Research

Recherche

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See related article page 305

Return to August 7, 2001 Table of Contents

Quality of congestive heart failure treatment at a Canadian teaching hospital

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Abstract

Background: Practice guidelines for the management of congestive heart failure (CHF) emphasize the need for assessment of left ventricular function and treatment with angiotensin-converting enzyme (ACE) inhibitors. However, previous studies have shown that many patients do not receive these tests or medications. The objective of this study was to evaluate the compliance of physicians at a large Canadian teaching hospital with published CHF management guidelines.

Methods: We conducted a retrospective review of the charts of 200 patients admitted to Sunnybrook & Women's College Health Sciences Centre, Toronto, in 1997 for whom CHF was the diagnosis most responsible for the hospital admission. Quality of care was measured with 3 indicators: the use of left ventricular function testing to determine systolic versus diastolic dysfunction; the prescription of ACE inhibitors to appropriate patients (those with systolic dysfunction, no contraindications to ACE inhibitor therapy and no angiotensin II receptor blocker use); and the prescription of target doses of ACE inhibitors.

Results: Of the 200 patients 177 (88.5%) received left ventricular function testing before or during their hospital stay; of the 177, 117 (66.1%) had systolic dysfunction. A total of 100 patients were considered to be ideal candidates for ACE inhibitor treatment. Of the 100, 89 (89.0%) received ACE inhibitors; however, only 23 (23.0%) were prescribed target doses.

Interpretation: Most patients who had CHF at this Canadian hospital received left ventricular function testing and ACE inhibitor therapy. Future educational efforts should focus on the importance of adequate dosing of ACE inhibitors.

Congestive heart failure (CHF) is a common and serious condition that affects 200 000 to 300 000 people in Canada. It is the leading reason for hospital admission among elderly Canadians. Furthermore, since 1970 the rate of death from CHF has increased by 60%, and the current 5-year survival rate is only 62%.[1]

Because of this prevalence, several professional groups have issued guidelines to optimize the diagnosis and management of the disease.[2–4] Follow-up studies have shown lower than expected rates of adherence to these guidelines.[5–7] However, these studies evaluated practices before or soon after the first guidelines were published and therefore did not allow for the dissemination and incorporation of the guidelines into common clinical care. In addition, many of the early studies did not differentiate between patients with systolic and diastolic dysfunction, which made it difficult to evaluate quality of care in combined patient cohorts.

In this study we sought to overcome these difficulties and to assess the quality of CHF care at a Canadian hospital using measures derived from the Agency for Health Care Policy Research guidelines.[2] The quality indicators included the use of left ventricular function testing in all patients with CHF and the prescription of angiotensin-converting enzyme (ACE) inhibitors to appropriate patients.

Methods

We conducted a retrospective review of the charts of patients admitted to the Sunnybrook & Women's College Health Sciences Centre, a large teaching hospital in Toronto. Included were patients admitted in 1997 with a most responsible discharge diagnosis (the diagnosis that

most accounted for the need for the hospital stay) of CHF. We randomly selected 200 patients from a total of 275 with CHF admitted that year. If patients were admitted more than once in 1997, the first admission was used for our analysis. Patients were excluded if they died during their hospital stay, had renal failure requiring dialysis or were transferred from another hospital.

We gathered detailed information on patient demographic features, past medical history, diagnostic tests and medical therapy. One of us (E.W.) reviewed and abstracted the data.

The study was approved by the Sunnybrook & Women's College Health Sciences Centre research ethics board.

For the first quality indicator we determined whether left ventricular function was measured before or during the hospital stay in patients admitted with a diagnosis of heart failure. Patients were considered to have received appropriate testing if they had documentation of their left ventricular function in the chart or a record in the hospital's echocardiography laboratory.

For the second indicator we measured the proportion of "ideal" patients who were treated with ACE inhibitors. Patients were considered to be ideal candidates for ACE inhibitor treatment if they had systolic dysfunction, did not have contraindications to ACE inhibitor therapy and were not receiving angiotensin II receptor blockers. Systolic dysfunction was defined according to left ventricular grade or ejection fraction. Grade II/III to IV left ventricular dysfunction or an ejection fraction of 40% or less was interpreted as systolic dysfunction.[2] All tested patients without systolic dysfunction were considered to have diastolic dysfunction. Contraindications to ACE inhibitor use included history of intolerance, severe aortic stenosis, hyperkalemia (potassium level greater than 5.5 mmol/L) that could not be reduced, renal artery stenosis, serum creatinine level greater than 265 mmol/L that could not be reduced or symptomatic hypotension.

