A Tale of Two Specialties: Differences between Heart Failure Patients Admitted to Internal Medicine and Cardiology

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Summary

The authors described and compared the clinical profiles of patients hospitalized with heart failure (HF) to internal medicine (IM) and cardiology services. Data on age, gender, length of stay, and left ventricular systolic function, as well as specific co-morbidities and clinical parameters, were recorded retrospectively to allow the assessment of provider-related differences in HF populations.

IM patients were significantly older, more likely to be female, and more likely to have preserved left ventricular function. IM patients also suffered a significantly greater number of co-morbidities, in particular chronic obstructive pulmonary disease, pneumonia, other lung diseases, thromboembolic disease, anemia, and arthritis. Finally, significantly more IM patients had a high risk of mortality at the time of hospital admission compared with cardiology patients. In summary, IM patients were older, “sicker,” and more likely to die within the next year. Complex disease and advanced age may affect outcomes, therapeutic strategies, and impact on diagnostic accuracy.

Résumé

Les auteurs comparent les profils cliniques de patients hospitalisés pour insuffisance cardiaque (IC) en médecine interne (MI) et en cardiologie. On a collecté rétrospectivement des données sur l'âge, le sexe, la durée du séjour et la fonction systolique ventriculaire gauche, et tenu compte de maladies concomitantes spécifiques et de certains paramètres cliniques pour évaluer les différences existant dans les populations de patients avec une IC selon les fournisseurs de soins.

Les patients en MI étaient significativement plus âgés, plus souvent de sexe féminin et présentaient plus souvent la conservation de la fonction ventriculaire gauche. Les patients en IM présentaient également un nombre

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significativement plus élevé de maladies concomitantes, en particulier la maladie pulmonaire obstructive chronique, la pneumonie, d'autres maladies pulmonaires, des maladies thromboemboliques, de l'anémie et de l'arthrite. Enfin, un nombre significativement plus élevé de patients en MI présentait un risque élevé de mortalité au moment de leur admission à l'hôpital à comparer avec les patients en cardiologie. En résumé, les patients en MI étaient plus âgés, plus « malades » et plus susceptibles de mourir dans l'année qui suivait. Les maladies complexes et l'âge avancé sont susceptibles d'influencer l'issue de la maladie, les stratégies thérapeutiques et l'exactitude du diagnostic.

Hear failure (HF) prevalence remains stable – approximately 1% of the population lives with HF in Canada and worldwide.¹ With 1-year mortality rates approaching 33%,² the true burden of HF is perhaps better illustrated by considering its effect on quality of life. HF is associated with frequent and prolonged hospitalizations; 9% of patients are readmitted within 30 days of hospital discharge and almost one third are re-hospitalized within 1 year.² Furthermore, HF is frequently associated with multiple other co-morbidities and significant limitations in mobility.³

Inequitable distribution of physicians who manage HF is an important issue in Canada. Access to specialty care is inconsistent, particularly in remote areas, and family physicians provide care for the majority of patients with HF. A significant proportion is cared for by general internists, and a smaller fraction of patients with HF receive care from subspecialty cardiology.⁴ Previous reports have suggested that the HF patient populations cared for by generalists versus subspecialists are different in terms of their clinical profiles. Similarly, the type of physician (i.e., generalist versus subspecialist) is thought to affect outcomes in patients with HF.^{5–7}

A study by Auerbach et al.⁵ prospectively examined the use of resources and survival of patients with congestive heart failure (CHF) hospitalized under internists versus cardiologists in five US teaching hospitals. Compared with cardiologists' patients, internists' patients were significantly older, were more likely to be female, and had higher ejection fractions (EFs). They had more co-morbidities and were less independent in activities of daily living. Cardiologists' patients underwent significantly more invasive investigations (e.g., angiography) and incurred higher costs, but there were no differences in 30-day survival between the two groups.

Similar patient profiles were described in an Ontario-based study⁶; patients attended by cardiologists were more likely to be younger, be male, and have lower Charlson co-morbidity scores. Cardiologist care was associated with higher rates of invasive interventions, higher adherence to guideline medications, and

lower in-hospital and 30-day mortality rates. The TEMISTOCLE survey,⁷ an Italian study, reported comparable clinical profiles of patients with CHF.

It is not clear whether the specialty of the HF care provider affects patient outcomes or whether patient characteristics and concomitant co-morbidities influence outcomes such as length of stay (LOS), adherence to current HF management guidelines, and mortality.

A quality improvement (QI) initiative to improve HF care was undertaken on both the cardiology and internal medicine (IM) wards at St. Michael's Hospital, a tertiary care centre in Toronto, Ontario. The QI initiative focused on standardizing admission order sets and implementing a diuretic management algorithm for acute HF admissions. We sought to identify any potential specialist-related differences in clinical profile and predicted mortality in an attempt to ascertain differences in diuretic algorithm implementation and outcomes in these two patient populations.

