

Adherence to Guidelines for Patients Hospitalized with Heart Failure: A Nationwide Survey

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Abstract

Background: Despite significant advances in the therapy of heart failure, many patients still do not receive optimal treatment.

Objectives: To document the standard of care that patients hospitalized with HF in Israel received during a 2 month period.

Methods: The Heart Failure Survey in Israel 2003 was a prospective 2 month survey of patients admitted to all 25 public hospitals in Israel with a diagnosis of HF.

Results: The mean age of the 4102 patients was 73 years and 43% were female. The use of angiotensin-converting enzyme/angiotensin receptor blockers and beta blockers both declined from NYHA class I to IV (68.8% to 50.6% for ACE-inhibitor/ARB and 64.1% to 52.9% for beta blockers, $P < 0.001$ for comparisons). The percentage of patients by NYHA class taking an ACE-inhibitor or ARB and a beta blocker at hospital discharge also declined from NYHA class I to IV (47.5% to 28.8%, $P < 0.002$ for comparisons). The strongest predictor of being discharged with an ACE-inhibitor or ARB was the use of these medications at hospital admission. Negative predictors for their usage were age, creatinine, disease severity class, and functional status.

Conclusions: Despite the dissemination of guidelines many patients did not receive optimal care for HF. Reasons for this discrepancy need to be identified and modified.

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angiotensin receptor blockers, beta blockers and spironolactone has been shown to improve survival [1-4]. Recent clinical practice guidelines [5,6] have incorporated these new developments into clinical practice; however, many patients still receive suboptimal care. A study in the United States showed that only 64% of patients received recommended care for HF [7]; similar results have been documented in Europe [8]. There is much potential to improve the care of these patients through physician education, guideline dissemination and quality improvement programs. The goal of the present survey was to document the standard of care that patients with HF hospitalized in Israel receive and to assess the impact of hospitalization on the quality of care.

Patients and Methods

The Heart Failure Survey in Israel 2003 was a prospective 2 month national survey conducted in March-April 2003 of patients admitted to 93/98 internal medicine departments and 24/25 cardiology departments in all 25 public hospitals in Israel with a diagnosis of heart failure either as an acute, acute exacerbation of chronic, or a chronic condition. Patient demographics, medical history, previous diagnostic testing, physical examination data, laboratory values, electrocardiogram, chest X-ray, echocardiogram and cardiac catheterization results, medications, hospital treatment, New York Heart Association class and status upon discharge were recorded. Data were obtained by patient interviewing and chart review by the local treating team who participated in the survey, using a standardized form. Functional status and disease severity were measured by using the two sub-indices of the Index of Co-Existent Disease, the Index of Disease Severity, and Functional Severity [9].

Heart failure continues to be a major cause of morbidity and mortality in the western world. In the last two decades there has been a significant advance in the medical treatment of the condition. The use of angiotensin-converting enzyme inhibitors,

HF = heart failure

ACE = angiotensin-converting enzyme

ARB = angiotensin receptor blocker

The care that the patients received was compared to recommendations from the European guidelines for the diagnosis and treatment of chronic heart failure that were published in 2001 and were available during the survey period [5]. We focused on their recommendations that:

1. "An objective evidence of cardiac dysfunction at rest is necessary for the diagnosis of heart failure; echocardiography is the preferred method for this documentation"
2. "All patients with symptomatic heart failure due to systolic left ventricular dysfunction should receive an ACE inhibitor"
3. "Beta-blocking agents are recommended for the treatment of all patients with stable, mild, moderate and severe heart failure from ischaemic or non-ischaemic cardiomyopathies and reduced left ventricular ejection fraction, in NYHA class II-IV, on standard treatment, including diuretics and ACE inhibitors"
4. "Aldosterone antagonism is recommended in advanced heart failure (NYHA III-IV), in addition to ACE inhibition and diuretics to improve survival and morbidity"
5. "In general, calcium antagonists are not recommended for the treatment of heart failure due to systolic dysfunction"
6. "There is little evidence to show that antithrombotic therapy modifies the risk of death, or vascular events in patients with heart failure other than in the setting of atrial fibrillation when anticoagulation is firmly indicated."

In addition, we looked at the percent of patients who received influenza and pneumococcal immunizations, recommended for all patients with congestive heart failure [10].