For the final indicator we determined whether target doses of ACE inhibitors were prescribed at discharge. The threshold for target dosing was based on the amounts used in the major clinical trials and other quality-of-care audits.[2,3,5,7–9] The target daily doses were defined as 150 mg for captopril, 20 mg for enalapril, 20 mg for lisinopril, 20 mg for fosinopril, 20 mg for benazepril, 20 mg for quinapril and 10 mg for ramipril.

We compared the relative rate (with 95% confidence interval [CI]) of prescription of medications at discharge to patients with systolic and diastolic dysfunction.

Results

We reviewed the medical records of 200 patients with CHF. The characteristics of the study population are summarized in Table 1. The median length of stay was 5 days. The medications prescribed before admission and during the hospital stay are presented in Table 2. On admission, 93 patients (46.5%) were receiving ACE inhibitors. Of the 133 patients with a previous history of CHF, 74 (55.6%) were receiving ACE inhibitors on admission. During their hospital stay 147 patients (73.5%) received ACE inhibitors.

Left ventricular function testing

Of the 200 patients 177 (88.5%) received left ventricular function testing. Of the 177, 99 underwent testing during the index hospital stay. In almost all cases (98.3%), testing was done with echocardiography. About two-thirds (66.1%) of tested patients were found to have systolic dysfunction; the remaining third had diastolic dysfunction.

Discharge medications

The medications prescribed on discharge are shown in Table 2. ACE inhibitors (relative rate 1.38 [95% CI 1.08–1.78]), digoxin (relative rate 1.74 [95% CI 1.13–2.57]) and nitrates (relative rate 1.59 [95% CI 1.14–2.50]) were used significantly more frequently in patients with systolic dysfunction than in those with diastolic dysfunction. There

Table 1: Characteristics of patients with congestive heart failure (CHF) admitted to a large teaching hospital in Toronto in 1997

Characteristic	No. (and %) of patients *n = 200*
Age, yr	
< 70	33 (16.5)
70–80	70 (35.0)
> 80	97 (48.5)
Sex	
Female	103 (51.5)
Male	97 (48.5)
Medical history	
Previous diagnosis of CHF	133 (66.5)
Diabetes mellitus	63 (31.5)
Hypertension	89 (44.5)
Previous myocardial infarction	92 (46.0)
Previous coronary artery bypass grafting	23 (11.5)
Previous percutaneous transluminal coronary angioplasty	5 (2.5)
Signs and symptoms	
Dyspnea	188 (94.0)
Chest pain	40 (20.0)
Peripheral edema	90 (45.0)
Elevated jugular venous pressure	124 (62.0)
Vital signs	
Febrile	2 (1.0)
Tachycardia (heart rate > 100 beats/min)	63 (31.5)
Tachypnea (respiratory rate > 24 breaths/min)	83 (41.5)
Systolic blood pressure < 90 mm Hg	2 (1.0)
Systolic blood pressure > 200 mm Hg	11 (5.5)
Diastolic blood pressure > 100 mm Hg	17 (8.5)
Electrocardiography findings*	
Atrial fibrillation	54 (27.0)
Hypertrophy	61 (30.5)
Ischemia	28 (14.0)
Chest radiography findings	
Pulmonary edema	170 (85.0)
Cardiomegaly	81 (40.5)
Laboratory findings	
Potassium level > 5.0 mmol/L	15 (7.5)
Serum creatinine level > 130 mmol/L (women) or > 165 mmol/L (men)	58 (29.0)
Hemoglobin level < 120 g/L (women) or < 135 g/L (men)	107 (53.5)

*As determined from the cardiologist's report.

were no significant differences between the 2 groups in the use of other medications on discharge.

Of the 117 patients with systolic dysfunction, 12 had contraindications to ACE inhibitor therapy documented in their charts, and 5 were treated with angiotensin II receptor blockers. Therefore, there were 100 patients considered ideal candidates for ACE inhibitor therapy, of whom 89 (89.0%) were prescribed an ACE inhibitor at discharge.

Only 23.0% of the 100 patients considered ideal candidates for an ACE inhibitor were prescribed the target dose used in the clinical trials. We considered that a portion of the cases in which less than the recommended dose was prescribed may have been due to the initiation of therapy with a new drug and the need to titrate to a therapeutic dose. We therefore evaluated discharge dosing in the 82 patients who were receiving an ACE inhibitor on admission. However, only 24 (29.3%) of these patients were prescribed a target dose.

Interpretation

Most (88.5%) of the patients in our sample underwent left ventricular function testing before or during their hospital stay. This rate compares favourably with those reported in studies from the United States and Europe (52%–83%).[5,10–13]

Because ACE inhibitors have been shown in clinical trials to reduce rates of death and hospitalization, they have become a central tenet of CHF management guidelines.[2,3] The physicians of patients evaluated in our study achieved high rates of ACE inhibitor use (89.0%) on discharge in appropriate patients.

