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Published in:
European Journal of Heart Failure

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2003

Link to publication in University of Groningen/UMCG research database

Citation for published version (APA):
Pont, LG., van Gilst, WH., Lok, DJA., Kragten, HJA., Haaijer-Ruskamp, FM., & Dutch Working Group Heart Failure (2003). The relevance of heart failure severity for treatment with evidence-based pharmacotherapy in general practice. European Journal of Heart Failure, 5(2), 187-193. [PII S1388-9842(02)00202-7].

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ELSEVIER

The European Journal of Heart Failure 5 (2003) 187–193

The European Journal of Heart Failure

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The relevance of heart failure severity for treatment with evidence-based pharmacotherapy in general practice

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Received 18 March 2002; received in revised form 23 July 2002; accepted 3 October 2002

Abstract

Aims: Internationally, research indicates that pharmacotherapy for chronic heart failure (CHF) is sub-optimal. Traditionally, assessment of drug use in heart failure has focused on the use of individual agents irrespective of CHF severity. This study investigates drug use for CHF patients in general practice with respect to the available evidence, incorporating both disease severity and the use of combination drug regimes. *Methods and results*: A cross-sectional survey of 769 Dutch CHF patients was performed as part of IMPROVEMENT of HF study. For each New York Heart Association severity classification the minimum treatment appropriate for the heart failure severity according to the scientific evidence available at the time of the study (1999) was defined. The proportion of patients treated with each drug increased with increasing severity, with the exception of the β-blockers. Patients with less severe heart failure were approximately four to eight times more likely to receive evidence-based treatment than those with more severe heart failure. *Discussion*: To assess pharmacological treatment of heart failure, in relation to the available evidence, it is important to take severity into account. While the number of drugs prescribed increased with increasing severity, the use of evidence-based regimes was lower in patients with more severe heart failure.
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Keywords: Heart failure; General practice; Pharmacotherapy; Evidence-based practice

1. Introduction

Chronic heart failure (CHF) is an increasingly important health care issue affecting almost 4% of the population aged over 55 years and up to 13% of those aged over 75 [1]. With the aging population, the prevalence of heart failure is rising and unlike other cardiovascular conditions, morbidity is increasing [2]. The majority of heart failure patients are managed in general practice [2], thus knowledge regarding GP management of heart failure is essential. Pharmacological treatment is an important aspect of heart failure management and in the past decade, the management of heart failure has undergone major change. Major studies have demonstrated the benefits of ACE inhibitors (ACEI) [3,4], β-blockers [5] and spironolactone [6] in improving the prognosis of heart failure patients. Current research indicates internationally that pharmacotherapy for heart failure is sub-optimal [2,7] and lags behind the current evidence.

While the under-use of ACEIs for heart failure has been well-documented [8,9], little is known about the use of other drugs in the daily practice. To date, investigation into heart failure pharmacotherapy has focused on the use of single agents [10,11] without taking heart failure severity into account. However, optimal heart failure treatment differs depending on the heart failure severity, and usually involves combination therapy. The aim of this study is to investigate the pharmacological treatment of heart failure in general practice with respect to the available evidence, incorporating both disease severity and the use of combination therapy.

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PII: S1388-9842(02)00202-7

2. Methods

2.1. Study population

This study was part of the IMPROVEMENT of HF (Improvement program on evaluation and management of heart failure) study, an initiative developed to increase awareness and management of heart failure among primary care physicians throughout Europe [12]. A sample of Dutch general practitioners ($n=78$) stratified by practice location to be representative of the Dutch situation, were invited to participate in the study. Each general practitioner registered all heart failure patients seen during a 6-week period in 1999/2000. A random selection of up to 10 of these patients per prescriber was included in the study. Trained research assistants abstracted data on selected cardiovascular comorbidities, clinical status and current medication use from patients' medical records. Heart failure severity according to the New York Heart Association (NYHA) classification was determined by each patient's GP.

2.2. Minimum evidence-based treatment

For each NYHA classification a minimum evidence-based treatment regime was defined. These regimes represent the basic minimum treatment for heart failure a patient with a particular heart failure severity should receive according to the evidence current at the time of the study in 1999/2000. While additional agents such as digoxin or spironolactone may be indicated for some patients within each severity classification, all patients could expect treatment with, at least, the minimum regimes. For NYHA 1 and 2 the minimum evidence-based heart failure treatment was defined as an ACEI, either as monotherapy or in combination with other agents. A combination regime including both an ACEI and a β-blocker was defined as the minimum evidence-based regime for NYHA 3 and 4. Again this can be in combination with other agents as needed by the individual patient. Since it could be expected that angiotensin II antagonists (AIIA) could be used instead of an ACEI in some patients [13], we treated both agents together throughout this study, thus where ever we use the term ACEI we have included both ACEI and AIIA.

