

Potential gaps in congestive heart failure management in a rural hospital

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This article has been peer reviewed.

Introduction: Congestive heart failure (CHF) is increasingly recognized as an important cause of morbidity and mortality. Previous studies in urban settings have shown that patients frequently are not receiving recommended therapy. There is a paucity of studies that have evaluated CHF management in a rural setting. We therefore reviewed hospital and outpatient care in this setting as an initial step toward improving CHF care.
Method: A retrospective chart review was used to examine the care of all 34 patients hospitalized for CHF from 2000–2001 in a small rural hospital, to assess the need for improved CHF management.
Results: The median age of the patients was 78 yr, and a number of them had many co-morbid cardiovascular risks. Similar to other studies, only 23% of patients were prescribed recommended doses of angiotensin-converting enzyme (ACE) inhibitors. Use of beta-blockers was far below expected rates. Although there was follow-up care for nearly all patients (97%), few patients had echocardiography performed (38%) or had their medications altered in the outpatient setting.
Conclusion: There is a need for improved management of CHF in the rural setting. Approaches to improving CHF care should use the continuity of care advantage provided by primary care physicians to optimize outpatient medical treatment regimens and improve access to diagnostic services such as echocardiography.

Introduction : On reconnaît de plus en plus l'insuffisance cardiaque globale (ICG) comme une cause importante de morbidité et de mortalité. Des études antérieures réalisées en milieu urbain ont montré qu'il arrive souvent que des patients ne reçoivent pas la thérapie recommandée. Les études qui ont évalué la prise en charge de l'ICG en milieu rural sont rares. Nous avons donc étudié les soins hospitaliers et externes dans ce contexte comme première étape afin d'améliorer le traitement de l'ICG.
Méthode : On a procédé à une étude rétrospective de dossiers afin d'analyser les soins reçus par les 34 patients hospitalisés pour ICG de 2000 à 2001 dans un petit hôpital rural afin d'évaluer le besoin d'améliorer la prise en charge de l'ICG.
Résultats : L'âge médian des patients s'établissait à 78 ans et certains d'entre eux présentaient de nombreux risques cardiovasculaires comorbides. Comme dans le cas d'autres études, on a constaté que les doses recommandées d'inhibiteurs de l'enzyme de conversion de l'angiotensine (ECA) étaient prescrites à 23 % seulement des patients. L'utilisation des bêta-bloquants était très inférieure aux taux attendus. Même si presque tous les patients (97 %) ont reçu des soins de suivi, peu de patients (38 %) ont subi une échocardiographie ou ont bénéficié en contexte externe d'une modification de leur médication.
Conclusion : Il faut améliorer la prise en charge de l'ICG en milieu rural. Les stratégies d'amélioration du traitement de l'ICG devraient se fonder sur la continuité des soins, avantage qu'offrent les médecins de première ligne, afin d'optimiser les régimes de traitement médical en service externe et d'améliorer l'accès aux services de diagnostic tels que l'échocardiographie.

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Introduction

Congestive heart failure (CHF) is the leading cause of hospital admissions in Canada.[1] Hospitalization rates in Ontario for the fiscal year of 1996/97 averaged 287 per 100 000 people.[2] This disease syndrome is also a major cause of morbidity and mortality, with 1-year mortality ranging from 24% to 60% depending on age and co-morbidities.[3]

In recent years, the understanding of the pathophysiology of CHF has improved greatly and has led to the development of advanced methods for diagnosing and treating CHF. These medical advances and the high prevalence of the disease have been a motivating force for the development of clinical practice guidelines for the diagnosis and management of CHF. *The 2002/3 Canadian Cardiovascular Society Consensus Guideline Update for the Diagnosis and Management of Heart Failure* recommended that the diagnosis of CHF be based on clinical signs and symptoms and the use of diagnostic tools such as 12-lead electrocardiogram (ECG), digital pulse oximetry, chest radiography and echocardiography.[1] Clinical assessment of the severity by the New York Heart Association (NYHA) Classifcation is also considered important for effective selection of treatments. The NYHA guidelines indicate Class I with no symptoms, Class II – symptoms with ordinary activity, Class III – symptoms with less than ordinary activity and Class IV – symptoms when at rest.[4]

Medical management guidelines for CHF recommend the use of several classes of drugs, including angiotensin-converting enzyme inhibitors (ACE inhibitors), beta-blockers, diuretics and digoxin.[1] The initiating and target doses of ACE inhibitors are 1.25–2.5 mg bid and 10 mg bid, respectively, for Enalapril; 1.25–2.5 mg bid and 10 mg for Ramapril; and 2.5–5 mg od and 20–35 mg od for Lisinopril.