Statistical analysis

The data were entered into a database and were analyzed using SPSS version 10.1 (Chicago, IL, USA). For univariate analysis, we used a *t*-test for comparison of continuous variables, and Pearson's chi-square test for categorical variables. Fisher's exact test was used when appropriate. Logistic regression models were used for multivariate analysis. All reported *P* values were two-sided and *P* < 0.05 was considered significant. The data were analyzed from Registry III version.

Results

During the survey period 4514 patients were hospitalized for HF. There were 412 repeat hospitalizations, leaving a study population of 4102 patients. The mean age of the patients was 73 ± 11 and 1763 (43%) were females [Table 1]. Seventy-two percent had ischemic heart disease and their cardiac risk factors are shown in Table 1. The average length of stay was $5.9 (\pm 6)$ days and there was an in-hospital mortality of 4.7%.

Overall, 80% of the patients underwent echocardiographic evaluation, and estimation of left ventricular ejection fraction was available in 2847 patients (69%). Of those patients, 1479 (52%) had LVEF < 40% and 1368 (48%) had LVEF \geq 40%. The percent-

Table 1. Population characteristics and Disease Status of 4102 patients in the Heart Failure Survey in Israel 2003*

Gender	
Female	1763 (43%)
Male	2339 (57%)
Age (yrs), mean \pm SD	73 \pm 11
Ischemic heart disease	2953 (72%)
Hypertension	2801 (68%)
Diabetes	1727 (42%)
Dyslipidemia	1463 (36%)
Obesity	948 (23%)
Current smokers	416 (10%)

* Data are number (percentage) of patients unless otherwise specified

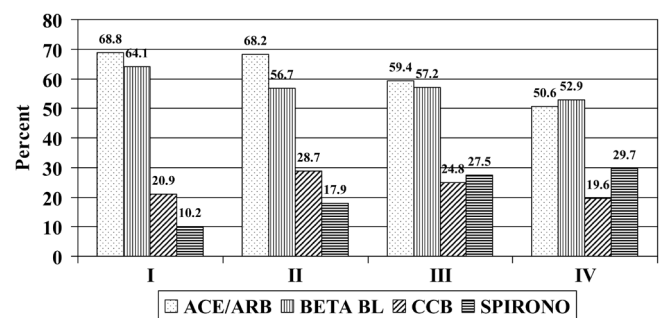


Figure 1. Drugs at discharge by New York Heart Association class. ACE/ARB = angiotensin-converting enzyme/angiotensin receptor, BETA BL = beta blocker, CCB = calcium channel blocker, SPIRONO = spironolactone. All differences/comparisons were significant, *P* < 0.001.

age of patients by NYHA class taking ACE-inhibitor/ARB, beta blockers, calcium channel blockers or spironolactone at hospital discharge is shown in Figure 1. The use of ACE-inhibitor/ARB and beta blockers both declined from NYHA class I to IV (68.8% to 50.6% for ACE-inhibitor/ARB and 64.1% to 52.9% for beta blockers, *P* < 0.001 for comparisons). The percentage of patients by NYHA class taking a combination of an ACE-inhibitor and/or ARB and a beta blocker at discharge also declined from NYHA class I to IV (47.5% to 28.8%, *P* < 0.002 for comparisons).

As shown in Table 2, the strongest predictor of being discharged with an ACE-inhibitor or ARB was the use of these medications upon hospital admission. Negative predictors for their usage were age, creatinine, disease severity class, and functional status. Likewise, the strongest predictor of being discharged with the combination of an ACE-inhibitor and/or ARB and a beta blocker was prior use of these medications. Negative predictors for use were age, serum creatinine, chronic obstructive pulmonary disease, functional status and disease acuteness.

The impact of hospitalization on the patients' medications is shown in Table 3. Hospitalization had a favorable impact on the increased use of ACE-inhibitor/ARB, beta blockers, aldosterone antagonists, diuretics, anticoagulants, anti-platelet agents, and

NYHA = New York Heart Association
LVEF = left ventricular ejection fraction

Table 2. Predictors of ACE-inhibitor or ARB use at discharge: multivariate analysis*

	Odds ratio (95% confidence interval)
Admission ACE-inhibitor/ARB	12.0 (9.8–14.5)
Age (per yr)	0.985 (0.976–0.993)
Creatinine (mg/dl)	0.81 (0.74–0.88)
Disease Severity Class	0.81 (0.71–0.92)
Functional Class	0.66 (0.57–0.77)

* Controlling for gender, KILLIP Class on admission, and admission ward (cardiology vs. medicine).

