

**ORIGINAL ARTICLE**

*The Veterans Affairs Cooperative Study Group on Primary Care and Hospital Readmission:*

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# Enhanced Access to Primary Care for Patients with Congestive Heart Failure

**OBJECTIVE.** To determine whether enhanced access to primary care affects the diagnostic evaluation, pharmacologic management, or health outcomes of patients hospitalized with congestive heart failure (CHF).

**DESIGN.** Multisite randomized, controlled trial.

**SETTING.** Nine Veterans Affairs medical centers.

**PATIENTS.** 443 patients who were hospitalized with a diagnosis of CHF.

**INTERVENTION.** Enhanced access to primary care, including assignment of a primary care nurse and physician, increased telephone contact, additional outpatient visits, and patient education.

**MAIN OUTCOME MEASURES.** Diagnostic evaluation, pharmacologic management, health-related quality of life, and hospital readmission rates.

**RESULTS.** About 80% of patients who had enhanced access to care and patients receiving usual care underwent recommended evaluation of left ventricular ejection fraction. Among the subset of patients for whom an angiotensin-converting enzyme (ACE) inhibitor was recommended (i.e., ejection fraction < 40%), three quarters of the patients in both the enhanced access and usual care groups received the drug (75% vs. 73%;  $P > 0.2$ ). Enhanced access to primary care did not improve quality of life and increased hospital readmissions, with an average of  $1.5 \pm SD 2.0$  readmissions per 6 months of follow-up for patients who had enhanced access compared with  $1.1 \pm SD 1.8$  for those who received usual care ( $P = 0.02$ ).

**CONCLUSIONS.** Compliance with recommended CHF testing and treatment guidelines was equally high in both study groups. Enhanced access to primary care did not improve patients' self-reported health status and was associated with more frequent hospitalizations.

Evidence-based guidelines from the American College of Cardiology<sup>1</sup> and the Agency for Health Care Policy and Research<sup>2</sup> recommend pharmacologic therapies for patients with congestive heart failure (CHF). Both organizations advocate use of angiotensin-converting enzyme (ACE) inhibitors for patients with left ventricular ejection fractions less than 40% on the basis of evidence from high-quality randomized, controlled trials<sup>3–5</sup> recognizing that such treatment improves survival. Other agents (e.g., diuretics and digoxin) are suggested for many patients, depending

*The abstract of this paper is available at [ecp.acponline.org](http://ecp.acponline.org).*

on symptoms and other clinical characteristics. Adherence to these guidelines has been associated with improved outcomes (e.g., improved quality of life and reduced hospitalization rates) among patients with systolic dysfunction.<sup>6</sup> However, much evidence suggests that compliance with published guidelines is poor; studies<sup>7-9</sup> have shown extensive practice variation in use of recommended medications, and a national survey showed that only 31% of patients who had office visits for CHF received an ACE inhibitor.<sup>10</sup>

We previously reported that enhanced access to primary care increased, rather than decreased, hospital readmission rates for patients with CHF, diabetes, or chronic obstructive pulmonary disease.<sup>11</sup> Differences in hospital readmission rates between intervention and control patients were most pronounced among patients with CHF. To further investigate these differences, we looked at processes of care and examined whether CHF admissions were in fact prevented. One possible reason for increased hospital use is inappropriate compliance with quality-of-care standards for patients with systolic dysfunction. We therefore performed this secondary analysis to determine the extent to which diagnostic evaluation and pharmacologic management of patients in the randomized trial accounted for differences in health outcomes.

## Methods

The methods of the original study have been reported in detail elsewhere.<sup>11, 12</sup> In brief, eligible patients were veterans hospitalized in the general medicine service at one of nine VA medical centers (**Appendix**) diagnosed with CHF, diabetes mellitus, chronic obstructive pulmonary disease, or any combination of these conditions. Of the 504 patients with CHF in the original study, the data needed for the present analysis were complete for 443 patients; 41 patients were excluded because their charts were unavailable, and 20 were excluded because the chart lacked sufficient clinical detail with which to confirm the presence of CHF. **Figure 1** is a flow diagram that summarizes the study design. Eligible, consenting patients were randomly assigned to receive either enhanced access to primary care or usual care at their VA medical center. Patients were followed for 6 months after randomization. The study was approved by the human subjects and research committees of all participating hospitals, including the central coordinating center in Hines, Illinois.