Large-scale clinical trials have indicated that the use of ACE inhibitors reduces relative total mortality, hospitalization, worsening heart failure and recurrent myocardial infarction (MI) by 20%–25%, thereby clearly establishing ACE inhibitors as first-line therapy for this disease.[5] Similar evidence exists for beta-blockers for patients with heart failure and left ventricular ejection fraction = < 40%,[6] and for spironolactone for patients with NYHA Class IIIb–IV heart failure.[1,7]

There is increasing evidence that multidisciplinary clinics improve the management of CHF — including reduction in heart failure hospitalizations, accompanying cost savings, and improved adherence to therapy.[8] These clinics typically include nurse-led patient education, dietary and social services consultation, and drug therapy review by a cardiologist, pharmacist and/or primary care physician. Following this evidence, the CCS Consensus Guideline[1] recommends that the use of "specialized hospital based clinics staffed by physicians, nurses and other health care professionals with expertise in heart failure, should be considered for assessment and management of heart failure of higher risk individuals with heart failure." Others have noted that patients with CHF are managed mostly in the community by primary care physicians,[9] where there are many barriers to care, including lack of diagnostic and specialist services.[10,11] Most CHF management studies are set in urban teaching hospitals.

This study was prompted by the observation, made in a hospital audit, that CHF was the 2nd leading cause for hospitalization in our rural practice setting. Our community in Southern Ontario has a small hospital serving a population of 6000. In addition, a province-wide practice atlas of cardiovascular care suggested that, like other settings, many hospitalized older patients at our hospital were not adherent to ACE inhibitors.[2] There is a paucity of studies that have evaluated CHF management in a rural setting. We therefore reviewed hospital and outpatient care in this setting as an initial step toward improving CHF care.

Methods

The study protocol, including office follow-up, was submitted to and approved by the Ethics Review Committee of the Sunnybrook and Women's Health Centre in Toronto.

We identified patients in our rural community admitted to the Chesley Site of the South Bruce Grey Regional Health Centre from July 2000 through June 2001 with a most responsible diagnosis of CHF. Patients transferred from another acute care hospital were excluded from this study. If patients were admitted to hospital more than once during the designated study period , the first admission was used for analysis. The study period chosen allowed for a minimum 1-year post-hospital follow-up period at the time the study was done in July 2002.

Detailed information on patient sociodemographic features, presenting symptoms, past medical history, diagnostic tests and medical therapy was gathered through retrospective chart review using a previously developed 243-item chart abstraction tool.[3] Information regarding follow-up appointments

and outpatient diagnostic testing was extracted from the office charts of the primary care physicians.

The severity of the presenting symptoms was ascertained as the presence of dyspnea at rest, and radiographic evidence of pulmonary edema or cardiomegaly. When available, we extracted data on left ventricular ejection fraction from office charts or hospital records. Medical therapy was determined as the use and dosage of drugs such as ACE inhibitors, beta-blockers, calcium-channel blockers, ASA, digoxin and diuretics.

Results

Thirty-six patients matching the study criteria were admitted during the 12-month study period. Two patients were excluded because they developed CHF after admission to the hospital; therefore, 34 charts were examined. The characteristics of the study population are summarized in Table 1. Males accounted for 65% (n = 22) of the patients. The age of the population ranged from 34 to 91 (median 78) years. The most frequent symptom at presentation was shortness of breath (82% of patients), of which 71% had dyspnea at rest. Other presenting symptoms are listed in Table 2.

Diagnostic investigative reports, such as chest x-ray, 12-lead ECG and echocardiography were reviewed to determine the severity of CHF (Table 2). Eighty-eight percent of patients had a chest x-ray taken within 24 hours of admission. Of these, 63% showed radiologic signs of congestive failure, including: cardiomegaly (53%), pulmonary edema (47%), vascular redistribution (47%) and pleural effusions (10%). Not all chest xrays could be done on the day of admission, which may have resulted in some negative results of x-rays that were taken after treatment of CHF. Most patients (85%) had an ECG. Thirty-four percent of the ECG records showed signs of ischemia, as determined by either ST elevation or depression in any 2 contiguous leads. Echocardiographic reports were found for 38% of patients. Of these, 86% (n = 11) were done within 1 year pre- or post-admission. Fourteen patients had their left ventricular function assessed. Of these, 8 had a Grade I ventricle and 6 had left ventricular systolic dysfunction.

