JACC: HEART FAILURE
PUBLISHED BY ELSEVIER ON BEHALF OF THE AMERICAN
COLLEGE OF CARDIOLOGY FOUNDATION

VOL. 6, NO. 2, 2018

EDITORIAL COMMENT

Preventing Readmission After Hospitalization for Acute Heart Failure

A Quest Incompletely Fulfilled*

Jerome L. Fleg, MD

Acute heart failure (AHF) represents the most common reason for hospitalization in the Medicare population, accounting for more than 1 million hospitalizations annually in the United States. These patients are also at high risk for readmission, with 30-day readmission rates of ~25%. In an effort to reduce this costly source of hospitalization, the Hospital Readmissions Reduction Program initiated financial penalties starting in 2013 for hospitals with high 30-day risk-standardized readmission rates for patients recently hospitalized for AHF. This punitive approach for reducing presumably unnecessary readmissions was met, not surprisingly, with vehement opposition by many HF practitioners who cited multiple reasons for the inappropriateness of such a strategy. Among these were the concerns that hospitals caring predominantly for low-income patients with multiple comorbidities and poor access to outpatient health care would be unfairly penalized for factors beyond their control and the possibility that patients who required readmission would instead be treated as outpatients or have admission delayed to avoid hospital penalties for excessive 30-day readmissions. Indeed, the scenario was envisioned that such inappropriate avoidance of hospitalization could reduce readmissions at the expense of increasing mortality. A recent report by Gupta et al. (1) suggests that such a prophesy has already been fulfilled. Since the excess readmission penalty was imposed, 30-day risk-adjusted readmission rates for HF in Medicare beneficiaries decreased from 20% to 18.4%, whereas mortality increased from 7.2% to 8.6%. The 1-year risk-adjusted readmission and mortality rates followed a similar pattern, with hospitalizations declining from 57.2% to 56.3% while mortality rose from 31.3% to 36.3% (1).

SEE PAGE 143

Superimposed on this background is the study by Mudge et al. (2) in this issue of *JACC: Heart Failure*, which has relevance although based in Australia. The authors randomized 278 patients recently hospitalized for AHF to perform 24 weeks of a supervised center-based moderate intensity aerobic and resistance training exercise or to no such training. Both groups, however, received a HF disease management program (HF-DMP) that included 12 weeks of weekly self-management education classes plus symptom monitoring, medication titration, and social support. In addition, both groups received an individualized home exercise program designed to achieve moderate intensity aerobic exercise plus simple resistance exercise for 30 min 5 days per week. Median time from hospital discharge to program commencement was 43 days. No adverse events were associated with exercise training. There was no significant difference in the primary outcome of all-cause death or hospital readmission over 12 months (60% for the center-based training group vs. 65% for controls; a nonsignificant trend toward benefit was seen in intervention group patients <70 years of age).

The investigators should be congratulated for completing a study of this size and complexity in a HF population that included 35% of patients 70 years of age and older, and 26% were women. Several factors,

*Editorials published in *JACC: Heart Failure* reflect the views of the authors and do not necessarily represent the views of *JACC: Heart Failure* or the American College of Cardiology.

From the Division of Cardiovascular Sciences, National Heart, Lung, and Blood Institute, Bethesda, Maryland. The views expressed are solely the author's and do not necessarily reflect those of the National Heart, Lung, and Blood Institute, the National Institutes of Health, or the Department of Health and Human Services. Dr. Fleg has reported that he has no relationships relevant to the contents of this paper to disclose.

ISSN 2213-1779/$36.00

https://doi.org/10.1016/j.jchf.2017.12.012

however, can be identified that reduced the likelihood of a positive outcome. First, the median delay of 43 days between hospital discharge and exercise program commencement prevented the intervention from having an effect during the high-risk period within the first 30 days after hospital discharge. Next, the fact that 44% of the overall group reported exercising more than 150 min per week at baseline suggests a relatively highly motivated sample that would be less likely to benefit from an exercise intervention. Another important factor likely mitigating any outcome difference between groups was the HF-DMP that both groups received, which included home exercise training. In addition, the suboptimal adherence to the center-based supervised training sessions, with mean attendance of only 15 of the 36 sessions, probably attenuated any potential benefit of such training as illustrated by the minimal improvement in 6-min walk distance in either group after 3 and 6 months. Finally, it is noteworthy that only 82 of the 404 hospital readmissions that occurred over the 12 months of follow-up were due to HF.

Results of the study by Mudge et al. (2) are reminiscent of some other trials using an exercise intervention to reduce mortality and hospitalizations in HF patients. Although several single-center studies have reported good adherence to exercise training programs in the HF population, the large multicenter HF-ACTION trial involving 2,331 patients across 82 centers reported a very different experience (3). In this study of stable outpatients with systolic HF, good adherence to the home exercise training intervention over a median of 30 months occurred in only ~30% of the intervention group, despite intensive telephone support and free provision of in-home treadmills or stationary bikes to the participants. These latter findings mirror the generally poor attendance at phase 2 outpatient cardiac rehabilitation programs, especially in the Medicare population, despite the repeated demonstration that high attendance at such programs results in major reductions in recurrent clinical events. Thus, a major challenge for both the HF and cardiac rehabilitation provider communities is to develop better methods for engaging their patients in regular aerobic exercise.

Another factor likely reducing the ability of exercise training as well as other interventions to reduce hospital readmissions in patients hospitalized for AHF is the fact that a minority of these readmissions is typically due to HF. In the study by Mudge et al. (2), only ~20% of readmissions were secondary to HF; in HF-ACTION, the proportion was 31%. It may be anticipated that hospitalizations due to other comorbidities common in the older HF community would be less responsive to an exercise intervention than those due to HF. Although the effect on HF hospitalizations in the study by Mudge et al. (2) was nil (40 vs. 42 admissions in the 2 groups), in HF-ACTION, a stronger effect of exercise training was observed on the combined endpoint of cardiovascular death and HF hospitalizations than on all-cause death and hospitalizations. Such an observed differential response to an exercise intervention for HF patients likely pertains to other interventions aimed specifically at reducing HF readmissions.