Table 3. Medication on admission and at discharge

Drug	Admission (%)	Discharge (%)	Pvalue
ACE-inhibitor	52.5	58.8	< 0.001
ARB	8.1	8.9	0.009
Beta blockers	49.8	57.6	< 0.001
Spirolactone	15.4	20.2	< 0.001
Calcium channel blockers	26.7	25.2	0.009
Furosemide	62.0	73.2	< 0/001
Statins	35.4	39.5	< 0.001
Digoxin	13.8	14.5	0.09
Anticoagulants	19.1	21.7	< 0.001
Aspirin	59.8	67.2	< 0.001

statins, and a decreased use of calcium channel blockers. The use of ACE-inhibitor/ARB was relatively consistent among the 25 hospitals (53–72%) but there was greater variation in the use of beta blockers (29–76%, $P < 0.001$) and calcium channel blockers (14–47%, $P < 0.001$). In our study 1359 patients (33.1%) had atrial fibrillation, and of those only 47.1% were discharged on anticoagulation therapy.

Influenza vaccine data were available for 2501 patients (61% of study population). Only 989 of these patients (40%) had received the vaccine in the preceding year. Pneumococcal vaccine status was known for 2383 (58%). Only 421 of these patients (18%) had received the vaccine in the preceding 5 years.

Discussion

European and American guidelines for the diagnosis and treatment of HF have reached a broad consensus for incorporating the numerous published studies and knowledge into our daily clinical practice [5,6]. The use of echocardiography in the diagnosis of heart failure and the use of ACE-inhibitors or ARB, diuretics and beta blockers in the majority of HF patients and spironolactone in symptomatic HF patients with systolic left ventricular dysfunction had already been recommended at the time of our survey [5,6]. Overall, the standard of care that Israeli patients receive is consistent with that of other western countries. Sixty-four percent of the patients received an ACE-inhibitor or ARB at discharge compared to 60% in Europe [11] and 53% in the United States [12], but this number still leaves much room for improvement. Fifty-eight percent of our patients were discharged with a beta

blocker but only 40% with the combination of an ACE-inhibitor and/or ARB and beta blocker. Comparable numbers in Europe were 34% for beta blockers and 20% for the combination [11]. It is unclear why Israel performed better than Europe but it might be a reflection that the European survey included a wide variety of countries. Our results were also slightly higher than those of the United States, where 48% of the patients are discharged with a beta blocker [12].

The relatively low percentage (20%) of patients who received spironolactone in our survey is probably due to its recent introduction into the guidelines. Our study population included also patients with diastolic dysfunction and NYHA I-II who were not included in the recommendation for spironolactone [5,6]. Additionally, aldosterone antagonists have the potential risk of hyperkalemia, especially among patients with renal failure and old age [13]. The use of this medication highlights the problem of how quickly new recommendations get introduced into clinical practice. It is not enough that guidelines get written and distributed, but we must ensure that physicians are familiar with them and follow them. It has recently been shown that three factors influence provider knowledge of HF guidelines: dissemination approaches, use of technology in guideline implementation, and hospital culture [14]. However, beyond physician knowledge we must identify other factors that impact on physician behavior. Clinical inertia has been suggested as one reason that physicians do not follow accepted guidelines [15] and strategies to overcome this need to be developed.

Our data demonstrate that there is ample opportunity to initiate quality improvement programs in patients with HF. A multidisciplinary team approach has been shown to be effective in the care of these patients [16], as was a program to involve local physicians in the development of practice guidelines [17]. New initiatives at the system level, such as the chronic care model that empowers patients to interact with well-prepared healthcare teams also need to be expanded in the care of patients with HF [18].