Almost all patients (97%) had comorbid conditions or concurrent cardiovascular risk factors (Table 3). The most common comorbidities were angina, asthma/COPD (chronic obstructive pulmonary disease) or previous MI, and the most common coronary risk factor was current or past smoking.

Table 4 shows medications prescribed during or within 2 months after admission. The drug class prescribed most frequently was ACE inhibitors, with 29 (85%) patients receiving this treatment either during their hospital stay or at discharge. However, of these only 24% received a target dose of ACE inhibitors as defined by the CCS Consensus Guideline.[1] Doses of ACE inhibitors were rarely increased following discharge from hospital. Most patients (82%) were also treated with a diuretic, and most commonly with the loop diuretic furosemide (93%). Only one patient was initiated

Table 1. Characteristics of the 34 patients hospitalized for congestive heart failure from 2000–2001 in a small rural hospital

Characteristic	% (and no.) of patients* n = 34
Male	65 (22)
Age in years, median (and range)	78 (30–91)
<60	9 (3)
60–75	29 (10)
≥76	72 (21)

*Unless otherwise specified.

Table 2. Clinical features of the 34 patients with congestive heart failure (CHF)

Variable	% (and no.) of patients n = 34
Presenting symptom as noted by the admitting physician	
Dyspnea	82 (28)
Onset at rest	71 (20)
Onset with less than ordinary exertion	3.6 (1)
Wheeze	65 (22)
Rales/crackles	56 (19)
Bilateral ankle edema	41 (14)
Chest pain	29 (10)
Nocturnal cough	29 (10)
Orthopnea	26 (9)
Neck vein distension	9 (3)
Paroxysmal nocturnal dyspnea	3 (1)
Hepatojugular reflux (positive)	0
Investigations	
Chest x-ray	88 (30)
Evidence of CHF	63 (19)
Cardiomegaly	53 (16)
Pulmonary edema	47 (14)
Vascular redistribution	40 (12)
Pleural effusion	33 (10)
ECG done	85 (29)
Ischemia (ST changes)	20 (10)
Echocardiography within 1 yr	38 (13)

on a beta-blocker in hospital or after discharge.

The in-hospital mortality rate was 15% (5 patients) (Table 5). On discharge, all patients were instructed to make follow-up appointments with their family doctors. Seventy-nine percent of the 29 patients discharged from the hospital had an identifiable office chart, and 21 of the 29 (72%) had a recorded follow-up appointment with a family physician. Eighteen percent of patients with outpatient records were referred to specialists (cardiologists or general internists), 3% had a follow-up appointment with a specialist only, and no follow-up appointment was recorded for 2 patients (7%). The majority of patients (76%) were seen for follow-up within 14 days of discharge. Outcomes at 1 year following discharge included the following: 31% of patients were readmitted at least once for CHF, and 1 patient suffered an acute MI within this time period. The overall 1-year mortality, including patients who died during their stay in hospital, was 50%. Table 6 indicates that poor renal function did not correlate with lower dosing of ACE inhibitors. A similar trend toward drug underuse was discovered when examining the use of spironolactone for treatment.

Discussion

Patients admitted to the hospital with CHF were elderly, frequently had shortness of breath at rest (NYHA Class IV), abnormal chest x-ray and ECG findings, and many co-morbid conditions. The severity of disease and high 1-year mortality rate in our study was similar to other recent studies.[3]

Echocardiography was performed less often than is recommended by the CCS Consensus Guideline, which recommends it as the primary diagnostic tool.[1] Echocardiograms allow the evaluation of left ventricular ejection fraction, which in turn allows for the classification of the underlying pathophysiology into heart failure with impaired or preserved systolic function. This classification is critical for the treatment of CHF because the medical management of the disease differs according to the underlying

Table 3. Cardiovascular risk factors and co-morbidities of the 34 patients with congestive heart failure (CHF)

Variable	% (and no.) of patients *n* = 34
Cardiovascular risk factor	
Angina	50 (16)
Ever smoked	47 (16)
Asthma / COPD	41 (14)
Previous myocardial infarction	41 (14)
Hypertension	38 (13)
Coronary artery disease	32 (11)
CVA / TIA	26 (9)
Diabetes	24 (8)
Atrial fibrillation	21 (7)
No. of co-morbidities	
≥3	47 (16)
2	26 (9)
1	24 (8)
0	3 (1)

COPD = chronic obstructive pulmonary disease; CVA = cerebrovascular accident; MI = myocardial infarction; TIA = transient ischemic attack

