Cardiovascular Topics

A strategy to improve adherence to guideline-directed medical therapy (GDMT) and the role of the multidisciplinary team in a heart-failure programme

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Abstract

Background: Heart failure (HF) patients place a heavy burden on the healthcare system because of their frequent need for in-patient treatment, emergency room visits and subsequent hospital stays. To provide proper care and effective therapy, practitioners have streamlined delivery techniques such as clinical pathways, checklists and pocket manuals. However, a description of the establishment of a disease-management programme, including a multidisciplinary team of physicians, clinical pharmacists and nurse specialists is required. The aim of this study was to highlight the role of the multidisciplinary team in a heart-failure programme by assessing the improvement in adherence to guideline-directed medical therapy.

Methods: A retrospective, observational research was undertaken on patients with HF at a cardiac centre in Riyadh, to observe the HF patients' management before (January to December 2014) and after (January to December 2015) the establishment of a programme.

Results: The use of angiotensin converting enzyme inhibitors and angiotensin receptor blockers was 75.59% in 2014 at discharge and 81.17% in 2015 ($p = 0.249$). Beta-blockers use at release increased from 87.83% in 2014 to 94.53% in 2015 ($p = 0.021$). The flu vaccine was given to 48.24% of patients in 2014 and 75.13% of the patients in 2015 ($p < 0.001$). The pneumococcal vaccine was administered to 44.22% of patients in 2014 and 75.13% of patients in 2015 ($p < 0.001$). The ejection fraction improved from 30.21% in the first month to 39.56% in the 12th month ($p = 0.001$) in patients managed in 2015.

Conclusion: The multidisciplinary heart-failure programme resulted in a positive effect, in the form of improved patient care after including the clinical pharmacist and nurse specialist.

Keywords: angiotensin converting enzyme inhibitors, directed medical therapy, heart failure, immunisation, medical therapy

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Heart failure (HF) is associated with reduced quality of life, increased morbidity and mortality rates and increased healthcare costs,[1] therefore, it is a public health burden. Globally, it is estimated that approximately 26 million people are living with heart failure,[2] with 5.7 million cases in the USA alone.[3] The increase in prevalence of HF and the risk of acute exacerbation has resulted in a concomitant rise in the number of related hospitalisations.[4]

There was a one to 2% prevalence of HF in 2011, with its incidence approaching five to 10 per 1 000 persons per year in the Western world.[2] There is a lack of studies assessing the incidence and prevalence of HF in the Middle East (ME). However, scattered data are available from a single centre in the ME region.[5]

There is an increased rate of out-patient visits, hospitalisations and re-admissions among HF patients than in previous years, representing a considerable burden to the healthcare system.[6] Morbidity, premature mortality, unpaid care costs and loss of productivity correspond with HF as it imposes both direct costs to healthcare systems and indirect costs to society.[7] The overall economic cost of HF was approximately $108 billion per annum worldwide in 2012.[8] HF care generally involves patients with multiple co-morbidities in different settings and providers, which predisposes them to medication errors and complications that require special attention and utmost care.[9]

The nature of HF therapy needs patient self-management and constant monitoring, making the implementation of guideline-based therapies a problem in clinical practice. To guarantee proper care and effective therapy, practitioners have streamlined delivery techniques such as clinical pathways, checklists and pocket manuals.[10]

However, there is a need to describe the development of a disease-management programme. Effective programmes require multidisciplinary involvement, including input from a cardiologist, HF specialist nurse and physiotherapist/exercise physiologist, as well as facilities for supervised exercise.[11] They all play their respective roles in translating the guidelines into practical tools for adhering to and utilising such therapies. Angiotensin converting enzyme inhibitors (ACEIs),[12]

angiotensin receptor blockers (ARBs),[13] beta-blockers (BB),[14] mineralocorticoid receptor antagonists (MRA),[15] and the newer angiotensin receptor neprilysin inhibitors (ARNI)[16] have all revolutionised the field of HF through their ability to reduce mortality and hospitalisation rates.

