# Are there sex-related differences in specialized, multidisciplinary congestive heart failure clinics?

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**S Houde, D Ehrmann Feldman, L Pilote, et al. Are there sex-related differences in specialized, multidisciplinary congestive heart failure clinics? Can J Cardiol 2007;23(6):451-455.**

**BACKGROUND:** Specialized, multidisciplinary clinics improve service provision and reduce morbidity for patients with congestive heart failure (CHF). Although sex-related differences in access to cardiac health services have been reported, it remains unclear whether there are sex-related differences in the use of these specialized services.
**OBJECTIVES:** To evaluate possible sex-related differences in severity at entry into specialized, multidisciplinary clinics, and compare prescription patterns between male and female patients at these clinics.
**METHODS:** Data were obtained from the electronic clinical files of 765 CHF patients newly admitted to any of three main CHF clinics in Montreal, Quebec. Univariate and multivariate models were used to compare differences between sexes.
**RESULTS:** Only 27.1% of patients were female. The mean age (± SD) of the women in the present study was similar to that of the men (64±16 years versus 65±13 years, respectively). Left ventricular ejection fraction at entry for patients with reduced systolic function was comparable between sexes. The New York Heart Association functional class at entry was similar among men and women with systolic dysfunction. However, among patients with preserved systolic function, women were more symptomatic, with a higher functional class at entry (adjusted OR 2.52, 95% CI 1.18 to 5.38). Prescription profiles were similar for men and women.
**CONCLUSION:** Entry into a clinic may be delayed for women with preserved systolic function CHF. However, clinic referral patterns and disease management appeared to be similar among both men and women with systolic dysfunction CHF.

**Key Words:** *Congestive; Health services; Heart failure; Women*

## Y a-t-il des différences reliées au sexe dans les cliniques multidisciplinaires spécialisées d'insuffisance cardiaque congestive ?

**HISTORIQUE :** Les cliniques multidisciplinaires spécialisées améliorent la prestation des services et réduisent la morbidité des patients atteints d'une insuffisance cardiaque congestive (ICC). Bien qu'on ait déjà constaté des différences reliées au sexe dans l'accès aux services en santé cardiaque, on ne sait pas si ces différences existent à l'égard de l'utilisation des services spécialisés.
**OBJECTIFS :** Évaluer les différences possibles reliées au sexe de la gravité à l'arrivée aux cliniques multidisciplinaires spécialisées et comparer les schémas posologiques entre les hommes et les femmes qui fréquentent ces cliniques.
**MÉTHODOLOGIE :** On a obtenu les données dans les dossiers cliniques électroniques de 765 patients atteints d'une ICC qui venaient d'être admis dans l'une des trois principales cliniques d'ICC de Montréal, au Québec. On a utilisé les modèles univariés et multivariés pour comparer les différences entre les sexes.
**RÉSULTATS :** Seulement 27,1 % des patients étaient des femmes. L'âge moyen (±ÉT) des femmes participant à la présente étude était similaire à celui des hommes (64±16 ans par rapport à 64±13 ans, respectivement). La fraction d'éjection ventriculaire gauche à l'arrivée des patients dont la fonction systolique était réduite était comparable entre les sexes. La classe fonctionnelle de la *New York Heart Association* était similaire entre les hommes et les femmes présentant une dysfonction systolique. Cependant, parmi les patients qui avaient préservé leur fonction systolique, les femmes étaient plus symptomatiques, et leur classe fonctionnelle était plus élevée à l'arrivée (RR rajusté 2,52, 95 % IC 1,18 à 5,38). Les profils d'ordonnance étaient similaires chez les hommes et chez les femmes.
**CONCLUSION :** L'arrivée en clinique est peut-être retardée pour les femmes atteintes d'ICC qui avaient préservé leur fonction systolique. Cependant, les schèmes de consultation en clinique et de prise en charge de la maladie semblaient similaires entre les hommes et les femmes atteints d'ICC présentant une dysfonction systolique.