### Enhanced Access

At each site, the enhanced access intervention was delivered by a team that consisted of a licensed registered nurse and a primary care physician, usually a general

internist. The intervention began immediately after randomization, while the patient was still in the hospital (**Table 1**). The inpatient portion of the intervention included education provided by the nurse. Patients with CHF were instructed to weigh themselves daily and were given individualized guidelines for weight change that should trigger a telephone call to their primary care nurse or physician. The nurses also discussed and provided written educational materials from the American Heart Association about living with CHF.<sup>13</sup> The primary care physician visited the patient in the hospital before discharge and developed a problem list and treatment plan with the nurse. Within 2 days of discharge, patients received a telephone call from the nurse to assess potential difficulties with medications or medical regimens and to identify health problems arising since discharge. The patient also received an appointment with the primary care physician and nurse within 1 week. The frequency of all other visits and telephone calls was left to the discretion of the physician, patient, and nurse. The average compliance score with key components of the intervention was 89% across all nine sites.

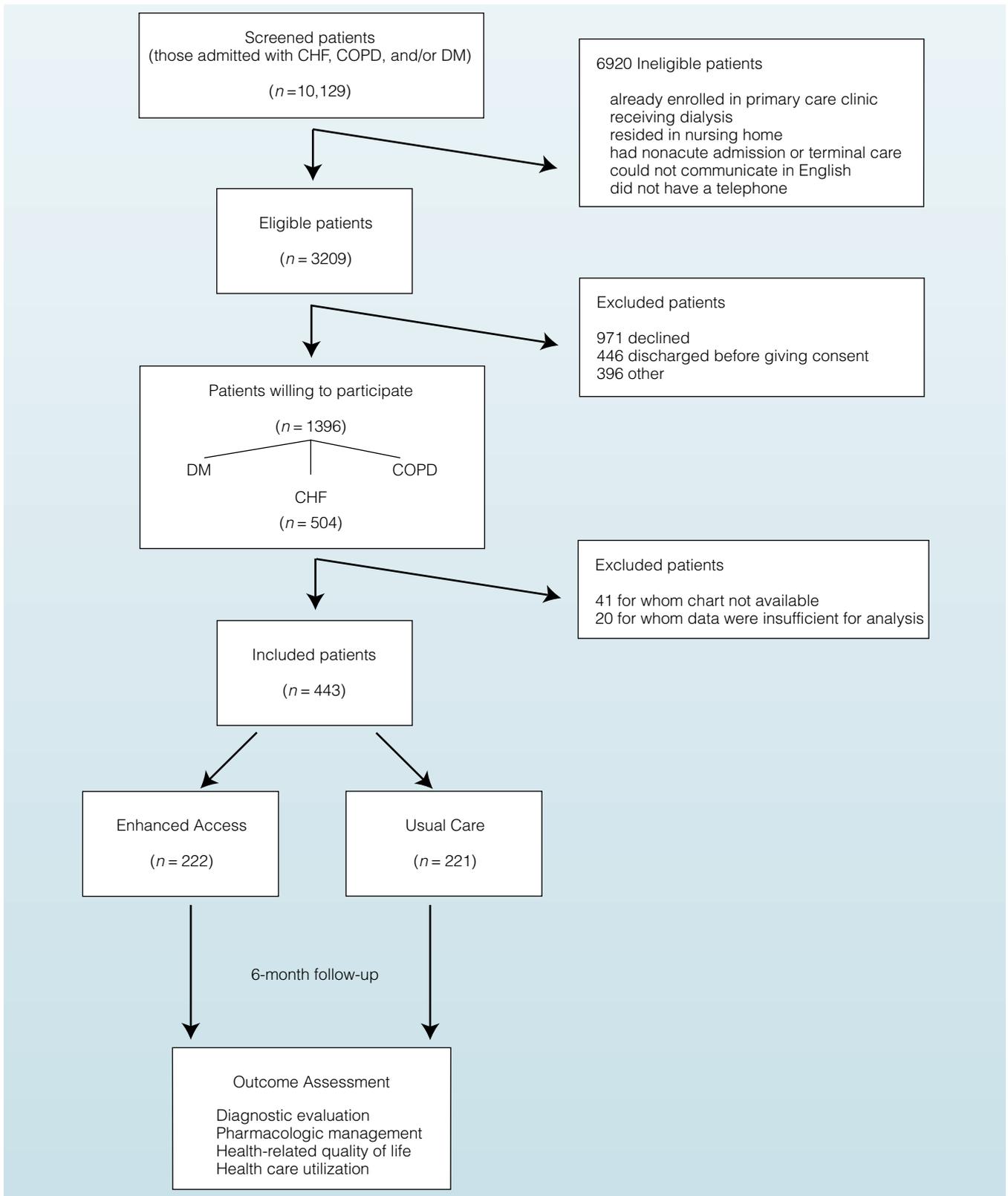
### Usual Care

For controls, we neither required nor prohibited any specific postdischarge care. Such care could have been provided by community or VA physicians, as arranged during the index admission. Control patients did not have access to the primary care nurse (used specifically for intervention patients) and received no supplemental education or assessment of needs beyond what was customarily offered at each site.

### Baseline Assessment and Health Outcomes

**Table 2** summarizes the baseline assessment and the main study outcomes. In addition to standard demographic characteristics, we assessed New York Heart Association classifications for all patients at the baseline interview. We also collected specific clinical information to estimate risk for hospital readmission on the basis of a validated index.<sup>14</sup> The readmission risk index uses such information as results of laboratory tests and emergency department use to produce a score that identifies patients as being at low, medium, or high risk for hospital readmission.

Our study evaluated four main outcomes: diagnostic evaluation, pharmacologic management, health-related quality of life, and hospital readmission rates. We abstracted the medical records to obtain information about the diagnostic evaluation and management of CHF during the index hospitalization. Our review focused on diagnostic tests that assessed left ventricular ejection fraction.



