcome measures. Measures included:

- Inpatient medical confinement costs
- Inpatient length of stay
- Total medical expenditures by various levels of Bluetooth-enabled scale utilization (i.e., four different levels of engaged group scale utilization versus non-engaged group with no scale utilization)

Engaged members actively participated in the program between April 1, 2014 and September 30, 2015, and were classified by scale usage (i.e., average weigh-ins per month). Weights per month were calculated by summing the number of days the member stepped on the scale at least once during each month in the post-index period. The resulting average values per month ranged from 0 to 30 days. The total number of days of confirmed scale use during the post-index period was divided by the total number of post-index months on a per member basis, resulting in a mean weight days per month value for each eligible engaged member. This resulted in four participant categories:



Non-engaged members were those referred to the program during the same time without evidence of successful telephone contact or participation.

Methods

Inverse propensity score weighting was used to minimize differences in demographics, health status, health care supply and socioeconomic characteristics among HF engaged and non-engaged.^{8,9} To apply the weighting technique, it was necessary to generate a propensity score for each sample member.

The propensity score was derived by logistic regression modeling, using demographic, health status (including pre-index health care costs) and other characteristics that were defined as adjustment variables. The propensity score for each member was obtained from the logistic regression output as his or her predicted probability of engaging in the HF program. The propensity score for each member was then transformed into a case weight for subsequent regression analysis; the weight was defined as 1.0 divided by the member's propensity score value.

After building the propensity weight, the final step is estimating the impact of scale usage on health care expenditures and inpatient outcomes by adding the propensity score weight to a fixed effect generalized linear model (GLM), with a gamma distribution and log-link. For study all outcomes, the GLM models included the scale usage cohort as the primary independent variable and participant characteristics as adjustment variables.

Results

When paired with regular use of a remote weight-monitoring scale, engagement in this HF management program appears to be associated with significantly lower per member per month (pmpm) costs, length of stay (LOS) and inpatient costs when compared to non-engaged members.

Scale utilization and pmpm post-index allowed medical cost

Figure 1 shows adjusted post-index pmpm all cause medical costs by scale utilization group. All engaged members had significantly lower medical costs than the control group; with scale use of 25 or more times per month experiencing the lowest expenditures.

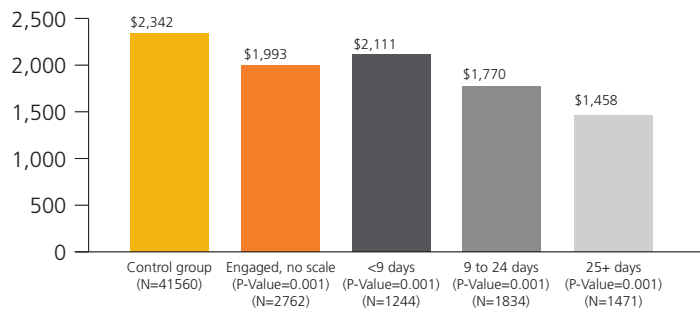


Figure 1. Scale utilization and pmpm post-index allowed medical costs

Note: The average scale data usage was adjusted for days spent in an inpatient setting.

Figure 2 breaks out average inpatient admission cost in the post-index period by scale utilization group. Inpatient confinement costs for members with any scale usage were significantly lower than both the control group and engaged members with no scale use.

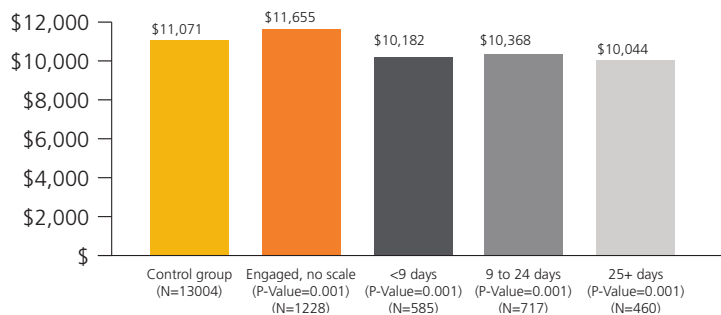


Figure 2. Scale utilization and post-index inpatient admission costs

Note: The average scale data usage was adjusted for days spent in an inpatient setting.

Figure 3 displays the inpatient confinement length of stay (LOS) by scale utilization group. All engaged members regardless of scale use had a significantly lower average length of stays than control group members.

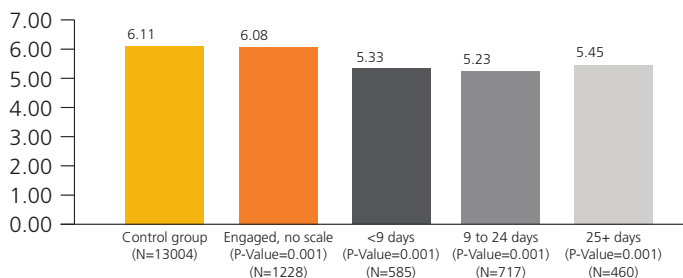


Figure 3. Scale utilization and length of stay (LOS)

Note: The average scale data usage was adjusted for days spent in an inpatient setting.

Conclusions

As statistics indicate, patients with HF are likely to require acute IP hospitalizations not only for their heart condition, but also for other related chronic conditions. Our study found participation in a clinically based HF management program in conjunction with high scale usage may improve health-related and financial outcomes among older individuals.

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