Heart Failure in Primary Care
Measuring the Quality of Care

Paul A. James, MD; Timothy M. Cowan, MSPH; Robin P. Graham, PhD, MPH; Carlos Roberto Jaén, MD, PhD; Barbara A. Majeroni, MD; and Jeffrey S. Schwartz, MD
Buffalo, New York

BACKGROUND. Concerns exist about the quality of care provided to heart failure patients by primary care physicians. Using an evidence-based clinical guideline, we evaluated the care given to patients with systolic heart failure.

METHODS. We retrospectively reviewed the medical records of 420 patients from 25 primary care practices in upstate New York who had received a diagnosis of heart failure. Chart documentation confirmed the diagnosis (n = 395). We excluded patients with noncardiogenic volume overload or correctable valvular disease (n = 338). Performance profiles measured use of diagnostic tests, left ventricular ejection fraction (LVEF) measurement, patient education, and prescription of angiotensin-converting enzyme (ACE) inhibitors. For treatment recommendations, patients were classified according to LVEF status.

RESULTS. Only 82% of the patients studied had an LVEF test result documented in their charts. Of these, 49% had an LVEF ≤40%. ACE inhibitor use was greater among patients with low LVEF (91%) than among those with a normal LVEF (62%). Among patients with systolic heart failure taking ACE inhibitors, 87% were at target doses. Adherence measures were low for laboratory evaluation and patient-education criteria.

CONCLUSIONS. Heart failure with normal LVEF was as prevalent as systolic heart failure in these primary care practices. Performance profiles for the physicians' prescriptions of ACE inhibitors exceeded those published in the literature. Patients who did not have a documented measure of LVEF, however, received lower quality of care as measured by this disease-specific guideline. This underscores the importance of measuring LVEF.

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Heart failure is a significant health problem in the United States for which primary care and specialist physicians provide care. Gross estimates suggest that more than 1 million hospitalizations and 400,000 new cases occur annually, at a cost of $10 billion.[1] Heart failure is a lethal condition with a mortality rate approaching 50% in 5 years.[2] Given the seriousness and prevalence of this condition and scientific evidence demonstrating reduced mortality with specific medical interventions, researchers have raised concerns about the care heart failure patients receive in primary care settings.[3-6]

Evidence-based clinical practice guidelines were developed to educate physicians about appropriate processes of care.[1,7] Specifically, one guideline published by the Agency for Health Care Policy and Research (AHCPR) has been disseminated through pamphlets and published in the literature for primary care physicians.[8] Yet, the extent of the dissemination and the effectiveness of applying the guideline in actual practice are unknown.[9]

The evaluation of clinical practice and measures of physician performance require appropriate translation of evidence-based clinical practice guidelines into explicit review criteria.[10] Recommendations for review criteria for this clinical guideline have been published (Table 1), and specific adherence rates have been recommended.[9,11] Few studies to date have examined the quality of care delivered in primary care settings using this rigorous methodology.[12]

We examined the quality of care provided to heart failure patients in upstate New York primary care offices. We measured quality using performance rates representing adherence to specific review criteria translated from the AHCPR heart failure clinical practice guideline. We studied 2 research questions: (1) How many heart failure patients in primary care settings found through claims data are actually eligible for measuring quality of care in accordance with an evidence-based guideline for systolic dysfunction? and (2) What are the adherence rates to specific measurable review criteria among this sample of primary care physicians?

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From the departments of Family Medicine (P.A.J., T.M.C., R.P.G., C.R.J., B.A.M.) and Medicine (J.S.S.), State University of New York at Buffalo. Reprint requests should be addressed to Paul A. James, MD, Assistant Professor, Department of Family Medicine, Erie County Medical Center, 462 Grider Street, CC165, Buffalo, NY 14215. E-mail: paj@acsu.buffalo.edu.