**FIGURE 1. Study design and inclusion and exclusion criteria. The original randomized trial reported on aggregated results for patients with congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), and diabetes mellitus (DM). The current report focuses on the subset of patients with CHF.**

When multiple assessments of ventricular function were done during the study period, we used results to classify left ventricular ejection fraction in the following order: nuclear

cardiology studies, cardiac angiography, and echocardiography. Nonquantitative reports (e.g., “depressed left ventricular ejection fraction”) were interpreted to mean an

TABLE 1

**Components of the Enhanced Access to Primary Care Intervention**

SETTING AND PROVIDER	TASK
<b>Index hospitalization</b>	
<b>Nurse</b>	<b>Assess postdischarge needs</b> <b>Educate the patient (e.g., teach patient about measuring weight daily, use of diuretics)</b>
<b>Physician plus nurse</b>	<b>Provide contact cards for primary care physician and nurse</b> <b>Visit patient while in hospital to establish treatment plan</b> <b>Review medication plan</b> <b>Discuss care with inpatient physicians</b>
<b>Follow-up care</b>	
<b>Nurse</b>	<b>Telephone call within 2 days of discharge to:</b> <b>Check on problems</b> <b>Assess difficulties with medications</b> <b>Remind patient about visit</b>
<b>Physician plus nurse</b>	<b>See patient in clinic within 1 week of hospital discharge to:</b> <b>Review treatment plan</b> <b>Communicate changes to patient</b>
<b>Nurse</b>	<b>Serve as point of contact for most clinical questions to:</b> <b>Communicate questions to physician</b> <b>Promptly reschedule appointments that were not kept</b> <b>Telephone patient periodically</b>

ejection fraction less than 40%, making the patient a potential candidate for ACE inhibitor therapy.

To assess pharmacologic management, we classified cardiovascular medications as follows: digoxin, diuretics, ACE inhibitors,  $\beta$ -blockers, calcium-channel blockers, nitrates (transdermal or long-acting oral), other afterload-reducing agents (hydralazine or prazosin), and warfarin. Patients who were receiving these agents at baseline were differentiated from those who received them during the follow-up period. The contraindications or reasons for intolerance to ACE inhibitors listed in the medical record were symptomatic hypotension ( $n=1$ ), serum creatinine concentration greater than 2.0 mg/dL ( $n=13$ ), or other reasons ( $n=4$ ). In addition, we determined the proportion of patients who achieved the recommended daily target dose of their ACE inhibitor according to Agency for Health Care Policy and Research guidelines (i.e., captopril, 150 mg; enalapril, 20 mg; lisinopril, 20 mg; and quinapril, 40 mg).<sup>2</sup> Assessments of medication use were based on records of filled prescriptions obtained from VA pharmacy files.

