Early Evaluation of a Heart Failure Daily Health Monitoring Program Using Claims-Based Outcomes

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Background

Heart failure (HF), a chronic condition, represents a significant health burden to the United States; about 5.1 million people in the US suffer from heart failure. Tragically about half of people who develop heart failure die within 5 years of diagnosis.[1] Heart failure costs the nation an estimated $32 billion each year.[2] Daily weight monitoring may improve care plan compliance and clinical outcomes for those with heart failure, whose weight gain can be related to fluid retention.[3-6] This HF daily health monitoring program was designed to test an early alert process to ensure timely interaction between HF patients and their care team; and improve condition related self-efficacy, treatment adherence and related clinical outcomes.

Objective

To measure the impact of a health plan's HF remote monitoring program on related healthcare utilization and clinical outcomes

Methods

Study Design: Historical, cohort, with a propensity score matched comparison group

Study Period: June 01, 2017 to August 31, 2017 (program ongoing)

Data Source: Web-based application programming interface (i.e., a real-time display of program participation and weight); and medical claims

Study Sample: A total of 490 persons with Medicare Advantage health plan coverage from Humana Inc.; 245 patient program participants from 7 primary care clinics; 245 individuals selected for the comparison group based propensity score matching

- **Eligibility:** Age 65 and older; heart failure diagnosis stage D, C, or stage B with high probability of progressing; <400 pounds; no evidence of cancer, end stage renal disease, or hospice utilization; ability to comprehend and perform program instructions
- **Propensity Score Matching Characteristics:** Age, sex, HF stage, behavioral health conditions, Alzheimer's/dementia, depression, arthritis, chronic obstructive pulmonary disease, angina, acute myocardial infarction, evidence of stroke, diabetes, obesity, a variety of health index scores (e.g., Charlson Comorbidity Index), provider type and location

Program:

- Weigh-ins: Patient participants were asked to weigh themselves daily (i.e., approximately the same time each day) at home with their cellular enabled scales.
- Weight alerts: Initial and failed weigh-ins, and rapid weight change sent real-time alerts to the care team.
- Interventions: The care team responded (same day) to alerts by phoning the patient at home, assessing the patient's needs, and providing the appropriate intervention (i.e., fluid/diet restriction, medication adjustment, same day or next day office visit or cardiologist visit, immediate emergency department visit).

Measures:

- **Independent:** Program participation (participant group, comparison group)
- **Dependent:** Healthcare utilization (HF related inpatient admissions, all-cause inpatient admissions, physician office visits, emergency department visits, echocardiogram tests) and HF progression (stage B to C to D),[8] as identified by medical claims

Analysis: A difference in difference model estimated the effect of the program, by comparing changes in the dependent measures before and after the program, between the program participant and comparison group.

Results

Table 1. Sample Characteristics

	Participant	Comparison
Characteristic*	**Mean or n(%)**	**Mean or n(%)**
N	245	245
Age, years	76.4	76.4
Male	102(41.6%)	86(35.1%)
Heart Failure Stage		
B	117(47.7%)	117(47.7%)
C	123(50.2%)	123(50.2%)
D	<5.0%	<5.0%
Angina	73(29.8%)	67(27.3%)
Stroke	46(18.7%)	52(21.2%)
Diabetes	176(71.8%)	162(66.1%)
Obesity	165(67.3%)	155(63.2%)
CCI score	9.1	9.0
FCI score	6.9	6.5

CCI, Charlson Comorbidity Index; FCI, Functional Capacity Score; SD, standard deviation
* Measured at baseline

Table 2. Pre-Post Comparisons of Inpatient Admissions between Participant and Comparison Groups