Only a minority of patients (23.0%) in our study received ACE inhibitors at doses comparable to those assessed in clinical trials. However, the significance of this result is difficult to evaluate for a number of reasons. First, there is scant experimental evidence to clarify the optimal dosing of ACE inhibitors. One of the few trials was the Assessment of Treatment with Lisinopril and Survival (ATLAS) trial, which compared high and low doses of lisinopril. This trial showed a reduction in rates of hospital admission, but not in death rates, with higher doses.[14] Second, the population seen in clinical practice (as demonstrated by our study population) differs from the populations studied in clinical trials in that they are generally older with more concomitant diseases, such as renal insufficiency. Despite these difficulties, published CHF guidelines recommend using ACE inhibitor doses demonstrated to be effective in the clinical trials.[3] These problems epitomize the complexity of translating results from clinical trials to clinical practice.

Compared with similar audits of quality of care for patients with CHF, our study showed that the overall rates of prescribing ACE inhibitors were among the highest and the rates of prescribing target doses were intermediate. In studies from Europe and the United States, the corresponding overall and target dose prescription rates were 30%–90% and 14%–61% respectively.[5–13,15]

There are a number of limitations intrinsic to the design of our study. First, a retrospective chart review is limited by the information recorded in the chart. Important informa-

Table 2: Medications prescribed for CHF before hospital admission, during hospital stay and at discharge

	Time; no. (and %) of patients					
			At discharge			
Medication	Before admission	During hospital stay	All patients *n = 200*	Patients with systolic dysfunction *n = 117*	Patients with diastolic dysfunction *n = 60*	Relative rate of use in systolic v. diastolic dysfunction (and 95% CI)*
ACE inhibitor	93 (46.5)	147 (73.5)	130 (65.0)	89 (76.1)	33 (55.0)	1.38 (1.08–1.78)
Adequate dose of ACE inhibitor†	–	–	30 (23.1)	23 (25.8)	6 (18.2)	–
Angiotensin II receptor blocker	3 (1.5)	11 (5.5)	11 (5.5)	8 (6.8)	3 (5.0)	1.37 (0.38–4.97)
Diuretic						
1	120 (60.0)	200 (100.0)	173 (86.5)	104 (88.9)	50 (83.3)	1.07 (0.94–1.21)
> 1	10 (5.0)	42 (21.0)	22 (11.0)	17 (14.5)	5 (8.3)	1.74 (0.68–4.50)
Digoxin	81 (40.5)	108 (54.0)	96 (48.0)	68 (58.1)	20 (33.3)	1.74 (1.13–2.57)
β-Blocker	44 (22.0)	46 (23.0)	33 (16.5)	19 (16.2)	12 (20.0)	0.81 (0.42–1.56)
Nitrate	57 (28.5)	114 (57.0)	93 (46.5)	66 (56.4)	20 (33.3)	1.59 (1.14–2.50)
Hydralazine	8 (4.0)	9 (4.5)	8 (4.0)	4 (3.4)	3 (5.0)	0.58 (0.16–2.96)
Calcium-channel blocker	35 (17.5)	48 (24.0)	33 (16.5)	20 (17.1)	11 (18.3)	0.93 (0.48–1.82)
Antiarrhythmic	17 (8.5)	22 (11.0)	18 (9.0)	14 (12.0)	3 (5.0)	2.39 (0.72–8.00)

Note: ACE = angiotensin-converting enzyme, CI = confidence interval.
*Relative rate estimate represents comparison of patients with systolic and diastolic dysfunction.
†See the Methods for dosing information. Numbers and percentages represent ACE inhibitor recipients who were prescribed a target dose.

tion, especially regarding contraindications to ACE inhibitor use, may not have been recorded. Second, we were able to capture information only about the index hospital admission. This is of special relevance when managing a chronic problem, such as CHF. In such patients much of the medical treatment may be started or optimized in the outpatient setting following the acute exacerbation. Third, we evaluated practices at a single institution. Practices may differ elsewhere. Finally, the data were abstracted by a single reviewer.

In summary, left ventricular function testing and ACE inhibitor therapy were generally used in CHF management at this Canadian academic centre. However, ACE inhibitors were frequently prescribed at doses below those used in clinical trials. More research is needed to determine the optimal dosing levels for patients commonly treated in clinical practice.

Competing interests: None declared.

Contributors: Ms. Weil conducted the chart reviews for the study, analyzed the data and led the writing of the manuscript. Dr. Tu conceived the idea for the study, obtained funding for the study, oversaw the data abstraction and analysis and contributed to the writing of the manuscript.

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