2.3. Analysis

The primary objective of this study was to determine if heart failure patients managed in general practice were receiving evidence-based treatment. For each NYHA severity classification the number of patients with treatment corresponding to that defined above as the minimum evidence-based treatment was determined. Odds ratios associated with receiving at least the minimum evidence-based treatment were calculated for each NYHA class.

To gain further insight into the pharmacological treatment of heart failure patients in general practice, we determined the proportion of heart failure patients treated with different combination drug regimes. These combinations incorporated the drug groups for which at the time of the study, evidence existed of their benefit in the treatment of heart failure. Despite the lack of evidence from large clinical trials for the use of diuretics in heart failure, given their well-established and accepted role in the treatment of heart failure, we included this group in the different combination regimes studied.

Table 1
Patient characteristics

Mean age years (S.D.)	71.6 (12.3)
% female	40.1
Severity	*Number* (%)
NYHA 1	134 (17.4)
NYHA 2	253 (32.9)
NYHA 3	232 (30.2)
NYHA 4	150 (19.5)
Comorbidity	
Hypertension	313 (40.7)
Atrial fibrillation	185 (24.1)
Myocardial infarction	271 (36.0)

3. Results

3.1. Study population

In total, data from 769 patients registered with 78 GPs were included in the study. The mean number of patients per GP was 9.9. Mean patient age was 71.5 years and 59.9% of the heart failure patients were male (Table 1). NYHA classification was recorded for almost all patients (94.5%). Patient characteristics are presented in Table 1.

3.2. Medication use

Looking simply at the use of the individual drug groups diuretics were the most commonly used drug group, used by 66.8% of the patients (Table 2). The proportion of patients treated with each drug group increased with increasing NYHA classification, with the exception of the β-blockers. The use of the latter decreased with increasing heart failure severity. Of the patients with NYHA class 1 heart failure 51.5% were being treated with a β-blocker while in NYHA class 4 this was only 23.3%. As expected, AIIA appeared to be used as an alternative to ACEIs in most patients using either of these drug groups. Only a small proportion of patients (0.7%), were using both an ACEI and an AIIA simultaneously.

Table 2
Use individual drug groups by heart failure patients. Results presented as percentage of patients (95% confidence intervals)

	NYHA 1 ($n=134$)	NYHA 2 ($n=235$)	NYHA 3 ($n=232$)	NYHA 4 ($n=150$)	Total ($n=796$)
Diuretic	29.9 (22.1–37.6)	57.3 (51.2–63.4)	81.9 (76.9–86.9)	92.7 (88.5–96.8)	66.8 (63.5–70.2)
ACEI	41.0 (32.7–49.4)	57.7 (52.0–64.2	66.8 (60.8–72.9)	69.3 (62.0–76.7)	59.9 (56.5–63.4)
β-blocker	51.5 (43.0–60.0)	42.3 (36.2–48.4)	36.2 (30.0–42.4)	23.3 (16.6–30.1)	38.4 (34.9–41.8)
Digoxin	11.9 (6.4–17.4)	20.2 (15.2–25.1)	34.9 (28.8–41.0)	37.3 (29.6–45.1)	26.5 (23.4–29.6)
Spironolactone	4.5 (1.0–8.0)	7.5 (4.3–10.8)	15.9 (11.2–20.7)	30.0 (22.7–37.3)	13.9 (11.5–16.4)

3.3. Cardiovascular comorbidity and medication use

Coexisting atrial fibrillation was present in 24.1% ($n=185/796$) of the participating patients. Digoxin was prescribed to 58.3% ($n=108/185$) of these patients. Of all digoxin users, 52.9% ($n=108/204$) of patients had coexisting atrial fibrillation. β-blockers were prescribed to 295 (38.4%) heart failure patients. Less than half of these patients had a past history of MI (45.4%, $n=134/295$) or coexisting hypertension (45.8%, $n=135/295$). Just over 50% (50.6%, $n=137/271$) of heart failure patients with a history of MI were not treated with a β-blocker. The majority of heart failure patients with coexisting hypertension were treated with a diuretic (71.6%, $n=224/313$) and/or an ACEI (73.8% $n=231/313$). However, hypertension was present among less than half of all diuretic users (43.6%, 224/514) and just over half of all ACEI users (50.2%, 321/2460).

