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# Heart Failure Disease Management

## A Sustainable Energy Source for the Health Care Engine*

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Despite the demonstrated value of heart failure (HF) disease management, many questions remain. Which program elements contribute most toward the observed benefits? What patient characteristics predict benefit? Importantly, do benefits persist beyond the intervention period? In this issue of the *Journal*, Ferrante et al. (1) bring us closer to answers, reporting clinical outcomes over 3 years after completion of a randomized, controlled disease management intervention in an Argentine population with stable HF. The observed persistent reduction of death or HF hospitalization helps us toward understanding the mechanism of benefit of disease management, developing an approach toward its cost-effective deployment, and establishing policy related to this growing and costly health care problem.

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A meta-analysis of remote telemonitoring (2) demonstrated reduced rates of HF hospitalization and mortality. Three of 6 trials showed improved health-related quality of life, and 3 of 4 demonstrated health care cost reduction. But a number of recent trials have failed to demonstrate benefit, and analyses have failed to provide adequate description of populations and interventions (3,4). Although findings have not been uniform, if the key elements can be identified and applied to appropriate populations, there is significant potential for improving health care outcomes and cost of care.

Applying and simplifying a proposed disease management taxonomy (5), elements of HF programs might be grouped into 3 categories: 1) monitoring and fluid management; 2) sustained therapeutic modifications; and 3) patient education. Monitoring, which may be telephone based or may incorporate telemonitoring technology, is designed to detect changes in fluid and/or hemodynamic status and evidence of disease activity and implement short-term interventions to restore stability and prevent hospitalization. Sustained therapeutic modifications may include optimizing prescription and dosing of drugs with known benefits on disease progression. Education is directed toward improving patient adherence to medication and dietary prescriptions and toward self-monitoring and response to changes in clinical status.

The analysis performed by Ferrante et al. (1) provides new insights into the value of different program components for achieving sustained clinical benefit, placing emphasis on patient adherence. Patients who showed the greatest improvement in adherence also showed the greatest reduction in rates of the primary outcome end point, principally by a reduction in HF hospitalizations. Patients randomly assigned to the active intervention also had higher achieved usage rates for beta-blockers and spironolactone, with a favorable trend for angiotensin-converting enzyme inhibitors. Therefore, it seems likely that 2 of these 3 categories of HF program elements—sustained therapeutic modifications and education—contributed to the sustained benefit. Telephone monitoring may have contributed to the benefits during the initial year of intervention, but seems unlikely to have contributed to the sustained benefits.

Few analyses have focused on the sustainability of benefit after discontinuation of the intervention. Estimating sustainability and understanding the factors that might generate sustained benefit are critical in projecting a program's cost effectiveness. A program's value would be substantially magnified with the knowledge that the outcome benefits would be sustained after selectively discontinuing the active intervention at a specific time point or under specific clinical circumstances.

Rich et al. (6) demonstrated improved medication adherence and reduced rehospitalization rate (7) during a 90-day multidisciplinary intervention for a population of predominantly elderly, African-American women with a high rate of systolic hypertension and a relatively low baseline usage of angiotensin-converting enzyme inhibitors and beta-blockers. The authors noted a persistent reduction in the readmission rate during the 9 months after discontinuation of the intervention. It is likely that all 3 categories of management elements—monitoring, sustained therapeutic modification, and education—contributed to the overall treatment benefit. In particular, more effective antihyper-

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tensive treatment may have had an impact on the natural history of the underlying disease.

In contrast, we designed a trial to assess the sustainability of benefit of a 3-month telemonitoring intervention and found regression of the reduced HF hospitalization rate observed during the active intervention, after selective withdrawal to a more passive phase (8). Our population had higher baseline angiotensin-converting enzyme inhibitor and beta-blocker use than that of Rich et al. (6), with little longitudinal change in utilization or dosing. Although our program included education regarding adherence and self-monitoring, it is likely that effective educational efforts also took place within the control population. Although the intervention was cost effective at reducing 90-day HF-related events, we did not demonstrate a net cost savings (9). In a more recent trial, we showed incremental impact of active electronic telemonitoring, compared with telephone-based monitoring, on HF rehospitalization, although not of all-cause hospitalization (10). Our findings indicate that in an otherwise well-managed population, telemonitoring-based reduction in HF hospitalization rates are maintained only as long as the intervention is applied.

Deploying an intervention emphasizing patient education, but also including home telemonitoring, Krumholz et al. (11) showed reduced rate of death or readmission, with a net cost savings of $6,985 per patient. The work by Ferrante et al. (1) suggests that even more cost-effective strategies can be constructed by intensively focusing on appropriate prescription and patient adherence during targeted time frames, while selectively engaging in telemonitoring for a limited period. Further work is needed to determine the incremental value of continued monitoring of stable patients, and whether it justifies the ongoing cost.

Unlike most such trials, Ferrante et al. (1) enrolled a broad ambulatory population, without a requirement for recent hospitalization. However, cost effectiveness should increase by targeting patients with the highest likelihood of adverse events and the greatest opportunity for improvement in adherence and/or drug prescription. Applicability to other populations depends on replicating improvement in adherence to a degree similar to that observed by these authors. Although much of the population variability in adherence remains unexplained, Wu et al. (12) found that medication adherence was the major factor linking ethnicity to clinical outcomes. Other factors linked to adherence include income, rates of depression, availability of social support, and out-of-pocket prescription costs (6,13–15). As encouraging as are the findings of Ferrante et al. (1), caution is needed in considering their generalizability to other patient groups with differing disease, treatment, socioeconomic, and cultural characteristics.

The newly observed long-term benefits speak to the need for our health care reimbursement model to transition to one that gives incentive to providers to implement appropriately targeted disease management programs. Although disease management trials have not uniformly demonstrated cost saving, they have generally achieved a cost-effective reduction in the rates of major HF events. The primary end point benefits observed by Ferrante et al. (1) were driven exclusively by reduced rates of rehospitalization, although functional class was also improved. Others studies have suggested reduced mortality (16,17). The marginal costs associated with these benefits are likely to fall well within the cost-effective range.

The prevalent U.S. model of reimbursing episodes of care fails to facilitate disease management. The current focus on reducing 30-day rehospitalization rates may have unintended consequences, such as focusing programs exclusively on the first 30 days after discharge—a far cry from the 1-year intervention offered by Ferrante et al. (1)—and delaying a needed rehospitalization until after the 30-day window. We need a shift from payment for episodes of care to reimbursing continuity of care for a given population (18). The medical home concept provides for sustained, organized, interdisciplinary management of complex conditions such as HF. A key to its success is financial alignment, bundling payments for patient populations to groups of providers, as through the accountable care organization. Although there are several challenges to implementing such an approach (18), particularly managing the actuarial risk within HF populations, it is the model that will give the most incentive to providers to design and implement the most cost-effective management programs.

Ferrante et al. (1) point to the possibilities for improving outcomes for the growing population with HF. They offer deeper understanding of the program components that drive benefits and help us to conceptualize the most clinically effective strategies. Finally, they challenge us to reconstruct our health care system into one that aligns providers to offer integrated, multidisciplinary, cost-effective programs—including empowerment of patients themselves—to generate a sustained improvement in health care outcomes.

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