METHODS

Design and Sampling

We used a retrospective case review study design. Twenty-five practices from a practice-based research

TABLE 1

Review Criteria for Systolic Heart Failure

Criteria	Proposed Standard of Quality, %†	Interrater Reliability (κ)
1. If heart failure suspected or clinically evident, a chest x-ray; ECG; complete blood count (CBC); serum electrolytes, creatinine, albumin, liver function tests; and urinalysis were done. If patient aged ≥65 years, had atrial fibrillation or signs or symptoms of thyroid disease, T4 and thyroid-stimulating hormone (TSH) tests were done. Time frame: 3 months before or after initial date of diagnosis.	75 to 80	CBC=0.38* Liver=0.38* Alb=0.43* Thyr=0.44* ECG=0.51* Renal=0.63*
2. If heart failure suspected, an echocardiogram or radionuclide ventriculograph was done to measure LVEF. Time frame: 3 months before or after initial date of diagnosis.	90 to 95	0.57*
3. For each subsequent measure of LVEF completed (using echocardiography or radionuclide ventriculography), one of the following reasons was documented: (a) new heart murmur, (b) new myocardial infarction, (c) sudden deterioration despite compliance with diet and medications, (d) progressive symptoms possibly requiring heart transplant, or (e) patient was noncompliant. Time frame: Every test between initial date of diagnosis and date of chart review.	75 to 80	-0.10
4. Counseling for (a) diet, (b) daily weights, (c) exercise, and (d) compliance with treatment recommendations was recorded. Time frame: 3 months before or after initial date of diagnosis.	90 to 95	Diet= 0.53* Wgt=-0.10 Exer=-0.02 Meds= 0.31*
5a. A patient with LVEF ≤40% underwent a trial of ACE inhibitors unless contraindicated by (a) a history of intolerance or adverse reactions, (b) serum potassium greater than 5.5 mEq/L, or (c) symptomatic hypotension.	90 to 95	0.80*
5b. Patients on ACE inhibitors achieved a target dose of at least (a) 10 mg bid of enalapril, (b) 50 mg tid of captopril, (c) 20 mg qd of lisinopril, or (d) 20 mg bid of quinapril — unless patients had renal insufficiency (creatinine <3.0 mg/dL), in which case only a half dose of ACE inhibitors were given. Time frame: Evaluated once prescribed dose remained the same for 6 months.	90 to 95	0.72*
6. If patient had signs of significant volume overload, a diuretic was started. Time frame: Between initial date of diagnosis and date of chart review.	90 to 95	0.36*
7. If a patient experienced persistent or worsening symptoms or signs of volume overload, despite compliance with medications and diet, one of the following was documented: (a) a diuretic was newly prescribed, (b) the dose of the diuretic was increased, (c) a loop diuretic was initiated in a patient previously taking a thiazide diuretic. A second diuretic (for example, metolazone, spironolactone) was added to the regimen of a patient taking a loop diuretic, or (d) the patient was admitted to the hospital for intravenous diuretic therapy. It is stated that the patient cannot tolerate a higher dose of diuretic because of hypotension or renal insufficiency. Time frame: Visits between either January 1, 1994, or date of diagnosis (whichever was more recent) and date of chart review.	75 to 80	-0.07
8. At each visit for heart failure, patients had the following items documented: (a) symptom status, including whether they were better, worse, or the same as at the previous visit; and (b) assessment of volume overload, including mention of the presence or absence of at least one of the following: third heart sound, rales, jugular venous distension, and peripheral edema. Time frame: Visits between either January 1, 1994, or date of diagnosis (whichever was more recent) and date of chart review.	90 to 95	0.10

ECG denotes electrocardiogram; LVEF, left ventricular ejection fraction; ACE, angiotensin-converting enzyme; bid, twice a day; tid, 3 times a day; qd, every day.

*Cohen's κ was statistically significant at $P < .05$, indicating that interrater agreement is greater than expected by chance.

†Proposed standard of quality based on manuscript by Hadorn and colleagues.[11]

network in upstate New York voluntarily participated in a larger quality improvement project for heart failure. We solicited all physicians (n = 226) who had expressed interest in participating in a quality improvement program on a 1996 mail survey,[13] as well as all physician members of the Western New York Practice-Based Research Network. Practices were selected according to practice location (urban, suburban, or rural), type of practice, order of receipt of physician-signed informed consent, and our goal of enrolling at least 400 patients with heart failure. Twenty-five physicians were selected from 35 respondents who signed informed consent forms. Their practices represented 47 physicians and 12 mid-level providers. We included solo (n = 9), group (n = 16), and hospital-affiliated (n = 5) practices with patient populations representing a broad case mix. They were located in rural (n = 13), urban (n = 4), and suburban (n = 8) sites.