3.4. Minimum evidence-based treatment

As NYHA heart failure severity class increased, the proportion of patients receiving the minimum evidence-based regime suitable for their severity class decreased (Table 3). After adjustment for age and sex, patients with less severe heart failure (NYHA classes 1 and 2) were approximately four to eight times more likely to receive evidence-based treatment than those with more severe heart failure (NYHA class 3 and 4).

3.5. Combination regimes

As expected, the use of combination therapy increased as disease severity increased (Table 4). Of the patients classified as NYHA heart failure class 1, the majority were treated with monotherapy (35.8%), 26.1% were being treated with a combination regime consisting of 2 or more of the drug groups investigated and 12.7% were being treated with a combination of 3 different agents. Just under a quarter of NYHA class 1 patients (22.4%) were not receiving any of the drug groups included in this study.

Over 60% of NYHA class 2 heart failure patients were being treated with a combination regime. For the

Table 3
Minimum evidence-based treatment: percentage of heart failure patients treated with the minimum evidence-based regime per NYHA class[a]

Severity	Minimum evidence-based treatment regime	Crude odds ratio (95% confidence interval)	Adjusted odds ratios (age/sex) (95% confidence interval)	Percentage of patients (95% confidence interval)
NYHA 1 ($n=134$)	ACEI	3.8 (2.2–6.7)	3.8 (2.1–6.7)	41.0 (32.7–49.4)
NYHA 2 ($n=253$)	ACEI	7.7 (4.6–12.7)	7.8 (4.6–13.0)	57.7 (52.0–64.2)
NYHA 3 ($n=232$)	ACEI + β-blocker	1.6 (0.9–2.7)	1.6 (0.9–2.8)	22.4 (17.0–27.8)
NYHA 4 ($n=150$)	ACEI + β-blocker	1	1	15.3 (9.6–21.1)
Total ($n=769$)				36.0 (32.6–39.4)

[a] Other cardiovascular drug treatments in addition to the minimum evidence-based regime may have been used.

majority of NYHA class 2 patients a combination of two drug groups was used (34.4%). Overall, the most common combination among NYHA class 2 patients (13.4%) was a diuretic and ACEI. The majority of NYHA class 3 patients received were also treated with a combination consisting of two agents and again the combination of an ACEI and a diuretic was the most commonly used (18.7%). Among the most severe heart failure patients (NYHA class 4) the majority were prescribed a regime consisting of three different drug groups. Again, among NYHA class 4 patients, the most common individual regime was the combination of an ACEI and a diuretic (18.7%).

4. Discussion

Overall, the number of heart failure patients receiving at least the minimum evidence-based treatment recommended for their heart failure severity defined in this study was low (36.0%). We observed that patients with more severe heart failure are less likely to be receiving evidence-based treatment in general practice than patients with less severe heart failure. When stratified for age, sex and NYHA severity class, patients with less severe heart failure were approximately four to eight times more likely to be receiving an evidence-based treatment than patients in NYHA severity classes 3 or 4.

We defined minimum evidence-based treatment regimes based on the evidence current at the time of the study. Evidence regarding the benefits of ACEI on both symptoms and mortality in heart failure first emerged in the late 1980s [3,14] and these agents were considered first-line treatment for all heart failure patients at the time of this study [15]. The role of β-blockers in the treatment of heart failure had also been established [16,17]. Thus, treatment with a β-blocker was included in our definition of minimum evidenced-based treatment for NYHA class 3 and 4. While digoxin has a clear role in the treatment of heart failure in a subgroup of patients, that is in those with coexisting atrial fibrillation, it was not considered an essential drug for the treatment of all heart failure patients of a particular severity class [15]. Similarly, there was evidence supporting the use of spironolactone in the treatment of heart failure for some patients [6] but this was in the role of an add-on therapy and not as a basic treatment [15]. If spironolactone or digoxin were included in the minimum evidence-based regime definition it is expected that the number of patients receiving the minimum recommended treatment would be even lower.