Health-related quality-of-life (based on the Short Form-36 Health Survey [SF-36]<sup>15</sup>) was assessed by a research assistant during the index hospitalization before randomization and again 6 months later. Health-related quality of life was summarized by using the

physical component summary (PCS) and the mental component summary (MCS) scores from the SF-36.<sup>16</sup>

Health care utilization (clinic visits and hospital readmissions) was assessed through a centralized hospital database. Data on non-VA health service utilization (during the study period and during the 6 months before randomization) were collected with confirmed patient reports. Only 5% of hospital use and outpatient visits occurred at non-VA providers.

### Statistical Analysis

We used the Student *t*-test or the Wilcoxon rank-sum test, as appropriate, to assess comparisons between enhanced access and usual care groups. Because a longitudinal quality-of-life analysis can be biased if the proportion of deaths differs between the study groups, we examined changes in PCS and MCS scores after weighting death in multiple ways, as suggested by Diehr and colleagues.<sup>17</sup> Because the weightings made little difference, we present the unweighted results.

### Results

Table 3 shows demographic and clinical characteristics of the 443 patients according to study group. Despite the

TABLE 2

**Baseline Assessment and Outcome Measures\***

MEASURE	DEFINITION	DATA SOURCE
<b>Baseline assessment</b>		
New York Heart Association class	Standard classification of heart failure symptoms	Patient interview at baseline
Readmission risk index	Previously validated index based on laboratory test results and emergency department use	Chart and laboratory database at index hospitalization
<b>Outcomes</b>		
Diagnostic evaluation	Tests to assess left ventricular function	Chart review
Pharmacologic management	ACE inhibitors, digoxin, diuretics, calcium channel blockers, nitrates, $\beta$ -blockers, aspirin, warfarin	Chart review for index hospitalization and central pharmacy database for 6-month follow-up
Health-related quality of life	Short Form-36 Health Survey PCS and MCS scores	Patient interview at baseline and 6 months after randomization
Health care utilization	Clinic visits, hospital readmissions	Central hospital database queried at 6 months after randomization

\*ACE = angiotensin-converting enzyme; MCS = mental component summary; PCS = physical component summary.

exclusion of 61 patients (because of incomplete data), no statistically significant nor clinically important differences were seen in baseline demographic or clinical measures. For example, approximately one third of patients in each group were at high risk for hospital readmission on the basis of a validated risk score.

### Diagnostic Evaluation

More than one half of patients in each group had New York Heart Association class III or IV symptoms during the index hospitalization. Overall, diagnostic evaluation of left ventricular function was noted in the medical records of 82% of enhanced care patients and 78% of usual care patients. Echocardiography was the most common method of assessment, followed by nuclear cardiology studies and cardiac angiography. Approximately one fifth of patients did not have a specific test mentioned in the chart, although the record reflected that a test had been completed and results were mentioned. Among patients whose ventricular function had been assessed, 65% had systolic dysfunction (i.e., ejection fraction < 40%).

### Pharmacologic Management

Figure 2 shows how two major pharmacologic agents were used to treat patients with systolic dysfunction. A high proportion of patients (97% in the enhanced access

group and 95% in the usual care group) were considered eligible for ACE inhibitor therapy according to specified criteria. For those patients, similar proportions of patients in the enhanced access and usual care groups were taking an ACE inhibitor during or before the index hospitalization (59% and 60%, respectively). The increase in the proportion of eligible patients who were prescribed an ACE inhibitor during follow-up was approximately equal for both groups and reached 75% for patients receiving enhanced access and 73% for those receiving usual care; these percentages reflect attention to this important therapy for patients with low ejection fractions. However, only 30% of intervention patients and 32% of control patients achieved the target dose of the prescribed ACE inhibitor (i.e., the dose recommended by the Agency for Health Care Policy and Research guideline) at any point during follow-up. Digoxin use at baseline was similar for both groups; however, during follow-up, digoxin use increased significantly for the patients receiving enhanced access (70% vs. 57%;  $P=0.02$ ).

Most patients also received diuretics and nitrates; however, patients in the enhanced access group and those in the usual care group did not differ significantly in the use of these or other agents. In each group, about half of the patients received nitrates, one quarter received warfarin, and a small proportion received either calcium-channel blockers (17%) or  $\beta$ -blockers (12%).