Each practice was asked to provide a list of patients with the International Classification of Diseases (ICD-9-CM) code for congestive heart failure (428.00) from their billing database. Patient lists were generated, and primary care physicians were asked to review the lists to delete any names of deceased patients or those given a misdiagnosis. From 20 practices, every medical record of patients listed with heart failure was examined. In the 4 largest group practices and 1 solo practice, patients were systematically selected by ordering the patient list alphabetically and selecting every nth patient. To meet our goal of enrolling approximately 400 patients, 25 to 40 patients were selected from each of these 5 practices. These samples represented 19% to 55% of all patients on the lists provided by the practices. A total of 420 patients were selected.

Selection Criteria for Heart Failure Patients

Of those with a documented ICD-9-CM code 428.00, patients included were those with 3 or more office visits with heart failure documented in the assessment (suspected heart failure) and for whom another competing diagnosis for volume overload was not later determined (verified heart failure). Of the 420 patients with a billing diagnosis of heart failure, 25 had insufficient documentation in the medical record. Thus, data from 395 records were studied for compliance with the diagnostic criteria for heart failure, as these records reflected physician suspicion of the condition during at least 3 visits. Of these, an additional 57 patient charts were excluded, because an etiology for volume overload was found other than simple left ventricular failure. These records included those patients with valvular heart disease and those with volume overload due to noncardiac etiologies. Thus, we assessed 338 medical records documenting sustained management of heart failure by the primary care physician for their compliance with the treatment review criteria. We report this data for 2 subgroups according to left ventricular ejection fraction (LVEF) test result, to differentiate systolic heart failure from diastolic and unclassified heart failure.

Measures Used

Initially we developed 4 review criteria[9] using a measurement validity method described by Palmer and colleagues.[10] This method is a systematic and rigorous approach for translating guideline recommendations into measurable review criteria. We expanded our data collection to test 5 additional criteria recommended by researchers at RAND[11] (Table 1). Three of the 9 criteria focused on the diagnosis of heart failure and education; 6 measured pharmacologic management and monitoring of patients known to have systolic heart failure defined as an LVEF ≤40%. Two of these criteria (laboratory tests and patient counseling) had multiple measures, making a total of 17 adherence measures. Patients' cardiac functional status was assessed by asking each primary physician to rate their patients using the New York Heart Association (NYHA) classification system.[14] Responses were returned no later than October 1997.

Medical Record Review

In 1996, a separate study enabled the development and testing of the chart extraction form using 99 patients in 4 practices. Minor revisions were made on the basis of recommendations from the nurse chart extractors and the participating physicians. The revised medical record reviews took an average of 1 hour and 15 minutes to complete. They included any data found within the office medical record, such as medication lists, problem lists, progress notes, consultation letters, hospital discharge data, emergency department visits, laboratory results, radiographic data, and old records from other physicians.

The chart extractors first collected data related to the initial date of diagnosis. Next, they recorded all LVEF tests, emergency department visits, and hospitalizations that occurred between the date of initial diagnosis and the date of the medical record review. Finally, between either January 1, 1994, or the date of diagnosis (whichever date was more recent) and the date of the medical record review, all progress notes for office visits were examined for documentation of heart failure evaluation, medications prescribed, and test use. This period provided a potential for 3 years of follow-up. Chart review occurred from December 1996 through March 1997.

To evaluate consistency across reviewers, a second blinded record review was completed using 45 patient records selected randomly. The κ statistic was estimated to assess interrater reliability for each review criterion. For these analyses, only the 8 measures (representing 5 criteria) with a $\kappa \geq 0.4$ were used for analyses of adherence. The highest ratios were for the measurement of LVEF (0.57), measurement of renal function (0.63), prescribed trial of angiotensin-converting enzyme (ACE)

inhibitors (0.80), and ACE inhibitor at target dose (0.72). In addition to this assessment of data quality, the chart extraction manager evaluated each extraction form; any questionable or missing information was verified during a follow-up chart review.