Congestive heart failure (CHF) is the most common cause of hospital admissions in people 65 years of age and older (1). Women represent more than one-half of these CHF hospitalizations (2); thus, it is important to determine whether there are sex-related inequities in the referral and follow-up of CHF patients. A sex-related bias in access to services has been documented in coronary artery disease (3-8) and, to a lesser extent, in CHF (9-12).

In the past decade, new developments in treatment have led to improvements in CHF survival, decreased hospital admissions and improved quality of life (13,14). To implement these new treatment regimens, and to account for the growing number of cases and hospitalizations, specialized, multidisciplinary CHF clinics have been established. Benefits of these clinics include reduction in emergency room visits, hospitalization frequency and length of stay, together with reduced cost of care and improvement in quality of life; moreover, there is now some evidence to support their impact on survival (15-20). However, it is unclear whether men and women are equally enrolled in such case management programs, and whether they derive the same benefits. Thus, the purpose of the present study was to evaluate possible sex-related

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**TABLE 1**
**Characteristics and sex comparisons of patients in specialized, multidisciplinary congestive heart failure clinics**

| | All | Men | Women | P |
|---|---|---|---|---|
| Number of patients | 765 | 558 | 207 | <0.001* |
| Mean age, years (mean ± SD) | 65±14 | 65±13 | 64±16 | 0.70† |
| Ischemic etiology, % | 55 | 61 | 41 | 0.001‡ |
| Valvular etiology, % | 9 | 8 | 12 | 0.18‡ |
| Mean number of comorbidities§, (mean ± SD) | 2.5±1.6 | 2.5±1.6 | 2.4±1.6 | 0.45‡ |
| Hypertension, % | 37 | 36 | 41 | 0.27‡ |
| COPD, % | 12 | 13 | 8 | 0.08‡ |
| Dyslipidemia, % | 33 | 35 | 28 | 0.06‡ |
| Renal failure, % | 22 | 24 | 16 | 0.01‡ |
| Anemia, % | 6 | 6 | 7 | 0.44‡ |
| Asthma, % | 6 | 5 | 9 | 0.06‡ |
| Peripheral vascular disease, % | 8 | 9 | 6 | 0.26‡ |
| Cerebrovascular disease, % | 10 | 10 | 12 | 0.44‡ |
| Diabetes, % | 33 | 34 | 29 | 0.16‡ |
| Thyroid disease, % | 11 | 9 | 16 | 0.003‡ |
| Smoking, % | 28 | 30 | 21 | 0.02‡ |
| History of atrial fibrillation, % | 29 | 30 | 28 | 0.58‡ |
| Past myocardial infarction, % | 43 | 48 | 29 | 0.001† |
| Systolic blood pressure¶, mmHg (n=631) | 114±20 | 114±21 | 114±20 | 0.81† |
| Creatinine¶, mmol/L (n=615) | 131±79 | 137±83 | 112±64 | 0.001† |
| Sodium¶, mmol/L (n=604) | 140±4 | 140±4 | 140±4 | 0.12† |
| Hemoglobin¶, mg/L (n=339) | 133±18 | 136±18 | 124±16 | 0.001† |
| Number of deaths during follow-up period | 119 | 88 | 31 | |
| Specified functional class at entry, % | | | | |
| NYHA class I | 6 | 5 | 10 | |
| NYHA class II | 36 | 38 | 31 | 0.007* |
| NYHA class III | 51 | 51 | 49 | |
| NYHA class IV | 7 | 6 | 10 | |

**$\chi^2$ test; †t test; ‡$\chi^2$ test; §Total number of comorbidities from diabetes, thyroid disease, peripheral vascular disease, asthma, chronic obstructive pulmonary disease (COPD), dyslipidemia, gout, systemic hypertension, anemia, cerebrovascular disease and 'others'; ¶Normal reference values for these biological parameters differ between men and women. NYHA New York Heart Association*

differences in severity at entry and prescription patterns at these clinics.