Methods

Patients hospitalized with HF to the cardiology or IM service from January 1 to December 31, 2011, at St. Michael's Hospital were studied retrospectively. Only patients who had a primary diagnosis of HF requiring therapy with intravenous furosemide were included. Data on age, gender, LOS, left ventricular systolic function (based on echocardiography and defined as preserved if greater than 55%, as per classification at our site), and specific co-morbidities were recorded to allow for assessment of provider-related differences in HF populations. Additional clinical variables recorded at the time of hospital admission were collected: respiration rate, systolic blood pressure, blood urea nitrogen, sodium concentration, and hemoglobin concentration.

As a marker of disease severity, the HF mortality prediction model by Lee et al.⁸ was used. This model uses acute physiological variables as well as selected co-morbid conditions to calculate a risk score, providing a simple method to stratify a patient's 30-day and 1-year risk of death at the time of presentation to hospital.

Table 1. Comparison of Cardiology and Internal Medicine Patient Demographics

	Internal Medicine	Cardiology	<i>p</i> Value
Age	75.8 y (47–95 y)	71.7 y (26–96 y)	.03
Female	60 (58.8%)	67 (35.8%)	.0002
LOS	9.4 d (1–42 d)	10.9 (1–88 d)	NS

LOS = length of stay; NS = not significant.

Table 2. Comparison of Cardiology and Internal Medicine Patient LVEF

EF	Internal Medicine (%)	Cardiology (%)	<i>p</i> Value
<40%	24.5	49.2	.0001
40–55%	12.7	16	NS
>55%	51	34.8	.0006
Not performed	11.8	0	

LVEF = left ventricular ejection fraction; NS = not significant.

Table 3. Co-morbidities among Cardiology and Internal Medicine Patients

	Cardiology <i>n</i> (%)	Internal Medicine <i>n</i> (%)	<i>p</i> Value
Coronary disease	110 (58.8)	47 (46.5)	.045
Valvular disease*	65 (34.8)	26 (25.5)	NS
Hypertension	147 (78.6)	73 (71.6)	NS
Diabetes mellitus	78 (41.7)	49 (48.1)	NS
Atrial fibrillation	111 (59.4)	38 (62.8)	NS
CVA/TIA	26 (13.9)	23 (22.6)	NS (.06)
Dementia	9 (4.8)	9 (8.8)	NS
Malignancy	17 (9.1)	17 (16.7)	NS (.056)
Psychiatric disease†	21 (11.2)	9 (8.8)	NS
COPD	34 (18.2)	39 (38.2)	.0002
Pneumonia‡	15 (8.0)	17 (16.7)	.02
PE/DVT	5 (2.7)	8 (7.8)	.04
Lung disease§	19 (10.2)	39 (38.2)	.0001
AKI/CKD	83 (44.4)	57 (55.9)	NS (.06)
Anemia	30 (16.0)	39 (38.2)	.0001
Alcohol/drug use	16 (8.6)	7 (6.9)	NS
HCV	4 (2.1)	4 (3.9)	NS
Cirrhosis	7 (3.7)	9 (8.8)	NS (.07)
Arthritis#	29 (15.5)	33 (32.4)	.0009

AKI = acute kidney injury; CKD = chronic kidney disease; COPD = chronic obstructive pulmonary disease; CVA = cerebrovascular accident; DVT = deep vein thrombosis; HCV = hepatitis C virus; NS = not significant; PE = pulmonary embolism; TIA = transient ischemic attack.

* Valvular disease includes aortic stenosis, previous valve replacement, and mitral regurgitation.

† Psychiatric disease includes depression and schizophrenia.

‡ Pneumonia diagnosed at the time of admission for congestive heart failure.

§ Lung disease includes pulmonary hypertension and restrictive lung disease.

|| Alcohol/drug use includes alcohol dependence, intravenous drug use, and cocaine use.

Arthritis includes osteoarthritis, rheumatoid arthritis, and previous joint replacement.

Statistical Analysis

The study cohort was stratified according to admission to the IM or cardiology ward. Continuous variables were expressed as a mean $\pm$ standard deviation. Differences between continuous variables were evaluated using the Wilcoxon rank sum test. Discrete variables were summarized by frequency percent. Differences between discrete variables were evaluated with the chi-square test, with the Fisher exact test when necessary. A *p* value of $<.05$ was considered statistically significant.