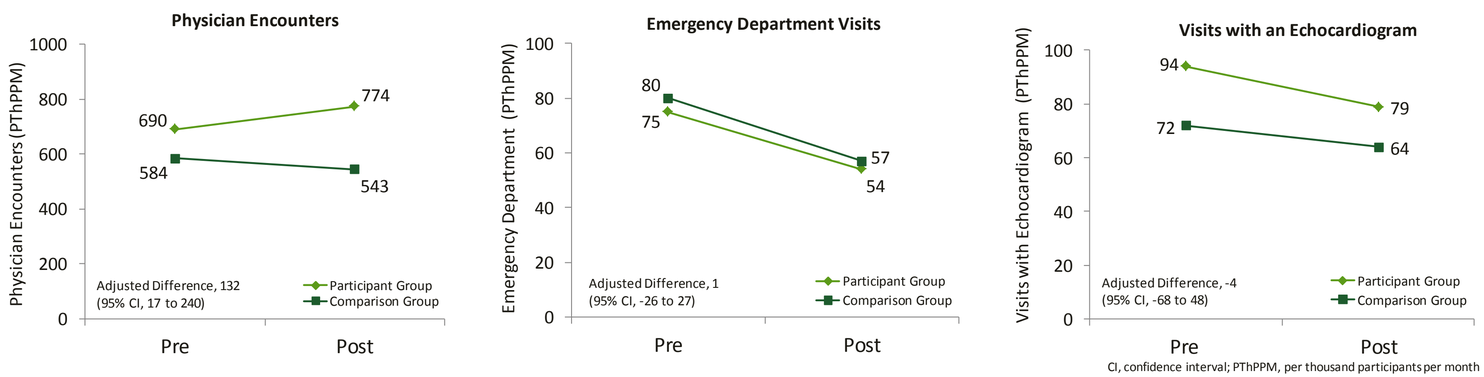
	Pre-Period		Post-Period		
Measurement	**Participant (n=245)**	**Comparison (n=245)**	**Participant (n=245)**	**Comparison (n=245)**	***Adjusted Difference (95% CI)***
Heart Failure-Related					
Inpatient Admissions	61	61	39	53	-14 (-39 to 11)
Inpatient Admissions, Days	299	307	215	248	-26 (-222 to 139)
Inpatient Admission, ≥1 Day	16.3%	16.3%	10.2%	11.0%	-0.8% (-6.1 to 4.1%)
All-Cause					
Inpatient Admissions	88	90	68	84	-15 (-43 to 16)
Inpatient Admissions, Days	427	460	376	441	-34 (-289 to 201)
Inpatient Admission, ≥1 Day	21.6%	21.6%	15.1%	17.6%	-2.5% (-8.6 to 3.3%)

CI, confidence interval; Inpatient admissions and inpatient admission days are measured per thousand participants per month (PThPPM); If the 95% confidence interval contains zero, then the effect was not significant at the 0.05 alpha level

There was no significant pre-post change in inpatient admissions between the participant and comparison groups.

More patients progressed from HF stage B to C in the participant group than the comparison group. There were no differences in progression from HF stage C to D between the groups (Actual patient counts were too low to report).

Figure 1. Pre-Post Comparisons of Healthcare Utilization Measures between Participant and Comparison Groups



CI, confidence interval; PThPPM, per thousand participants per month

The HF daily health monitoring program had a significant effect on physician encounters. The participant group had a significant increase in physician encounters when compared to the comparison group.

There were no significant differences in emergency department visits or echocardiogram tests.

Conclusion

- According to our model, the HF daily health monitoring program had a significant effect on physician office visits.
- This data reflected only a 3-month observation window of the HF daily health monitoring program. As the program continues, we may observe a sustained increase in physician office visits and subsequent reduction in inpatient admissions.

Limitations

- Due to limited sample size, this study may be under powered; which increases the likelihood of Type II error.
- Limitations common to claims data apply to this study (e.g., coding errors, missing data, fixed variables).
- Diagnoses were identified to the extent such information was available from administrative medical claims.
- This study included patients from select clinics and one health plan; and therefore may not be generalizable to all populations.

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