## METHODS

### Patients and clinics

Data from all patients admitted to any of three participating clinics (based at university teaching hospitals), between May 1, 2000, and April 30, 2002, were included in the study.

Many patients are referred to these clinics directly from emergency departments or subsequent to hospitalization. Other patients are referred directly by cardiologists who are affiliated with the hospital. To be admitted in the clinics, patients must have a confirmed diagnosis of CHF.

### Clinic intervention

The goals of the clinics are twofold: education and optimization of the medical regimen. Professionals involved in the clinics include cardiologists, nurses, dieticians and, in some cases, pharmacists.

### Data collection

Data were collected from the electronic medical records at each clinic at the end of the selected period for the study. The participating clinics use the same software to manage electronic charts (Vision-C software, Carole Drouin, Marc Frenette and Claude Sauvé). Anonymous data were retrieved and merged from the three clinics after ethics approval was obtained from the respective university ethics committees.

Left ventricular ejection fraction (LVEF) was recorded at the first visit, and nurses or doctors assessed the New York Heart Association (NYHA) functional class at each visit. Regular medication updates were recorded in patient charts by nurses, cardiologists or pharmacists. Any presciption of a class of medication during the period of study was considered to be a trial of the use of that class of medication. Data were collected on medication class, but not on specific individual medications.

### Analysis

**Clinic characteristics:** Separate analyses were conducted for each clinic. However, results did not differ between the stratified analyses and the aggregated analyses; therefore, the results of the aggregated analyses are presented in the present report.

**Severity at entry:** Disease severity was assessed both objectively and clinically, using LVEF for patients with systolic dysfunction (defined as LVEF of 40% or lower) and NYHA functional class (determined at the first visit) for all patients. Univariate analysis was used to compare these measures of severity between sexes. Multivariate analyses consisted of multiple linear regression for LVEF and multiple logistic regression for NYHA functional class. Because few patients belonged to NYHA class I or IV, and because the objectivity of this classification has been questioned (21,22), class I was combined with class II and class III was combined with class IV for multivariate analysis. Covariates in the LVEF analyses were age, etiology (ischemic or not) and total number of comorbidities. Covariates in the NYHA functional class analyses were age (dichotomized at the fourth quartile, ie, 75.3 years of age and older), etiology (ischemic or not) and presence of systolic dysfunction, as defined by LVEF of 40% or lower.

**Prescribed medications:** Logistic regression models, which included sex and the presence of reduced or preserved systolic function as covariates, were used for beta-receptor antagonist (beta-blocker) prescription, and angiotensin-converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB) prescription. The prescription of either ACE inhibitors or ARBs was considered, because ARBs are an acceptable alternative to ACE inhibitors when ACE inhibitors are not well tolerated (23). The proportions of men and women receiving the recommended medications were also compared, as per the 2001 Canadian Cardiovascular Society guidelines (24).

## RESULTS

### Baseline characteristics

Of the 765 patients who were admitted during the two-year study period, 27% were women (Table 1). The mean age was 65 years, with no significant differences between sexes. More than one-half of patients had CHF of ischemic etiology, which was more prevalent in men than women (61% of men versus 41% of women, P<0.001). The two groups had similar numbers of comorbidities.

**TABLE 2**
**Factors associated with severity (New York Heart Association functional class) at entry to the clinic, stratified by systolic function**

| | Patients with reduced systolic function, OR (95% CI) (n=525) | Patients with preserved systolic function, OR (95% CI) (n=132) |
|---|---|---|
| Women | 0.91 (0.58–1.42) | 2.52 (1.18–5.38) |
| Age ≥75.3 years | 2.20 (1.39–3.47) | 2.49 (1.06–5.84) |
| Ischemic etiology | 1.65 (1.14–2.39) | 3.10 (1.38–7.01) |

**Severity at entry**

**LVEF:** The mean LVEF at entry was higher in women than men (37±16% compared with 29±12%, P<0.001); accordingly, they presented less often with systolic dysfunction (61% of women versus 86% of men, P<0.001). Nevertheless, in the subgroup of patients with reduced systolic function, there was no difference in LVEF between men and women (26±8% for women and 25±8% for men, P=0.312). This result was confirmed in the multivariate analysis.