Analyses

The unit of analysis for both research questions was at the patient level, and weighted performance rates are reported for the total population of heart failure patients in the 25 practices. Initial plans to analyze performance at the physician and practice levels were hindered by the small number of patients in each practice. Seven of the 25 practices had ≤10 patients with evidence of heart failure; 13 practices had 11 to 25 patients. Recent evidence suggests that performance rates lack stability with such small numbers.[15] Weighted adherence rates were calculated to adjust for the systematic sampling in the 5 larger practices.

For the first research question (How many heart failure patients found through claims data are actually eligible for measuring quality of care in accordance with an evidence-based guideline for systolic dysfunction?), we calculated the adjusted percentages of patients listed in the administrative datasets who had evidence of heart failure in the chart (more than 3 visits with documentation), had verified heart failure, and had confirmed systolic heart failure (LVEF ≤40%). For the second research question (What are the adherence rates to specific measurable review criteria among this sample of primary care physicians?), we used several denominators for the various review criteria. For the 3 diagnostic criteria, we used the estimated total number of patients who had evidence of heart failure documented in their charts. For the first ACE inhibitor review criterion, we evaluated performance separately among the systolic heart failure patients and all other heart failure patients (those with a normal LVEF or no LVEF documented). For the second ACE inhibitor criterion (evaluating dosages), the denominator was the estimated number of patients taking the drug at the time of the chart review.

Tests of 2 proportions were run for the 2 pharmacologic review criteria to determine if the performance rates were significantly higher in the systolic heart failure group than with all other heart failure patients. Also, chi-square tests and comparison-of-mean t tests were conducted to compare descriptors of heart failure presentation and specific comorbidities between these 2 groups (using the original unadjusted sample).

RESULTS

Patient Characteristics in Cohort

The average age of the patients was 76 years (± 11 years), with nearly one fourth of the sample aged 85 years or older. Although nearly half (48%) of the patients had been given their diagnosis less than 2.5 years before the chart-review period, almost one fourth (24%) had received the diagnosis more than 5 years ago. The prevalence of comorbidities was high among these patients. Eighty-six percent of the sample had one or more diseases associated with heart failure. Chronic obstructive pulmonary disease, diabetes, and arthritis were documented in approximately one third of the patient medical records (29%, 35%, and 32%, respectively).

The comparison of heart failure presentation descriptors and comorbidities is presented in Table 2. Systolic heart failure patients were younger at the time of diagnosis and were less likely to have arthritis or osteoporosis listed as a comorbidity. Although the prevalence of coronary artery disease was statistically similar in the 2 groups, significantly more (P = .01) of the systolic heart failure patients had a history of myocardial infarction (55% of patients with low LVEF vs 45% among the others). In all other comparisons, including NYHA functional classification, no difference was found between the groups.

Accuracy of Administrative Databases

Of 740 patients in the billing database with the ICD-9-CM code for heart failure, the adjusted number with suspected heart failure was 661 (89%). Only 572 (77%) had verified heart failure by clinical criteria. In the study sample, a low LVEF consistent with systolic heart failure was found for only 142 patients (37% of those with documented evidence of heart failure), though a normal LVEF was found for an equal number of patients (n = 145, 37%). Thus, we estimate only 31% of all patients labeled with heart failure in administrative databases in these 25 practices had documented systolic dysfunction.

Diagnostic Criteria

The adjusted performance rates based on our weighted sampling for the diagnostic review criteria are presented in Table 3. Within 3 months before or following diagnosis, 60% of all suspected heart failure patients (n = 661 estimated) had a measure of LVEF documented. This rate increased to 67% for the time interval of 6 months before or after diagnosis. When any time frame was disregarded, we found that 82% had an LVEF test documented in the medical record.