Table 4. Medications prescribed at any time from date of admission to 2 months after discharge for the 34 patients with congestive heart failure

Medication	% (and no.) of patients *n* = 34
ACE inhibitors	85 (29)
Ramipril	66 (19)
Enalapril	31 (9)
Captopril	3 (1)
Lisinopril	3 (1)
On target dose of ACE inhibitors	24 (7)
Diuretic	82 (28)
Furosemide	93 (26)
Spironolactone	18 (5)
Digoxin	24 (8)
Statin	21 (7)
Alpha-blocker	18 (6)
Calcium-channel blocker	18 (6)
Angiotensin receptor blocker	6 (2)
Beta-blocker	3 (1)

ACE = angiotensin-converting enzyme

Table 5. Outcomes and follow-up care for the 34 patients with congestive heart failure (CHF)

Variable	% (and no.) of patients
Follow-up appointments (n = 29)*	
With family physician	72 (21)
With specialist (internist / cardiologist)	21 (6)
Outcomes within 1 year of discharge (n = 29)*	
Readmission for CHF	31 (9)
Myocardial infarction	3 (1)
Died	41 (12)

*Excludes 5 patients (15%) who died during the index hospitalization

ventricular substrate.[12] The echocardiogram is important in the elderly, in whom diastolic dysfunction is more common.

Aday delineated the influences of health care use into system, patient and physician factors.[13] An important system factor that likely contributes to a low use of echocardiography is limited access to this service at our hospital (and other rural settings) compared with urban settings. For example, at a Toronto teaching hospital with onsite access to this test, 88.5% of patients had their left ventricular function assessed, with 48.5% having echocardiography during their hospital stay.[14] However, patient and physician factors may also contribute to the findings. Physicians may not be ordering echocardiography appropriately, and travel for diagnostic tests may be difficult for frail elderly patients. In a study of primary care management of CHF in 15 European countries, 82% of patients had received echocardiography.[9]

The drug therapy of CHF patients was underused but very similar to that reported in both a large Ontario teaching centre and in rural Georgia.[14,15] Most patients receive ACE inhibitors and diuretic therapy, but too few were receiving the target dose as defined in clinical practice guidelines.[1,16] Higher doses of ACE inhibitors have been shown to reduce the risk of rehospitalization for CHF patients by over 20% when compared with low doses.[17] Primary care physicians in our community setting used ACE inhibitors in a frequency and dose similar to that of the specialist-delivered care in a teaching hospital.[14] However, in the office follow-up period assessed in the study, doses of ACE inhibitors were not titrated up to appropriate target doses. Other studies have shown that primary care physicians, compared with cardiologists, are less likely to prescribe ACE inhibitors and more likely to underdose these in CHF patients.[15,18] In the European study of primary care CHF management in 15 countries,[9] the average dose of ACE inhibitors used was 50% of target dose. Some of the reasons suggested in the literature for this include the idea that family physicians are less likely to order the correct diagnostic procedures and therefore may not differentiate systolic from diastolic dysfunction. Family physicians also report more concern about the side effects of these drugs.[10] The authors of the Toronto study[14] noted that evidence for the higher ACE inhibitors doses used in clinical trials,[17] although recommended by published guidelines,[1,16] is scant. The advanced age of most patients in this cohort may also have been a factor in the ACE inhibitors doses prescribed. However, an analysis of serum creatinine and ACE inhibitors dose in this study showed that poor renal function did not correlate with lower dosing of ACE inhibitors (Table 6).

We discovered a similar trend toward drug underuse when we examined the use of spironolactone for treatment (Table 6). Only 14% of patients were prescribed this diuretic, which, when prescribed, recently was found to cause a 35% reduction in mortality and rehospitalization for CHF.[7] Addition of low-dose spironolactone is indicated for CHF patients with systolic dysfunction who have normal renal function and serum potassium, and still have rest symptoms (NYHA Functional Class IV) on maximal medical therapy. Possible explanations for the low rate of use of spironolactone include lack of information on left ventricular function from echocardiogram, and insufficient time to incorporate new treatment information, as this cohort started in June 2000, less than 1 year after the landmark study was published.[7] Furthermore, the use of spironolactone may not have been appropriate in this patient population. The Randomized Aldactone Evaluation Study (RALES)[7] included mainly patients with a NYHA Class III–IV heart failure.[7] Recent evidence suggests that the use of spironolactone in patients with better heart function (NYHA Class I and II), who are receiving target dose ACE inhibitors therapy, is associated with more adverse effects such as hyperkalemia, when compared with patients in the RALES study.[19]

