Opportunities for Education in Heart Failure Pharmacotherapy Demonstrated by a Survey of Clinicians

P. Murray, C.T. O'Connor, V. Maher, D. Moore

Department of Cardiology, Tallaght University Hospital.

Abstract

Aim
We conducted a survey of practitioners 'knowledge of the clinical application of the major drug classes in HF, with reference to the European Society of Cardiology guidelines. The aim was to identify areas for practice development through education, which may improve HF morbidity and mortality.

Methods
We distributed a 14 item questionnaire assessing doctors knowledge of indications and contraindications for the major HF drug classes.

Results
Total number of responses was 127: Intern (N=21), SHO (N=64), Registrar (N=12), SpR (N=14), Consultant (N=4), GP (N=2). Consultants and GPs were excluded from analysis due to underrepresentation. Median years of practice was 4. Indications were correctly identified in a mean of 78% of responses overall. Of participants who felt comfortable with initiation and up-titration of beta blockers (N=84), only 31% (N=26) correctly identified an optimal target heart rate of less than 70 beats per minute. Forty-five percent (N=50) identified serum potassium and creatinine concentrations generally considered safe as contraindications to the initiation of MRA. Twenty-five percent of respondents (N=28) were unaware of a specialist HF service that catered to their institution, and how to refer to it, but 99% (N=110) felt that their practice would benefit from further education on HF pharmacotherapy.

Conclusion
Results of this survey suggest a need, and indeed a demand, for further education for clinicians in order to reduce mortality, morbidity, and hospital readmission in HF, as well as their attendant costs.

Introduction

Heart failure (HF) is a commonly encountered clinical entity associated with significant morbidity, the management of which costs at least €660 million annually to the Irish health service[1]. Evidence supporting the benefit of multidisciplinary care in reduction of readmission rates[2] has prompted the establishment of specialist HF clinics, resulting in improved medication adherence and early recognition and treatment of mild decompensation, thus averting the need for hospital admission. In contrast to this, relatively little emphasis has been placed on the role of the hospital general physician and the general practitioner in the management of stable HF[3].

There is a wealth of evidence for disease-modifying medications such as beta blockers[4, 5] (BB), angiotensin converting enzyme inhibitors[6-9] (ACEi), angiotensin 2 receptor blockers[10, 11] (ARB), mineralocorticoid receptor antagonists[12, 13] (MRA) and angiotensin receptor blocker / neprilysin inhibitors[14] (ARNI) in the context of heart failure with reduced ejection fraction (HFrEF). In the Irish setting, a randomised controlled trial comparing multidisciplinary care to routine care, the rate of early readmission was reduced to nil in both groups when patients were clinically stable on target doses of ACEi prior to discharge[15]. When administered within the indications recommended by European Society of Cardiology Heart Failure Guidelines[16], these medication classes significantly improve cardiovascular outcomes, most notably death, early rehospitalisation, and symptomatic functional class. Although we recognise the importance of loop diuretics as a mainstay of HF management, they are not included in this report due to the relative paucity of evidence regarding their use in maintenance therapy. The addition of the sodium-glucose cotransporter-2 inhibitor drug class to HF guidelines succeeded the end of this study.

This aim of this survey was to assess knowledge of pharmacotherapeutic options amongst generalists, and identify opportunities for education, in order to further optimise guideline-directed medical therapy while the patient awaits specialist input.

Methods

A 14 item **questionnaire** was designed to assess knowledge in relation to clinical indications for guideline directed heart failure medications, as well as target parameters for their titration. The questions were guided by class 1 recommendations from European Society of Cardiology (ESC) HF guidelines[16]. This questionnaire was distributed to attendees of all grades at hospital grand rounds and specialty journal clubs, as well as online via various social media platforms to reach doctors involved in general medical practice across all Irish Hospitals. Participation in the study was on a voluntary basis. Enrolment of respondents continued between February and March 2020. Responses from paper and electronic versions were collected in an anonymised database. Analysis was conducted using IBM SPSS Statistics.

Results

There were a total of 127 responses from 27 centres. Practitioners of extraneous specialities (N=10) were excluded (e.g. surgical/paediatric doctors), thus 117 responses were analysed. Median number of years of practice was 4.

Distribution of respondents by grade was as follows: Intern (N=21), SHO (N=64), Registrar (N=12), SpR (N=14), Consultant (N=4), GP (N=2). Distribution by location was 40% (N= 47) from tertiary level centres in Dublin city, 14% (N=16) from tertiary centres outside Dublin and 46% (N=54) from non-tertiary centres. Further reporting of breakdown was constrained by the need for anonymity. Due to low participation rates amongst consultants and GPs, these grades were excluded from the analysis.

Table 1 depicts respondents who correctly identified heart failure with reduced ejection fraction (HFrEF) as a strong indication for each of the therapies shown, both in absolute numbers and by frequency of grade. Indications were correctly identified in a mean of 78% of responses overall. When Junior doctors and senior doctors were grouped, there was no statistical difference in knowledge of indication for beta blockers, ACEi or ARNI. There was a higher knowledge base amongst junior doctors in the prescription of MRAs however ($p = <0.05$).