**NYHA functional class:** Because a significant interaction between sex and the presence of systolic dysfunction was observed, the multivariate logistic regression models were stratified according to LVEF of 40% or lower (reduced systolic function), or LVEF of higher than 40% (preserved systolic function). Controlling for age and etiology, there were no differences between men and women in functional class at entry among patients with reduced systolic function; however, in the subgroup of 132 patients with preserved systolic function, women presented with a more severe functional class at entry (Table 2).

**Prescribed medications**

Univariate analyses showed many sex-related differences in medication use (Table 3). In logistic regression analyses, the crude OR for women compared with men were 0.58 (95% CI 0.40 to 0.83) for beta-blocker prescription and 0.50 (95% CI 0.32 to 0.78) for ACE inhibitor or ARB prescription. However, these differences are explained by the type of CHF: after adjusting for presence of systolic dysfunction, these OR became 0.77 (95% CI 0.50 to 1.19) for beta-blocker and 0.80 (95% CI 0.44 to 1.44) for ACE inhibitor or ARB prescription. Among patients who should be on beta-blockers according to the Canadian guidelines, a slightly lower, but nonsignificant, proportion of women used these agents (82% of women and 87% of men, P=0.211). Analysis for ACE inhibitors showed a tendency toward a lower proportion of women using the medication (75% of women and 84% of men, P=0.060), but the sex-related differences disappeared when considering ACE inhibitor or ARB prescription (95% of women compared with 97% of men, P=0.327).

## DISCUSSION

In our analysis of three CHF clinics in Montreal, Quebec, we found that referred patients were younger and predominantly male compared with the general population of patients with CHF. For those with systolic dysfunction, the severity at entry to the clinic and the prescribed medications were similar in both men and women. However, among those with preserved systolic function, women presented with more severe symptoms.

**TABLE 3**
**Use of medication among all patients during clinic follow-up***

| | All, % | Men, % | Women, % | P† |
|---|---|---|---|---|
| Beta-blockers | 78 | 81 | 71 | 0.003 |
| ACE inhibitors | 74 | 77 | 66 | 0.001 |
| ARBs | 21 | 20 | 25 | 0.138 |
| ACE inhibitors or ARBs | 88 | 90 | 82 | 0.002 |
| Nitrate compounds | 50 | 51 | 46 | 0.173 |
| Cardiac glycoside | 69 | 69 | 67 | 0.477 |
| Antiplatelet agents | 56 | 57 | 51 | 0.129 |
| Diuretics | 89 | 91 | 86 | 0.040 |
| Calcium channel blockers | 19 | 18 | 22 | 0.160 |
| Antiarrhythmic agents | 24 | 27 | 17 | 0.006 |

**These results represent prescription of at least one drug of the specified class at any time during the clinic follow-up. The proportions indicated are among all the patients: reduced and preserved systolic function congestive heart failure patients; †$\chi^2$ tests. ACE Angiotensin-converting enzyme; ARB Angiotensin receptor blocker*

The lower proportion of women and the relatively young age of patients in our study suggest that referral to these clinics may serve as a selection filter that excludes older patients with CHF, who are more often women (25-28) and frequently present with preserved systolic function CHF (1,29,30). These clinics do not accept patients who are cognitively impaired or are unable to attend appointments regularly, which may explain the mean age of the patients (65 years), and is considerably younger than the average age of 75 years in epidemiological studies (25,31,32). In Montreal, in 1999, 85% of the hospitalizations for CHF were for people 65 years of age and older (33). Furthermore, the similarities in age distribution between men and women in these clinics is surprising, because epidemiological studies have shown that CHF develops later in life in women (30), who are older at diagnosis (34) and at first CHF hospitalization (13,35). We observed that only 27% of the patients in this study were women, even though the crude prevalence of CHF is similar between the sexes (28,36-38). In Montreal, during the study period, the number of short-term hospital admissions with CHF as the principal diagnosis was comparable between women and men (with 3006 and 2890, respectively) (unpublished data). Because the benefits derived from CHF clinics are not the same for all CHF patients (39), it seems appropriate to apply a screening process for entry into the clinics. However, we do not know whether this apparent exclusion of older patients and/or women results from an equitable selection based on service need or from some other access barrier.