TABLE 1 HFSA-Recommended Elements of Heart Failure Disease Management Programs

1	Comprehensive education and counseling individualized to the patient and patients' environment
2	Promotion of self-care behaviors including potentially self-titration of diuretic dosing (with family member/health care provider assistance)
3	Emphasis on behavioral strategies to ensure adequate compliance
4	Adequate follow-up after hospital discharge or clinical instability (preferably within the first 7 days after event)
5	Optimization of oral therapy especially evidence-based therapy
6	Increased access to health care providers
7	Early attention to signs and symptoms of fluid overload
8	Assistance with financial and social concerns

HFSA = Heart Failure Society of America.

Notwithstanding the disappointing results of the study by Mudge et al. (2), a large base of research has accumulated over the past 2 decades investigating the efficacy of various interventions to reduce hospital readmissions in HF patients. In the 1995 pioneering study of Rich et al. (4), a multi-faceted nurse-directed intervention consisting of comprehensive patient/family education, individualized dietary instruction, social service consultation, medication review, and intensive home and telephone follow-up reduced all-cause readmissions by 44% and HF readmissions by 56% over the next 90 days in patients 70 years and older discharged after a HF hospitalization. Since then, a multitude of studies have investigated strategies for reducing readmissions in patients recently hospitalized for HF. The results of these HF-DMPs have been generally disappointing; no specific type has consistently reduced HF- and all-cause hospitalizations (5). Among 7 studies comparing home visits to usual care, 3 studies showed significant reduction in HF readmissions. Of 13 randomized controlled trials evaluating structured telephone support follow-up interventions, 4 studies observed a decrease in HF hospitalizations, but only 1 reported a reduction in all-cause hospitalizations. In an analysis of 13 noninvasive telemonitoring studies, only 3 studies found reductions in all-cause

hospitalizations and 3 of 10 reported reduced HF hospitalizations. However, a Cochrane meta-analysis demonstrated that both structured telephone support (RR = 0.77) and noninvasive telemonitoring (RR = 0.79) were associated with reduced HF readmissions. Studies using invasive hemodynamic monitoring using intrathoracic impedance, right ventricular pressure, or pulmonary artery pressure monitoring have shown similarly inconsistent results.

Where do these inconsistent results of strategies to reduce all-cause and HF readmissions leave us? Clearly, each of the proposed interventions has met with success in some studies although not in others. Some of these inconsistencies undoubtedly relate to issues of study design, including generally modest sample sizes, single-center involvement, and differences in patient and hospital characteristics. Clearly, one size does not fit all with regard to DMP success in reducing HF and all-cause hospitalizations. Nevertheless, the Heart Failure Society of America recommends that patients recently hospitalized for HF and other high-risk HF patients be enrolled in DMPs that include the components listed in the accompanying **Table 1** (5).

To avoid concluding on a negative note, a promising new approach involving exercise training to reducing hospital readmissions for high-risk frail older HF patients warrants mention. In a pilot study of 27 frail, older patients with multiple comorbidities admitted with AHF, a multidomain physical rehabilitation intervention begun in the hospital and continued for 12 weeks post-discharge resulted in a clinically meaningful improvement in the Short Physical Performance Battery at 3 months post-discharge and a 29% lower rehospitalization rate at 6 months post-discharge compared to controls (6). Based on these promising preliminary results, a much larger U.S. National Institutes of Health-funded multicenter randomized controlled trial (Rehabilitation and Exercise Training After Hospitalization [REHAB-HF]; NCT02196038) has been launched to determine whether this novel intervention will improve physical function and reduce all-cause readmissions in this high risk population.

ADDRESS FOR CORRESPONDENCE: Dr. Jerome L. Fleg, Division of Cardiovascular Sciences, National Heart, Lung, and Blood Institute, Room 8154, Bethesda, Maryland 20892. E-mail: flegj@nih.gov.

REFERENCES

1. Gupta A, Allen LA, Bhatt DL, et al. Association of the Hospital Readmissions Reduction Program implementation with readmission and mortality outcomes in heart failure. JAMA Cardiol 2017 Nov 12 [E-pub ahead of print].

2. Mudge AM, Denaro CP, Scott AC, et al. Addition of supervised exercise training to a post-hospital disease management program for patients recently hospitalized with acute heart failure: the EJECTION-HF randomized phase 4 trial. J Am Col Cardiol HF 2018;6:143–52.

3. O'Connor CM, Whellan DJ, Lee KL, et al. Efficacy and safety of exercise training in patients with chronic heart failure. HF-ACTION randomized controlled trial. JAMA 2009;301:1439–50.

4. Rich MW, Beckham V, Wittenberg C, Leven CL, Freedland KE, Carney RM. A multidisciplinary intervention to prevent readmission of elderly patients with congestive heart failure. N Engl J Med 1995;333:1190–5.

5. HFSA 2010 Comprehensive Heart Failure Practice Guideline. Section 8: Disease Management, Advance Directives, and End-of-Life Care in Heart Failure. Available at: http://www.hfsa.org/wp-content/uploads/2015/04/HFSA-2010-HF-Guidelines-Section-08.pdf. Accessed January 16, 2018.

6. Reeves GR, Whellan DJ, O'Connor CM, et al. A novel rehabilitation intervention for older patients with acute decompensated heart failure. J Am Col Cardiol HF 2017;5:359–66.

KEY WORDS acute heart failure, Medicare, readmission rate