The relative uniformity of the use of ACE-inhibitor/ARB among the 25 hospitals is not surprising given the universal acceptance of the importance of these medications in HF, but it is interesting to note the disparities in the use of calcium channel blockers and beta blockers among the institutions. Calcium channel blockers are not recommended in patients with left ventricular systolic dysfunction, but they are an effective therapy in hypertensive patients and in many patients with diastolic dysfunction [5,6]. The introduction of beta blockers and the increase in dosage should be done carefully. This may be a reason for local hospital variability in the use of beta blockers and calcium channel blockers.

Even though the most important predictor of use of optimal medications for HF was their use on admission, demonstrating the importance of the family physician, hospitalization did have a positive impact on adherence to guidelines. There was an increased use of recommended medications. Hospitalization of these patients for any cause should be a time to review their treatment and introduce the use of potentially life-saving medications. However, the hospitalization was frequently too short to

substantially change the patient's medications and their dosages. In addition, in these tenuous patients some medications (e.g., beta blockers) can be more safely introduced in the hospital, in many cases after removal of fluid overload and hemodynamic stabilization. If new medications are introduced it is crucial that physicians communicate these changes to the patients and their family doctors, as many of these medications have significant, if not dangerous side effects.

Our data are somewhat disturbing in that we have shown that patients with more advanced heart failure received potentially life-saving medication (ACE-inhibitor/ARB and beta blocker) less frequently. By logistic regression analysis it was not the severity of heart failure that explained this discrepancy, but rather other factors. Advanced age, creatinine, disease severity and functional status were predictors of non-use of ACE-inhibitor or ARB. The administration of these medications, especially to high risk patients, carries the risk of more adverse effects. However, it reduces morbidity and mortality, especially in elderly patients and patients with chronic renal failure [19-21].

Physicians therefore need to follow these patients more closely and frequently. Unfortunately, the ambulatory system cannot always fulfill this task. In addition, many physicians have the mistaken notion that renal failure is a contraindication to the use of ACE-inhibitor or ARB, which is simply not true in mild renal failure

Similar predictors were found for the non-use of beta blockers in combination with ACE-inhibitor/ARB with the addition of a history of chronic obstructive pulmonary disease. Administration of beta blockers in acute COPD may be contraindicated, but patients with stable COPD and HF can safely receive beta blockers, especially cardioselective ones. Similarly, beta blockers can be given to patients with coronary artery disease and COPD [22].

It was also surprising to note that less than half of the patients with HF and atrial fibrillation received anticoagulation therapy. These patients are at increased risk for stroke and there is substantial evidence that warfarin treatment can reduce this risk. Our data are consistent with other studies that demonstrated under-treatment of patients with atrial fibrillation [23]. Although increased usage was observed during hospitalization, more efforts are clearly needed.

Immunization guidelines recommend yearly influenza vaccination and at least one pneumococcal vaccination for patients with HF regardless of their age [10]. A disturbing finding was that only a small percentage of the patients in our study were vaccinated for influenza or pneumonia, as these diseases may cause significant morbidity and mortality in patients with HF. It was previously noted that elderly patients with chronic disease receive less preventive medicine than healthy seniors [24]. Patient and physician education need to convey the importance of vaccination in their disease management. It has been shown that vaccination during hospitalization can be an effective and safe strategy that is severely underused [25], but the study period (March-April) was not suitable for influenza vaccination.

COPD = chronic obstructive pulmonary disease

Study limitations

This is a prospective observational survey and not a randomized interventional study. The diagnosis and treatment of heart failure was determined only by the local treating medical team with variability among hospitals and departments. The data were derived from the patients directly as well as from their medical records. However, in many cases the information was based solely on the patient's chart. The strength of our report, however, is the nationwide extent of its data, reflecting the "real world" practice. The study period March-April does not necessarily reflect the hospitalized heart failure population during the whole year, as seasonal variation may occur. The data were obtained from a cohort of patients hospitalized with HF, and this study design excludes a large proportion of ambulatory patients with HF who most probably have different characteristics and might receive different treatments.

Conclusions

This national survey in all public hospitals in Israel showed that patients hospitalized with HF receive a standard of care quite equivalent to the care in other western countries and that hospitalization had a positive impact on the quality of care, but there is much room for improvement. Quality improvement initiatives and educational programs that target healthcare providers and patients, as well as further surveys on the implementation of evidence-based recommendations, are needed.

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