Assessment of pharmacotherapy for heart failure generally focuses on use of different drug groups [8,18–21] among all heart failure patients irrespective of their disease severity. In this study we observed, with the exception of the β-blockers, that the proportion of patients treated with each agent increased with increasing heart failure severity. Among all heart failure patients, irrespective of their severity level ACEI use was lower than expected. However, when drug use was stratified for NYHA severity class it became apparent that the lower use among patients in NYHA severity class 1 decreases the mean percentage of patients treated with an ACEI, and that ACEI use among patients with more severe heart failure was higher. In contrast, the percentage of heart failure patients treated with a β-blocker decreased in the more severe patients, which is not evident when simply looking at the total number of patients prescribed a β-blocker irrespective of heart failure severity. These findings underline the relevance of including a measure of heart failure severity in any assessment of pharmacotherapy quality.

Similarly, the majority of studies until now, focus on the prescribing of individual agents and not on combinations of these drug groups. Among our patient population the majority of patients (60.2%) were being treated with a combination of at least 2 different drug groups. Comparing Tables 2 and 4 show the value of including drug combinations in an assessment of prescribing quality. When looking at the individual agents, the majority of patients use diuretics or ACEI (66.8% and 59.9%, respectively). However, diuretics were used in combination with an ACEI in only 42.6% of all patients, despite the current ESC guideline recommendations that diuretics should always be used in combination with an ACEI. Since optimal heart failure therapy for most patients especially those with more severe heart failure consists of a combination of different agents [15], looking simply at the use of individual agents for the treatment of heart failure may overestimate the quality of evidence-based treatment for heart failure.

For this work, patient data was abstracted from the GPs medical records. These records contain complete information on each patient's current pharmacotherapy. Common to most studies investigating cardiovascular pharmacotherapy the problem is that the medications may be used for multiple cardiovascular indications. In this study we have assumed that a heart failure patient treated with a medication commonly associated with the treatment of heart failure would have been prescribed that medication for their heart failure since an indication is not generally available for each medication. Given the high prevalence of cardiovascular comorbidities among these patients it is possible that the medications included in this work were used for indications other than heart failure. From the GP records it is not generally possible to determine who initiated each medication: the GP or a specialist. Furthermore, medications supplied solely by a specialist may not be recorded in the patient's

Table 4
Combination regimes: percentage patients per NYHA treated with the major treatment regimes containing diuretics, ACEI, β-blockers, digoxin or spironolactone[a]

	NYHA 1	NYHA 2	NYHA 3	NYHA 4	All heart failure patients
None	22.4 (15.3–29.4)	8.3 (4.9–11.7)	0.9 (0.2–3.1)	0.7 (0.1–3.7)	7.0 (5.2–8.8)
Diuretic monotherapy	3.7 (0.5–6.9)	8.7 (5.2–12.2)	9.9 (6.1–13.8)	10.7 (5.7–15.6)	8.6 (6.4–10.2)
ACEI monotherapy	8.2 (3.6–12.9)	8.7 (5.2–12.2)	3.0 (0.8–5.2)	0.7 (0.1–3.7)	5.3 (3.7–6.9)
β-blocker monotherapy	23.1 (16.0–30.3)	11.5 (7.5–15.4)	4.7 (2.0–7.5)	2.0 (0.7–5.7)	9.6 (7.5–11.7)
Diuretic and ACEI	3.7 (0.5–6.9)	13.4 (9.2–17.6)	21.1 (15.9–26.4)	18.7 (12.4–24.9)	15.1 (12.6–17.6)
Diuretic and β-blocker	6.0 (2.0–10.0)	5.9 (3.0–8.8)	4.7 (2.0–7.5)	2.0 (0.7–5.7)	4.8 (3.3–6.3)
Diuretic and digoxin	0.7 (0.1–4.1)	3.2 (1.0–5.3)	4.7 (2.0–7.5)	5.3 (1.7–8.9)	3.6 (2.3–5.0)
ACEI and β-blocker	15.7 (9.5–21.8)	9.1 (5.5–12.6)	3.9 (1.4–6.4)	0.7 (0.1–3.7)	7.0 (5.2–8.8)
Diuretic and ACEI and β-blocker	3.0 (1.2–7.4)	9.5 (5.9–13.1)	8.2 (4.7–11.7)	7.3 (3.2–11.5)	7.5 (5.7–9.4)
Diuretic and ACEI and digoxin	6.0 (2.0–10.0)	7.5 (4.3–10.8)	11.2 (7.1–15.3)	14.7 (9.0–20.3)	9.8 (7.7–11.8)
Diuretic and ACEI and spironolactone	1.5 (0.4–5.3)	2.0 (0.3–3)	3.9 (1.4–6.4)	10.7 (5.7–15.6)	4.2 (2.7–7.6)
Diuretic and ACE and β-blocker and digoxin	1.5 (0.4–5.3)	1.6 (0.6–4.0)	6.0 (3.0–9.1)	3.3 (0.5–6.2)	3.3 (2.0–4.5)
Diuretic and ACEI and digoxin and spironolactone	0	1.2 (0.4–3.4)	3.4 (1.1–5.8)	6.7 (2.7–10.7)	2.7 (1.6–3.9)
Other[b]	4.5 (1.0–8.0)	9.4 (5.9–13.1)	14.4 (9.7–18.7)	16.5 (10.7–22.6)	11.5 (9.2–13.7)
Total	100 ($n=134$)	100 ($n=252$)	100 ($n=232$)	100 ($n=150$)	100 ($n=769$)