Higher adherence rates would have been found for use of LVEF if we had used more specific criteria. Of 72 charts reviewed that did not have any documentation of an LVEF measure, 13 (18%) showed the test had been ordered but no documentation of the result. Physicians were queried about LVEF testing for the remaining patients. They reported another 10 (14%) patients had LVEF measures taken while in the hospital and 8 (11%) patients refused the test. For our study these 31 patients were all grouped in the nonadherence category. Those patients without any LVEF measurement were signifi-

TABLE 2

Patient Characteristics in Congestive Heart Failure Project

Variable	CHF Patients with LVEF ≤40% (n=142)	Other CHF Patients* (n=196)
Age, in years, at time of medical record review		
Mean (95% CI)	73.5 (71.3, 75.5)	77.4 (75.9, 78.9)†
Years since initial CHF diagnosis		
Mean (95% CI)	3.6 (3.1, 4.1)	3.8 (3.4, 4.3)
NYHA functional status, no. (%)		
1: Mild	11 (13)	24 (20)
2: Moderate	33 (38)	47 (40)
3: Severe	31 (36)	28 (24)
4: Extremely limited	12 (14)	19 (16)
Missing	56	78
Comorbidities, no. (%)		
Known risk factors for HF		
Hypertension‡	93 (65)	124 (63)
Coronary artery disease‡	92 (65)	108 (55)
Diabetes‡	53 (37)	64 (33)
Alcoholism‡[LH1]	11 (8)	6 (3)
Lung diseases‡	49 (35)	68 (35)
Arthritis‡ or osteoporosis	34 (24)	74 (38)†
Other chronic diseases‡	84 (59)	126 (64)
No comorbidities‡	5 (4)	9 (5)

Note: This table presents rates for the 338 patients verified as having left ventricular heart failure.

CHF denotes congestive heart failure; LVEF, left ventricular ejection fraction; CI, confidence interval; NYHA, New York Heart Association.

*This group includes both those patients with the lowest LVEF >40% and those with no documented measure of LVEF found in the medical record.

†Patient characteristic was significantly different at $P < .01$.

‡Only the number of patients who had each comorbidity are presented in the table. The chi-square test compared prevalence among these patients to (≤.4) with that among other CHF patients without the comorbidity.

cantly older (82 vs 75 years; t test $P < .001$) and had fewer comorbidities (average = 2.6 vs 3.5; t test $P < .001$) than patients who had the test.

Measuring initial laboratory evaluation was complicated by uncertainty about the time of diagnosis, place of diagnosis, and the time frame chosen for compliance. Thus, several review criteria had low κs (< 40%) and were not reported. For laboratory evaluation, performance rates ranged from a low of 30% for thyroid function to a high of 72% for renal function tests. Documentation of patient education about diet changes was also low (21% compliance). However, low compliance should be interpreted with caution, as medical record review has been found to be unreliable in assessing patient education.[16]

Treatment Review Criteria

The performance rates for treatment review criteria are shown in Table 3. The adjusted rate of ACE inhibitor use in all patients with a diagnosis of heart failure was 74% (n = 421). We report data for compliance with each class of heart failure to illustrate the importance of documenting a low LVEF. The adjusted adherence rate was significantly higher for systolic heart failure patients (91%) than for patients with normal LVEFs or no LVEF measured (62%) (for the test of the difference between 2 population proportions $z = 7.88$, $P < .001$). The performance rates for achieving the target dosages were also significantly different in the 2 groups ($z = -2.38$; $P < .01$). Eighty-seven percent of the estimated number of systolic heart failure patients taking an ACE inhibitor at the time of the chart audit (n = 421 adjusted and estimated) were achieving the target dose, compared with 94% of the other patients. The 95% confidence interval for this performance rate in the systolic heart failure group did overlap the proposed standard of quality. Of the 267 patients in the initial sample who had been prescribed a trial of ACE inhibitors, 37 (11%) met exclusion criteria for not taking one at the time of the chart review.