**TABLE 3**

**Baseline Characteristics and Diagnostic Evaluation of Patients\***

CHARACTERISTIC	ENHANCED ACCESS (n=222)	USUAL CARE (n=221)
<b>Demographic</b>		
Mean age ± SD, yr	65.1 ± 9.1	64.0 ± 10.9
<b>Race</b>		
White, non-Hispanic	63%	70%
Black, non-Hispanic	31%	25%
Other	6%	5%
Male sex	99%	99%
<b>Clinical variables</b>		
<b>New York Heart Association class</b>		
I	12%	10%
II	37%	36%
III	34%	33%
IV	17%	21%
Ejection fraction measured	82%	78%
Ejection fraction < 40%	67%	63%
<b>Risk for hospital readmission†</b>		
Low	25%	19%
Medium	37%	48%
High	37%	33%

\*P > 0.1 for all between-group comparisons.

†Risk for hospital readmission was based on a validated model that combined laboratory values and health service utilization information obtained at the time of the index hospitalization.<sup>14</sup>

**Health-Related Quality of Life**

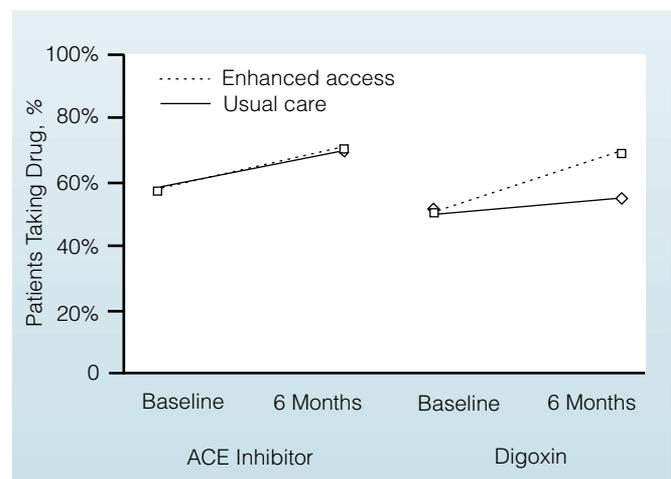
Health-related quality-of-life scores were very low during the index hospitalization. The PCS scores for enhanced access patients and usual care patients (mean, 29.3 and 28.6, respectively) and mean MCS scores (45.6 and 43.7) were in line with published norms for patients with CHF (mean PCS score, 31.0; mean MCS score, 45.7).<sup>16</sup> To put these scores in perspective, mean PCS and MCS scores in the general U.S. adult population are 51.1 and 50.7, respectively.<sup>16</sup> Quality-of-life scores did not differ by intervention status at baseline or at 6 months of follow-up (Table 4). Unexpectedly, quality-of-life scores did not differ between patients who had low left ventricular ejection fractions and those who had normal ejection fractions (data not shown).

**Hospital Readmissions**

Hospital use in the 6 months after randomization is shown in Table 4. The proportion of patients readmitted and the number of readmissions during these 6 months were higher among patients who received enhanced access. The proportion of CHF admissions deemed preventable according to a published protocol established by a consensus panel of physicians did not differ between study groups.<sup>18</sup> There were 29 deaths (13%) among patients in the enhanced access group and 19 deaths (9%) among patients in the usual care group. These results did not differ significantly (P=0.13).

**Discussion**

We evaluated diagnostic testing and pharmacologic management of patients with CHF in a large, multi-site, randomized trial of enhanced access to primary care.<sup>11</sup> The present study was stimulated by the observation that patients with CHF who were randomly assigned to enhanced access seemed to account for most of the difference in hospital readmission rates between the two study groups in the original trial. Given the importance of appropriate pharmacologic management of CHF patients with a low ejection fraction, we examined the extent to which systolic dysfunction was treated in compliance with quality-of-care standards. We found that CHF-related testing (i.e., to assess ejection fraction) and treatment did not differ across study groups. As noted,



**FIGURE 2.** Proportion of patients who received a particular medication either at baseline or at 6 months of follow-up. Only about one third of patients taking angiotensin-converting enzyme (ACE) inhibitors (30% in the enhanced access group and 32% in the usual care group) achieved the target dose recommended in the Agency for Health Care Policy and Research guideline for treatment of congestive heart failure.<sup>2</sup> The change in use of digoxin between study groups was statistically significant (P=0.02); the change in ACE inhibitor use was not.