[a] Other cardiovascular agents in addition to those included in this table may have been used. Ninety-five percent confidence intervals are presented in parentheses.
[b] Other combinations not shown in the table were used by less than 5% of heart failure patients in each NYHA class.

general practice records. However, in the Netherlands, patient's prescribed a new medication by a specialist return to their GP for further supply of the medication indicating that continual supply by the specialist is the exception.

A number of reasons could explain the low percentage of patients treated with at least the minimum evidence-based regime. Important in the use of any drug are the associated contraindications and side effects. Contraindications or poor tolerance are valid reasons for not using a drug group recommended in the evidence in an individual patient. Another factor that may contribute to the low percentage of patients receiving the minimum recommended treatment are the differences that exist between the clinical trial heart failure population and the general practice heart failure population [22]. The heart failure patients treated in general practice are generally older and have more comorbidities than the clinical trial heart failure population.

Under-use of ACEI in the treatment of heart failure has been extensively studied and barriers to optimal ACE use centre around GP concerns regarding side effects namely hypotension, renal insufficiency and cough [23,24]. Little work has been done on the barriers associated with optimal use of the other agents in the treatment of heart failure. In this study we see that while overall use of ACEI is approximately 60% in the most severe patients, it is higher at 70%. The most common reason among patients with class 3 and 4 heart failure for sub-optimal treatment was the lack of a β-blocker. The role of β-blockers has undergone major change in the past decade. Until the publication of new clinical

trials in the mid-1990s β-blockers were traditionally considered contraindicated for heart failure patients and this changing role may explain their low use in general practice for the treatment of heart failure. At the time of this study, the Copernicus study showing the benefits of β-blockers in stable NYHA class 4 patients had not yet been published [25], which could be one factor contributing to the low use of β-blockers among patients with severe heart failure.

To assess the pharmacological treatment of heart failure in relation to the available evidence, it is important to take severity into account. While the number of drugs prescribed per heart failure patient increased with increasing severity, the use of evidence-based regimes was lower among patients with more severe heart failure (NYHA 3 and 4). Overall prescribing of ACEI was low, however, use increased among patients with more severe heart failure. While the use of ACEI increased with increasing CHF severity, this was not the case for the β-blockers. Prescribing of β-blockers clearly decreased as CHF severity increased. Furthermore, prescribing of β-blockers among all patients was low. This shows that while the evidence regarding the use of ACEI in the treatment of CHF has started to reach general practitioners, the message regarding the use of β-blockers in the treatment of CHF is yet to penetrate. One of the next steps towards improving heart failure management is to investigate the reasons underlying the low use of β-blockers in general practice and then to address these issues with educational programs. Such programs are clearly needed to improve heart failure management in general practice and should give special consideration to the role of β-blockers in the treatment of CHF.

References

[1] Mosterd A, Hoes AW, de-Bruyne MC, et al. Prevalence of heart failure and left ventricular dysfunction in the general population—the Rotterdam study. Eur Heart J 1999;20:447–55.

[2] Edep ME, Shah NB, Tateo IM, et al. Differences between primary care physicians and cardiologists in management of congestive heart failure: relation to practice guidelines. J Am Coll Cardiol 1997;30:518–26.

[3] The CONSENSUS Trial Study Group. Effects of enalapril on mortality in severe congestive heart failure. Results of the Cooperative North Scandinavian Enalapril Survival Study (CONSENSUS). The CONSENSUS Trial Study Group. N Engl J Med 1987;316:1429–35.