DISCUSSION

Three important observations come from our study. Heart failure patients in primary care are heterogeneous, with half of the patients having a normal LVEF. The demographic variables in this study and others[17] suggest that primary care heart failure patients are older and have more comorbidities than participants in randomized clinical trials of ACE inhibitors.[18] These findings make assessments of quality of care difficult at best and impossible with certain methodologies. Primary care physicians' use of ACE inhibitors in systolic heart failure patients is higher here than reported in other published studies (Table 4). Finally, the accurate assessment of quality for chronic disease management in primary care is dependent on the use of appropriate methods and measures sensitive to the longitudinal processes of care. Study time frames influence the accuracy of quality assessments.

Previous studies have suggested that the diagnosis of heart failure in primary care is substandard because of overdiagnosis.[6,19] Yet, research is hampered by a lack of specificity in classifying heart failure. ICD-9-CM codes do not currently account for the different classes of heart failure. Although misdiagnosis occurs in practice, our data suggest that the syndrome of heart failure is heterogeneous, with systolic and diastolic heart failure being equally prevalent. This finding is perhaps not surprising given the age of our cohort, and is consistent with other studies suggesting a high incidence of heart failure with normal LVEF.[17,20] Determining the veracity of the diagnosis is vital for measuring quality.

Current views of heart failure may be no more accu-

TABLE 3

Review Criteria for Diagnosing and Treating Congestive Heart Failure

Criteria	Proposed Standard of Quality, %	Total Number of Patients	Adherence, % (95% CI)
Diagnostic Criteria			
Left ventricular ejection fraction test	90 to 95	611	
Within 3 months before or after diagnosis			60 (56, 64)
Within 6 months before or after diagnosis			67 (64, 71)
Ever done			82 (79, 85)
Laboratory tests within 3 months before or after diagnosis by primary care physician	80 to 85	611	
Renal function (creatinine, BUN)			72 (69, 76)
ECG			67 (63, 70)
Abumin			53 (49, 56)
Thyroid function (estimated n = 600)			30 (27, 34)
Patient education within 3 months before or after diagnosis	90 to 95	611	21 (18, 25)
Pharmacologic Criteria			
Trial of ACE inhibitors was prescribed	90 to 95		
HF patients with LVEF ≤ 40%		231	91 (88, 95)
All other HF patients*		340	62 (57, 67)
Among patients on ACE inhibitors, prescription was at target dose or exclusions were documented.	90 to 95		
HF patients with LVEF ≤ 40%		197	87 (83, 92)
All other HF patients*		180	94 (91, 98)

Note: The sample sizes and adherence rates in this table are weighted estimates, after adjusting for the systematic sampling in the 5 larger practices (versus reviewing charts of all patients with heart failure in the 20 smaller practices).
CI denotes confidence interval; BUN, blood urea nitrogen; ECG, electrocardiogram; ACE, angiotensin-converting enzyme; LVEF, left ventricular ejection fraction; HF, heart failure.
*This group includes both those patients with the lowest LVEF > 40% and those with no documented LVEF found in the medical record.

rate than musings on presbycardia were 50 years ago.[21] Since primary care heart failure patients are older and have more comorbidities than participants in randomized clinical trials, important questions are raised about the generalizability and effectiveness of interventions on the basis of our best scientific evidence.

In Table 4 we summarize other studies that have assessed physician performance with heart failure patients. The performance standard for LVEF measurement in our study is similar to that found in a recent outpatient study[22] that used the same ICD-9-CM selection criteria. Three other outpatient studies[19,23,24] were completed in the United Kingdom, where access to LVEF tests may be more limited than in the United States. Our findings reiterate the importance of an early measure of LVEF to classify heart failure, because a physician's use of ACE inhibitors was strongly associated with documentation of a low LVEF. Among the 18% of patients in the initial study sample who had no documented measure of LVEF, the performance rate for ACE inhibitor use (78%) was significantly lower than the threshold rate recommended for systolic heart failure patients. It is unlikely that clinical characteristics could distinguish between heart failure classes.[31]