Table 1: Numbers of respondents who correctly identified specific indication in HFrEF.

	Beta blocker	ACEi/ARB	MRA	ARNI	Average Knowledge
Total (N=111)	84 (75.7%)	83 (71.1%)	92 (82.9%)	85 (76.6%)	77.5%
Intern (N=21)	14 (66.67%)	7 (33%)	15 (71.4%)	18 (85.7%)	64.3%
SHO (N=64)	50 (78.12%)	53 (82.8%)	54 (84.4%)	48 (75%)	80.1%
Registrar (N=12)	9 (75%)	11 (91.6%)	10 (83.3%)	10 (83.3%)	83.3%
SpR (N=14)	11 (78.57%)	12 (85.7%)	13 (92.8%)	9 (64.3%)	80.3%

Self-reported competency in initiating and up-titrating HF medications is reported in Table 2. Of participants who felt comfortable with initiation and up-titration of beta blockers (N=84), only 31% (N=26) correctly identified an optimal target heart rate of less than 70 beats per minute. Forty-five percent (N=50) identified serum potassium and creatinine concentrations generally considered safe as contraindications to the initiation of MRA.

Table 2: *Self-reported competency in initiation and up-titration of medications.*

	Beta blocker	ACEi	ARB	MRA	ARNI	Average Confidence
Total (N=111)	84 (75.7%)	87 (78.4%)	63 (56.8%)	51 (45.9%)	13 (11.7%)	53.7%
Intern (N=21)	9 (42.9%)	10 (47.6%)	5 (23.8)	2 (9.5%)	0 (0%)	24.8%
SHO (N=64)	49 (76.6%)	51 (79.6%)	37(57.8%)	28 (43.75%)	7 (10.93%)	53.8%
Registrar (N=12)	12 (100%)	12(100%)	10 (83.3%)	9 (75%)	3 (25%)	76.7%
SpR (N=14)	14 (100%)	14 (100%)	11 (78.6%)	12 (85.7%)	3 (21.4%)	77.1%

Twenty-five percent of respondents (N=28) were unaware of a specialist HF service that catered to their institution, and how to refer to it, but 99% (N=110) felt that their practice would benefit from further education on HF pharmacotherapy.

Discussion

The objective of this survey was to elicit knowledge gaps in HF pharmacotherapy in order to identify areas for high-yield targeted intervention. Results suggest that a significant number of doctors involved in the management of HF are unaware of the strong indication for beta blocker and ACEi therapy in patients with HFrEF. Additionally, knowledge around the uptitration of medications to target doses was inadequate in the majority of respondents despite high rates of perceived competency. We observed a high rate of underestimation of the serum creatinine and potassium concentrations that would contraindicate treatment with an MRA. This raises the conjecture that beneficial medications might be inappropriately withdrawn.

The prevalence of HF is estimated at 2% in Ireland, rising to 10% in those aged 75 and over[3]. Five percent of acute hospital admissions are for a primary diagnosis of HF, in addition to a much higher rate of stable HF complicating other admissions. Mortality at 5 years following newly diagnosed HF has declined from 59% in 2000 to 52% in 2012[17], reflective of modest improvements in management. Coupled with the body of literature supporting pharmacotherapy to improve morbidity and survival outcomes in HFrEF, the persistently high mortality rate in this condition necessitates a broader understanding and application of guidelines in order to further improve upon these outcomes. The cost of implementing this treatment is offset by a reduction in the rate of readmission and its attendant costs[2].

Given the high prevalence of HF complicating acute hospital admissions, there is a need for improved recognition of its major therapeutic options amongst non-cardiovascular specialities on general medical take. Increased awareness of this important underlying diagnosis and its pharmacotherapy is essential in order to capitalise on the opportunity to provide better treatment and improve outcomes. This might be aided by greater availability and capacity of nursing-led HF units with facilities to reliably titrate and monitor medications in the outpatient setting.

In an effort to reduce sampling bias, the authors made the questionnaire available online. It was suggested that selection bias arising from surveying only those doctors who were attending educational meetings would skew the results toward higher levels of knowledge, however the online platform allowed an unmeasurable rate of non-participation. This introduces the possibility of significant response bias to results which could have had the opposite effect. In addition, the low response rates amongst consultants effected significant underrepresentation of senior doctors. This is likely due to high response rates on social media platforms where the survey was disseminated predominantly by SHOs, and limits the external validity of results given the greater influence that the input of senior clinicians is likely to exert on decisions.