[4] The SOLVD Investigattors. Effect of enalapril on mortality and the development of heart failure in asymptomatic patients with reduced left ventricular ejection fractions. The SOLVD Investigattors. N Engl J Med 1992;327:685–91.

[5] MERIT-HF Study Group, Hjalmarson A, Goldstein S, Fagerberg B, et al. Effects of controlled-release metoprolol on total mortality, hospitalizations, and well-being in patients with heart failure: the Metoprolol CR/XL Randomized Intervention Trial in Congestive Heart Failure (MERIT-HF). J Am Med Assoc 2000;283:1295–302.

[6] The Rales Investigators. Effectiveness of spironolactone added to an angiotensin-converting enzyme inhibitor and a loop diuretic for severe chronic congestive heart failure (the Randomized Aldactone Evaluation Study (RALES)). Am J Cardiol 1996;78:902–7.

[7] James PA, Cowan TM, Graham RP, et al. Family physicians' attitudes about and use of clinical practice guidelines. J Fam Pract 1997;45:341–7.

[8] Croft JB, Giles WH, Roegner RH, et al. Pharmacologic management of heart failure among older adults by office-based physicians in the United States. J Fam Pract 1997;44:382–90.

[9] Ferreira A, Bettencourt P, Cortez M, et al. Angiotensin-converting enzyme inhibitors in heart failure: physicians' prescribing behavior. J Card Fail 1997;3:295–302.

[10] van-Veldhuisen DJ, Charlesworth A, Crijns HJ, et al. Differences in drug treatment of chronic heart failure between European countries. Eur Heart J 1999;20:666–72.

[11] James PA, Cowan TM, Graham RP. Patient-centered clinical decisions and their impact on physician adherence to clinical guidelines. J Fam Pract 1998;46:311–8.

[12] The Study Group on Diagnosis of the Working Group on Heart Failure of the European Society of Cardiology. Increasing awareness and improving the management of heart failure in Europe: the IMPROVEMENT of HF initiative. Society of Cardiology. Eur J Heart Fail 1999;1:139–44.

[13] Dunselman PH. Effects of the replacement of the angiotensin converting enzyme inhibitor enalapril by the angiotensin II receptor blocker telmisartan in patients with congestive heart failure. The replacement of angiotensin converting enzyme inhibition. (REPLACE investigators). Int J Cardiol 2001; 77:131–8.

[14] Hobbs FD. Modern management of hypertension and heart failure: evidence and practice. Heart 2000;84(Suppl 1):35–8.

[15] The Task Force on Heart Failure of the European Society of Cardiology. Guidelines for the diagnosis of heart failure. Eur Heart J 1995;16:741–51.

[16] Rokstad K, Straand J. Drug prescribing during direct and indirect contacts with patients in general practice. A report from the More & Romsdal Prescription Study. Scand J Primary Health Care 1997;15:103–8.

[17] MERIT-HF Study Group. Effect of metoprolol CR/XL in chronic heart failure: Metoprolol CR/XL Randomised Intervention Trial in Congestive Heart Failure (MERIT-HF). Lancet 1999;353:2001–7.

[18] Reis SE, Holubkov R, Edmundowicz D, et al. Treatment of patients admitted to the hospital with congestive heart failure: specialty-related disparities in practice patterns and outcomes. J Am Coll Cardiol 1997;30:733–8.

[19] Komajda M, Bouhour JB, Amouyel P, et al. Ambulatory heart failure management in private practice in France. Eur J Heart Fail 2001;3:503–7.

[20] Mejhert M, Persson H, Edner M, et al. Epidemiology of heart failure in Sweden—a national survey. Eur J Heart Fail 2001;3:97–103.

[21] Senni M, Gavazzi A. How patients with heart failure are managed in Italy. Eur J Heart Fail 2001;3:257–60.

[22] Cleland JG. ACE inhibitors for the prevention and treatment of heart failure: why are they 'under-used'? J Hum Hypertens 1995;9:435–42.

[23] Luzier AB, DiTusa L. Underutilization of ACE inhibitors in heart failure. Pharmacotherapy 1999;19:1296–307.
[24] Horne R, Coombes I, Davies G, et al. Barriers to optimum management of heart failure by general practitioners. Br J Gen Pract 1999;49:353–7.
[25] Packer M, Coats AJS, Fowler MB, et al. The carvedilol prospective randomized cumulative survival study group. Effect of Carvedilol on Survival in Severe Chronic Heart Failure. N Engl J Med 2001;344:1651–8.