TABLE 4

**Health-Related Quality of Life, Clinic Visits, and Hospital Use\***

MEASURE	ENHANCED ACCESS	USUAL CARE	P VALUE†
<b>Quality of life‡</b>			
<b>Mean SF-36 PCS score</b>			
Baseline	29.3	28.6	>0.2
At 6 months	31.5	30.1	>0.2
<b>Mean SF-36 MCS score</b>			
Baseline	45.6	43.7	0.07
At 6 months	47.1	45.1	>0.2
<b>6-month outpatient utilization</b>			
Visits per patient	17.2	14.1	<0.001
General medical clinic	3.8	2.2	<0.001
Specialty clinic	4.2	4.2	>0.2
Other visits§	9.2	7.8	0.01
<b>6-month hospital utilization</b>			
Proportion of patients readmitted	55.9%	43.9%	0.01
Proportion of CHF readmissions deemed preventable	29.4%	29.6%	1.0
Number of readmissions	1.5	1.1	0.02
Hospital days	9.1	7.3	0.04
<b>Deaths</b>	<b>13.1%</b>	<b>8.6%</b>	<b>0.13</b>

\*CHF = congestive heart failure; MCS = mental component summary; PCS = physical component summary; SF-36 = Short Form-36 Health Survey.

†P values for proportions were calculated by using the Fisher exact test. All other P values were calculated by using the Wilcoxon rank-sum test.

‡For comparison, U.S. norms for PCS and MCS scores are 51.1 and 50.7, respectively, for the general population, and 31.0 and 45.7 respectively, for patients with CHF.<sup>16</sup>

§Other visits included psychiatry, physical therapy, emergency department, and laboratory only.

||Preventable hospitalizations were determined by a committee of physicians according to a published protocol.<sup>18</sup>

enhanced access to care did not improve self-assessed health status; rather, it was associated with more frequent hospitalization.

Several factors may have contributed to our inability to detect improvements in testing, treatment, or health outcomes in patients who received enhanced access to care. First, study patients may have been too sick to derive much benefit from any intervention. The mean baseline PCS score in the enhanced access group was approximately 29, indicating substantially impaired functional health. Whether enhanced access would be more effective in less debilitated patients is an open question. Second, diagnostic evaluation rates and use of appropriate pharmacologic agents were much higher in our usual care group than in patients reported in the literature from nonfederal institutions.<sup>10</sup> In other words, with

respect to CHF testing and treatment, patients in the usual care group received the same level of care as patients who had enhanced access to care. In settings with more typical (i.e., lower) levels of compliance with CHF treatment guidelines, our intervention may have had an important impact. Finally, although use of ACE inhibitors was high, only one third of patients in either treatment group achieved a recommended target dose, perhaps undermining the benefit of treatment.

Our results suggest that reductions in hospital use for patients with CHF will require more than simply enhancing access to primary care. Additional care as part of a larger disease management intervention may be needed. For example, Rich and colleagues<sup>6</sup> reduced hospital readmissions for elderly patients with CHF by using a multidisciplinary inter-

vention that included individual sessions with a dietitian, home visits by a nurse, and consultation with social-services personnel both before and after discharge.

Although we are unable to explain the differences in hospital readmission rates in terms of access to primary care or compliance with pharmacologic guidelines for patients in this study, several potentially important messages emerge from these data. First, overall compliance with pharmacologic guidelines for the treatment of patients with CHF due to systolic dysfunction was high in these nine VA medical centers. There is, however, significant room for improvement in terms of increasing the doses of ACE inhibitors to the levels necessary to provide the survival benefits shown in well-conducted randomized, controlled trials. Second, even the subgroup of patients with diastolic dysfunction reported low health-related quality-of-life scores, suggesting that CHF can be a devastating illness, even in patients with a normal ejection fraction. Although treatment guidelines for patients with low ejection fractions are explicit, more work needs to be done to guide management of patients with diastolic dysfunction. In the meantime, clinicians should attempt to prescribe appropriate doses of suggested agents, because it seems that reduced dosing may not confer the same benefit that is achieved in randomized trials.

## Take-Home Points

- Patients discharged from the hospital with congestive heart failure are frequently readmitted.
- We performed a randomized, controlled trial to test an intervention to enhance access to primary care for patients discharged with congestive heart failure.
- Patients in the intervention group had substantially more in-person contact with their primary care nurses and physicians.
- Enhanced access did not affect the proportion of patients appropriately receiving an angiotensin-converting enzyme inhibitor. In each group, three quarters of patients with a low ejection fraction received this therapy.
- Enhanced access did not improve self-reported health status and was associated with more frequent hospital admissions.

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