Results

Between January 1 and December 31, of 2011, a total of 289 patients with HF were admitted to St. Michael's Hospital. Of these patients, 187 (65%) were admitted to cardiology and 102 (35%) to IM. Patients in the IM ward were significantly older (75.8 ± 11.0 versus 71.7 ± 14.2 , $p = .03$) and more likely to be female (58.8% versus 35.8%, $p = .0002$). LOS was not statistically different between the two groups. IM patients were significantly more likely to have a preserved EF (51% versus

34.8%, $p = .0006$), whereas a significantly greater proportion of cardiology patients had severe (EF $< 40\%$) left ventricular dysfunction (49.2% versus 24.5%, $p = .0001$). The baseline clinical demographics, including age, sex, and LOS, are summarized in Table 1 and data on EF are outlined in Table 2.

IM patients were significantly more likely to suffer from chronic obstructive pulmonary disease (COPD), concomitant pneumonia, and other lung diseases (pulmonary hypertension and restrictive lung disease) and had a higher frequency of thromboembolic complications, anemia, and arthritis, whereas cardiology patients had higher rates of documented coronary artery disease. Although stroke, malignancy, cirrhosis, and kidney disease occurred more frequently in the IM group, this did not reach significance. The frequencies of various co-morbidities in the two patient groups are detailed in Table 3. Using the Lee HF mortality prediction index,⁸ we divided patients into “low-risk” groups (0.4–3.4% and 7.8–12.9% for 30-day and 1-year mortality risk, respectively) and “high-risk” groups (12.2–59% and 32.5–78.8% for 30-day and 1-year

Table 4. Cardiology and IM Patients: Predicted 30-Day Mortality

Predicted 30-Day Mortality (%)	Internal Medicine <i>n</i> (%)	Cardiology <i>n</i> (%)	<i>p</i> Value
0.4–3.4	70 (69.3)	124 (79.5)	.06
12.2–59	31 (30.7)	32 (20.5)	

mortality risk, respectively). Significantly more patients admitted to IM had a high 1-year risk of mortality at the time of hospital admission. A similar trend was established for 30-day mortality but did not reach statistical significance. These results are outlined in Tables 4 and 5.

Discussion

There are measureable differences in the clinical profiles of patients hospitalized with HF to our institution's IM and cardiology services. Specifically, we found that internists look after patients who are older, more likely to be women and more likely to have preserved LV function. IM patients are also significantly more likely to have concomitant lung disease – COPD, pneumonia, pulmonary hypertension, interstitial lung disease, and thromboembolic disease. They have higher rates of anemia and arthritis, and there is a trend toward higher rates of acute and chronic kidney disease, malignancy, and dementia. Cardiology patients have higher rates of documented coronary disease, but the frequency of coronary disease risk factors and length of hospitalization do not differ between the groups. Utilizing the Lee HF mortality prediction index,⁸ we found that, compared with cardiology patients, a greater proportion of IM patients have a “high” risk of mortality at the time of hospital admission.

In summary, our findings suggest that patients with HF who are admitted to IM wards are older, “sicker,” and more likely to die within the next year. These results parallel previously documented provider-related differences. Disease complexity and advanced age may affect diagnostic accuracy, therapeutic strategy, and patient outcomes. HF guidelines in Canada are written by cardiologists, and implicit in some of the published recommendations are assumptions about patient profiles. Patients in clinical trials are often younger, are male, and have fewer co-morbidities; as such, they are different from the “typical” IM patient with HF at our large urban teaching hospital. A patient's prognosis and risk of mortality at the time of hospital admission should be considered when examining outcomes. Furthermore, quality indicators of “good” HF care⁹ should consider patients who may not be eligible for certain recommendations before determining guideline compliance. For example, previous reports reveal that at the time of hospital

Table 5. Cardiology and IM Patients: Predicted 1-Year Mortality*

Predicted 1-Year Mortality (%)	Internal Medicine <i>n</i> (%)	Cardiology <i>n</i> (%)	<i>p</i> Value
7.8–12.9	48 (47.5)	97 (62.2)	.02
32.5–78.8	53 (52.5)	59 (37.8)	

*Effective sample size 257, frequency missing 32.

discharge, cardiologists are more likely to prescribe β blockers, oral anticoagulants, diuretics, and statins.⁷ Internists' patients are older and suffer more co-morbidity, perhaps warranting a more cautious approach to medical therapy. The application of guideline recommendations and other medical interventions “in the real world” must take into account all these issues. Finally, HF guidelines are not evidence based for patients with preserved EF; thus, they may be less applicable to IM patients.

There are several limitations to this study. First, it is a retrospective review in a single centre. Second, it relies heavily on diagnoses that are reported and documented in the electronic medical records. Cardiologists may be less likely to document co-morbidities that are not related to cardiovascular health.

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