The high prevalence of HF in Ireland and costs associated with admission for decompensation necessitates a sound knowledge of its management amongst generalists. This survey highlights an opportunity for cost-effective intervention by way of practice updates and continuing professional development which have been successful to varying degrees elsewhere[18]. It is postulated that a targeted HF education programme for clinicians would increase prescription of disease modifying agents such as beta blockers, ACEi and others, which would likely contribute to reduced HF readmissions, morbidity and even mortality. Results of this survey suggest a need, and indeed a demand, for further education and support to fortify the already robust knowledge of pharmacotherapy in stable heart failure.

Declaration of Conflicts of Interest:
The authors have no conflicts of interest to declare.

Corresponding Author:
Dr. Peter Murray
Department of Cardiology,
Tallaght University Hospital.
E-Mail: petercmurray@hotmail.com

References:
1. McDonald K, Gallagher J. The cost of Heart Failure in Ireland. 2015 November.
2. Ledwidge M, Barry M, Cahill J, Ryan E, Maurer B, Ryder M, et al. Is multidisciplinary care of heart failure cost-beneficial when combined with optimal medical care? Eur J Heart Fail. 2003;5(3):381-9.

3. Programme NHFCC. Heart Failure Model of Care. In: Directorate CSaP, editor. 2012.

4. Poole-Wilson PA, Swedberg K, Cleland JG, Di Lenarda A, Hanrath P, Komajda M, et al. Comparison of carvedilol and metoprolol on clinical outcomes in patients with chronic heart failure in the Carvedilol Or Metoprolol European Trial (COMET): randomised controlled trial. Lancet. 2003;362(9377):7-13.

5. The Cardiac Insufficiency Bisoprolol Study II (CIBIS-II): a randomised trial. Lancet. 1999;353(9146):9-13.

6. Group CTS. Effects of enalapril on mortality in severe congestive heart failure. Results of the Cooperative North Scandinavian Enalapril Survival Study (CONSENSUS). N Engl J Med. 1987;316(23):1429-35.

7. Investigators S, Yusuf S, Pitt B, Davis CE, Hood WB, Cohn JN. Effect of enalapril on survival in patients with reduced left ventricular ejection fractions and congestive heart failure. N Engl J Med. 1991;325(5):293-302.

8. Effect of metoprolol CR/XL in chronic heart failure: Metoprolol CR/XL Randomised Intervention Trial in Congestive Heart Failure (MERIT-HF). Lancet. 1999;353(9169):2001-7.

9. Packer M, Fowler MB, Roecker EB, Coats AJ, Katus HA, Krum H, et al. Effect of carvedilol on the morbidity of patients with severe chronic heart failure: results of the carvedilol prospective randomized cumulative survival (COPERNICUS) study. Circulation. 2002;106(17):2194-9.

10. Cohn JN, Tognoni G, Valsartan Heart Failure Trial I. A randomized trial of the angiotensin-receptor blocker valsartan in chronic heart failure. N Engl J Med. 2001;345(23):1667-75.

11. McMurray JJ, Ostergren J, Swedberg K, Granger CB, Held P, Michelson EL, et al. Effects of candesartan in patients with chronic heart failure and reduced left-ventricular systolic function taking angiotensin-converting-enzyme inhibitors: the CHARM-Added trial. Lancet. 2003;362(9386):767-71.

12. Pitt B, Zannad F, Remme WJ, Cody R, Castaigne A, Perez A, et al. The effect of spironolactone on morbidity and mortality in patients with severe heart failure. Randomized Aldactone Evaluation Study Investigators. N Engl J Med. 1999;341(10):709-17.

13. Zannad F, McMurray JJ, Krum H, van Veldhuisen DJ, Swedberg K, Shi H, et al. Eplerenone in patients with systolic heart failure and mild symptoms. N Engl J Med. 2011;364(1):11-21.

14. McMurray JJ, Packer M, Desai AS, Gong J, Lefkowitz MP, Rizkala AR, et al. Angiotensin-neprilysin inhibition versus enalapril in heart failure. N Engl J Med. 2014;371(11):993-1004.

15. McDonald K, Ledwidge M, Cahill J, Kelly J, Quigley P, Maurer B, et al. Elimination of early rehospitalization in a randomized, controlled trial of multidisciplinary care in a high-risk, elderly heart failure population: the potential contributions of specialist care, clinical stability and optimal angiotensin-converting enzyme inhibitor dose at discharge. Eur J Heart Fail. 2001;3(2):209-15.

16. Ponikowski P, Voors AA, Anker SD, Bueno H, Cleland JGF, Coats AJS, et al. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC)Developed with the special contribution of the Heart Failure Association (HFA) of the ESC. Eur Heart J. 2016;37(27):2129-200.

17. Taylor CJ, Ordonez-Mena JM, Roalfe AK, Lay-Flurrie S, Jones NR, Marshall T, et al. Trends in survival after a diagnosis of heart failure in the United Kingdom 2000-2017: population based cohort study. BMJ. 2019;364:l223.

18. Walsh K, Rutherford A, Richardson J, Moore P. NICE medical education modules: an analysis of cost-effectiveness. Educ Prim Care. 2010;21(6):396-8.