Table 6. Renal function and the use of angiotensin-converting enzyme (ACE) inhibitors and spironolactone for the 34 patients with congestive heart failure

	Use of ACE inhibitors			On spironolactone	
	Patient	Patient on ACE inhibitors			
Creatinine level, no. of patients	not on ACE inhibitors	Not on target dose	On target dose	Yes	No
< 115, *n* = 17	5	11	1	2	15
> 114, *n* = 17	0	12	5	3	14

Only 1 patient was started on a beta-blocker, clearly indicating underuse of a newer treatment that has an important impact on reducing CHF morbidity. Beta-blockers and warfarin (for CHF patients with atrial fibrillation) were the least used medical therapies for CHF in a recent evaluation of quality of CHF care in Ontario hospitals.[20] The guidelines on use of beta-blockers in CHF were quite new at the time of this study, and, possibly, improved use of this disease-modifying drug would be seen now.

Evidence of a high level of continuity of care in this study, as measured by almost complete follow-up with a family physician shortly after discharge, was encouraging. However, it appears that there was a lack of associated improvement in processes of care. For example, patients who were seen in follow-up seldom had their ACE inhibitors titrated to higher doses over time, and no patients were initiated on beta-blockers during office follow-up.

When considering ways to improve CHF care in rural practice, a number of different models can be examined. There is substantial evidence for the efficacy of multidisciplinary CHF clinics.[8] Multidisciplinary CHF management has been shown to improve adherence to practice guidelines.[21] These clinics have also been shown to reduce patient care costs, increase compliance with medications and life-style modifications, and improve quality of life.[8,16,21] Perhaps this form of patient care has a role in CHF management in rural centres, because our results suggest there is less strict adherence to CHF management guidelines. The clinic model has been used in large urban centres; therefore pilot demonstration projects would be needed to assess how well the concept and its delivery translate to rural settings.

Another model to improve CHF care is found in a recent initiative of the BC Ministry of Health Services.[22] This province-wide project focuses on CHF education for family physicians, provision of detailed guidelines and protocols to physicians, the use of a patient care flowsheet in the chart, and a self-monitoring sheet for patients. It also includes a substantial financial reward in the fee schedule for primary care physicians who follow the treatment guidelines when caring for CHF patients.

Another model could combine the effective components of multidisciplinary clinics with the broad reach of improvements in individualized primary care approaches.

A strength of the present study was the post-hospital discharge tracking of patient management and outcomes. Most studies of CHF to date have been hospital-based and do not examine office management after discharge.

Limitations

There are limitations found within the design of this study. A retrospective chart review such as this one only results in collection of information that is recorded in the hospital or office charts. The number of cases depends on admission data and is not powered for statistical analysis. There is the possibility that different doctors record clinical symptoms and signs with different degrees of accuracy. In some cases, important clinical information such as negative physical findings may not have been recorded. Furthermore, some of the charts of deceased patients could not be retrieved in the office setting. The absence of echocardiograms on 62% of patients limits interpretation of the appropriateness of the medical therapies used. In addition, one reviewer abstracted all chart data.

Conclusions

In summary, the 50% 1-year mortality for CHF in a small rural hospital was comparable to population-based CHF mortality[3] for the same province when age and co-morbidities were taken into account. Although some areas of practice were impressive (follow-up care) and others were similar to other settings (ACE inhibitor therapy), there is considerable room for improved CHF management. In particular, both assessment of left ventricular function with echocardiography, and the use of beta-blockers and spironolactone, were below rates expected with adherence to practice guidelines. Although this study did not examine underlying influences, potential reasons could likely be framed as system factors (such as the availability of services) and physician factors related to differences in care delivered by primary care physicians and specialists that are seen in other CHF studies. It is possible that alternative models of delivery, such as a multidisciplinary CHF clinic or the chronic disease management approach of British Columbia, may improve some aspects of care. Although these models of care appear to be poorly evaluated in rural settings, our positive experience with alternative delivery models for diabetes, a condition with similar complex management issues, encourages us to consider new models for the improvement of CHF care in rural settings.

Acknowledgements: This project was funded in part by the SWORRM summer student research program of the University of Western Ontario, and a research grant from the College of Family Physicians of Canada. Dr. Manuel is a Career Scientist of the Ontario Ministry of Health and Long-Term Care. Dr. Lee is funded by a Canadian Institutes of Health Research Clinician-Scientist research award.

Competing interests: None declared.

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