Misclassification of patients with heart failure is an important concern, both clinically and within administrative databases, and is complicated by comorbidities and uncertainties about the disease process over time. Many studies that suggest low physician compliance with ACE inhibitor prescription did not classify heart failure patients according to LVEF status.[3,4,5,24] In our study and in most others that classified heart failure by LVEF, however, there were substantially higher rates of ACE inhibitor use for patients with systolic heart failure.[25-28, 22] Also, the studies reporting the lowest compliance rates had less specific sample selection criteria than our study, using more ICD-9-CM codes.[4,5,29] Two studies suggesting low compliance were based on physician self-report.[3,5] Although the National Ambulatory Medical Care Survey provides insightful snapshots of physician practices, it may underestimate pharmaceutical use over time for chronic diseases; ACE inhibitors were not linked to measures of LVEF for heart failure.[5] The questionnaire used by Edep[3] and others to assess physician performance presented standard descriptions of heart failure patients with low LVEF but then asked physicians to respond on the basis of their population of heart failure patients, not the specific patient presented. According to our data, those primary care physicians may have accurately reflected their use of ACE inhibitors with their population of heart failure patients, since a large proportion may have had normal LVEFs.

Compared with studies that did classify by LVEF, the compliance of New York family physicians with the AHCPR clinical guideline recommendation for ACE inhibitor use is higher than that found in an academic setting[22] and in 2 studies of Medicare patients hospitalized for heart failure.[27,29] Other studies[25,26,30] have examined ACE inhibitor use for heart failure patients by

TABLE 4

Findings from Recent Articles About Quality Care Assessments for Heart Failure

Study	Study Design Characteristics: Data Source	Year Study Completed	Criteria for Systolic HF LVEF %	Sample Size	Adherence Measures: LVEF Test All HF Patients, %	ACE Inhibitor Use: All HF Patients, %	ACE Inhibitor Use: Patients With Low LVEF, %
Hospital-Based Studies							
McDermott et al[25]	MRR; 1st admission	1992	<40	467	73	54	65
Philbin et al[26]	MRR; 1st admission	1992	≤45	388	—	51	63
Gordian[29]	MRR; last admission	1994	<40	263	53	55	59
LSPROC[27]	MRR; last admission	1994	<40	6749	59	55	73
Philbin[30]	MRR; 1st admission	1995	—*	1150	—	64	—*
Outpatient Studies							
Parameshwar et al[23]	MRR; 3 general practices, patients Rx diuretics	1988	—	117	28	—	—
Wheeldon et al[19]	MRR; 1 acad. practice, diuretic users	1990	—	89	44	—	—
Clarke et al[24]	MRR; 6 general practices, patients Rx loop diuretics	NA	—	281	31	17	—
Croft et al[5]	NAMCS (self-report)	1992	—	352†	—	30	—
Fonarow et al[28]‡	MRR & evaluation, heart transplant candidates	1994	All systolic HF patients	214	—	—	77
Chodoff et al[22]	MRR; 2 academic practices	1994	<40	100	79	68	81
Simko and Stanek[4]	Rx database; 1 outpatient facility	1995	—	148	—	41	—
Edep et al[3]	Mail survey: self-report of current practices	1995	<40	Physicians: GP/FP: 342 IM: 325 CD: 327	GP/FP: 61 IM: 69 CD: 92	If mild-mod HF: GP/FP: 62 IM: 74 CD: 85	—

HF denotes heart failure; LVEF, left ventricular ejection fraction; ACE, angiotensin-converting enzyme; LSPROC, Large State Peer Review Organization Consortium; NA, date of data collection not provided; NAMCS, National Ambulatory Medical Care Survey; MRR, medical record review; GP/FP, generalist physician/family physician; IM, internal medicine physician; CD, cardiologist.

*The left ventricular ejection fraction was used as a continuous variable in multivariate modeling; a lower EF was associated with ACE-inhibitor prescription.

†Each office visit recorded in NAMCS was for a different patient.

‡This study was an intervention, examining the efficacy of ACE inhibitors. Baseline prescription rate is reported.

internists and cardiologists and also found lower rates of use in the hospital setting. Our study could reflect actual change in clinician behavior since the dissemination of the guideline. However, it more likely reflects the degree to which our study controlled for the classification of heart failure according to LVEF and the time frame for our observation.[31] The overall compliance rate for use of ACE inhibitors was 74% among patients with heart failure, verified through chart review. Yet, among patients with a confirmed LVEF ≤40% and corrected for patients with contraindications, the performance rate was 91%.