Men and women with systolic dysfunction had similar disease severity at entry, and the use of medications during follow-up was similar between sexes. It is encouraging to see that the previously suspected underuse of ACE inhibitors (and beta-blockers) in women with CHF (9-11,40,41) was not perpetuated in the clinics.

However, among the 132 patients with preserved systolic function, women were more severely symptomatic when first seen in the clinic. This finding may reflect a delay in the use of this health service in women with preserved systolic function. The underuse of some health care interventions in women may be associated with the physician-patient relationship (42-45) or with a delay in personally seeking medical attention for themselves due to caregiving roles (46,47). The sex-related

difference seen in this subgroup may also be a consequence of diagnostic confusion: CHF with preserved systolic function does not usually result from an acute event such as myocardial infarction or viral myocarditis (29,48), and there is no easily available marker to diagnose this condition, such as LVEF for systolic dysfunction (49). Furthermore, symptoms of CHF may be confused more easily with other diseases in women (25,48). Finally, this phenomenon may be related to a specific context; for example, more women have a primary care physician and some cardiologists are reluctant to include preserved systolic function CHF patients in their clinics.

The present study was designed as an analytical pilot project to explore possible sex-related differences in referral and management processes of patients in specialized CHF clinics. An important strength of our study was the inclusion of all patients followed at these clinics for analysis, thus reflecting the current practice in these CHF clinics in our community. We also studied patients from three different clinics to improve power and external validity. Because the study was retrospective, the observations were of behaviour taking place in real care settings, with no prior knowledge of the research objectives. However, an important limitation of our study was the use of clinical charts, which are often incomplete and in which information might have been recorded differently by personnel among the three clinics. To limit the impact of inaccurate, missing or heterogeneous data, we conducted interviews with key staff members to ensure that clinical charts were used similarly. We also conducted stratified analyses to ensure that combining the data from the different clinics did not bias the results. We used NYHA class to measure functional status at entry in the clinic; however, these values have to be interpreted with care, because the reproducibility and validity of NYHA class as a measure of outcomes are limited (21,22). To have a complete portrait of the referral access and practices of these clinics, it would have been ideal to also have data on nonreferred CHF patients. We tried to minimize this bias by comparing our results with available data from the same geographic region (Montreal, Quebec). We are presently conducting a prospective cohort study, of men and women who present with CHF to determine whether they are referred to these specialized clinics and when. We did not have information on medication the patients were taking when they entered the clinic, which might have influenced functional class and differed in certain groups of women with CHF (9-11,40,41). As mentioned in the 'Methods' section, data were collected by medication class and not by individual medications, which precluded analysis on specific medications. Finally, we did not have patient data on implantable cardiac defibrillators.

## CONCLUSION

It is reassuring to see that no sex-related differences were found in symptom severity at entry or in medication regimens for patients with reduced systolic function in the specialized CHF clinics. This may indicate increased awareness by the medical community regarding heart diseases in women or greater facility in treating patients when guidelines are clear. In contrast, women with preserved systolic function CHF were more symptomatic than men when they entered the clinic. It appears that the use of these services may be delayed in women with preserved systolic function CHF. This syndrome is more prevalent in women and has been largely neglected in clinical trials (23). The lack of data on CHF treatment adapted for women and for the treatment of preserved systolic function CHF is now being addressed in a number of studies (50), which should help clinicians offer better treatment for women in the future.

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