This research raises important questions about the measures and methods for studying quality in primary care. Our attempt to apply a rigorous method of guideline adherence measurement to primary care settings resulted in measurable review criteria that revealed the complexities of care over time. Despite the emergence of evidence-based medicine, there remains significant uncertainty in the day-to-day care of patients with chronic disease. The diagnostic uncertainty of systolic heart failure has been emphasized, but we would also emphasize that uncertainty surrounds the complex care of the elderly with multiple comorbidities. Our study did not address these issues. Moreover, the application of treatment efficacy studies from younger patients to effectiveness in primary care senior populations raises concerns about the external validity of these randomized clinical trials.

Also, cross-sectional assessments of quality miss the purpose and process of longitudinal physician-patient relationships and underestimate the potential for diagnoses and therapeutic approaches to evolve over time. Our criteria for accepting physician performance as appropriate were likely more lenient because of the time frame used for compliance. For example, the dose of an

ACE inhibitor had to remain constant for at least 6 months before we declared that the target dose had not been reached. Our experience in primary care settings suggests that the appropriateness for certain interventions, such as medication changes, is highly time sensitive, yet we know little of the contributors to timing of interventions in primary care.

LIMITATIONS

Though the 25 practices represent different types of offices in rural, suburban, and urban sites, the generalizability of our findings is limited, and larger studies should replicate this work, specifically with respect to the clarification of the syndrome of heart failure in primary care. The representativeness of the participating practices should be questioned. These practices are participants in a practice-based research network and were more likely to teach medical students; therefore, they may have been more up-to-date about heart failure, assessing LVEF, and using ACE inhibitors. However, we analyzed data from an earlier adherence survey of physicians in New York State[13] and found no difference in the use of guidelines or in physician knowledge of the heart failure clinical practice guideline by participants and nonparticipants.

For studies of this magnitude, errors in data collection and data entry are possible. Our quality checks reduced this bias, as did a re-examination of the medical records at a later date for changes in care. Questions also arise about the validity and reliability of the quality measures. The reliability of some of the review criteria is hindered by the complexities of physician decision making and the inadequacies in documentation. Although we measured multiple indicators of quality, only 2 were solid with good interrater reliability and scientific evidence supporting them.

Although assessing LVEF and ACE inhibitor prescriptions does approximate a standard of technical quality that evidence increasingly asserts improves patient outcomes, most physicians might argue that even these do not measure quality. Other activities, such as patient education about low-salt diets, exercise, and medication compliance, are important, but concerns about the quality of the data for these measures limit their utility for judging quality of care.[16] Also, examination of patient care should better evaluate the causes of variability, especially patient and other nonclinical factors that might supersede the technical standards established. For example, other work has suggested that physicians are less likely to order an echocardiogram if patient-centered nondisease factors become a priority.[32]

We believe the most reliable, accurate, and valid performance measures for systolic heart failure are those for pharmaceutic use and measures of LVEF, but the optimum time frame for observation requires further study. All other measures are suspect because of the variability of chart documentation, complexity of decision making, and timing of actions. Despite these difficulties, our study does establish benchmarks for comparison, and thus may serve as a foundation for others to attempt quality studies in primary care. Finally, our study does not answer the most important question of whether adherence to the guideline translates into improved outcomes.

CONCLUSIONS

We used review criteria translated from an evidence-based clinical guideline to evaluate the quality of care for primary care patients with heart failure in upstate New York. Primary care physicians should critically examine their practices for testing LVEF in patients suspected to have heart failure, as this appears below standard. Performance rates for ACE inhibitor use were above those noted in other studies and were acceptable for patients with documented systolic dysfunction. For patients who did not have a measure of LVEF documented, however, we noted lower quality of care as measured by this disease-specific guideline. Improved dosing of ACE inhibitors is needed to achieve target dosages in heart failure patients, while further study is needed to clarify the syndrome of heart failure in primary care settings.

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