Patients with HF may also benefit from immunisation against influenza and pneumococcal pneumonia. Vaccination is an inexpensive strategy that has the potential to reduce the high rates of morbidity, death and total cost of care associated with HF.[17]

This study aimed to improve adherence to directed medical therapy guidelines by highlighting the role of the multidisciplinary team (include physician, nurse and pharmacist) in the HF programme in improving left ventricular ejection fraction (EF) and reducing the rate of rehospitalisation.

Methods

This retrospective, observational study was performed to evaluate the adherence to guideline-directed medical therapy (GDMT) before (1 January to 31 December 2014) and after (1 January to 31 December 2015) the establishment of the HF programme among HF patients. The study was conducted at the Cardiac Centre, King Khalid Hospital in Riyadh, Saudi Arabia.

Study approval was obtained from the ethics review committee of the Cardiac Centre. The Institute has developed guidelines for HF treatment regimens, including the use of ACEI/ARB and BB, as well as influenza and pneumococcal immunisation.

The study participants included all chronic HF patients admitted to a single cardiac centre with EF less than 55%. Newly diagnosed acute HF cases (characterised by new or worsening symptoms and indications of HF, the leading cause of unexpected hospitalisation among patients) were excluded.

A total of 400 patients were selected for this study, however, after applying the inclusion and exclusion criteria, eight people declined to participate, leaving 392 persons with chronic HF eligible for the research.

The HF programme commenced in January 2015. Data collected were compared between the commencement of the programme (one-year time period) and that prior to the programme's initiation (one-year time period). The study assessed the following: the rate of adherence to GDMT among chronic HF patients; the impact of the adherence to guideline recommendations on the HF programme and guideline-driven toolkit; and the impact of the multidisciplinary approach in the HF programme.

The patients with HF were handled in accordance with the European Society of Cardiology (ESC) recommendations. According to the 2016 ESC recommendation, when patients are diagnosed with HF and have an EF of 35%, they should be started on ACEI/ARB and BB. When the patient is in sinus rhythm and the QRS length is less than 130 ms, cardiac resynchronisation therapy should be regarded as the therapy of choice. However, if the patient has refractory symptoms, digoxin, hydralazine and isosorbide dinitrate (H-ISDN), a left ventricular assist device (LVAD), or a heart transplant should be explored. When the patient is in sinus rhythm with a heart rate of more than 70 beats per minute, ivabradine should be started. Each HF patient was assessed for the use of GDMT based on these guidelines.

The programme was assessed for the study outcomes, including the administration of BB, ACEI or ARB, pneumococcal immunisation, the influenza before- and after-programme, and hospital re-admission rate within 30 days of discharge.

The three members of the programme were present together in the patient encounter, playing their respective roles. The physician's role, being the leader of the team, was to conduct an initial evaluation, take a history, carry out a physical examination and investigation, and review the management plan. The clinical pharmacists and nurses evaluated and assessed the appropriate GDMTs according to evidence, ensuring compliance with prescriptions during hospitalisation and follow up, and delivery of adequate patient education regarding medication use.

Patient data pertinent to the research were retrieved from the electronic medical record at two time periods after the initial visit, namely the first and 12th months. The collected data of EF and re-hospitalisation were then compared between the study groups to determine GDMT adherence.

Statistical analysis

SAS version 9.2 (SAS Institute, Inc, Cary, NC) was used to conduct the statistical analysis to observe the differences before and after the programme. The chi-squared test was used to observe the difference between two categorical variables and the dependent *t*-test was applied to observe the mean difference before and after the initiation of the programme. A p-value < 0.05 was considered statistically significant.

Results

The mean ± standard deviation age of the patients in 2014 was 59.82 ± 14.63 years with a male preponderance (78.95%), while the age was 58.02 ± 16.00 years with 73.49% males in 2015. Co-morbidities included obesity, diabetes mellitus, hypertension, atrial fibrillation, stroke, hypothyroidism, anaemia, chronic obstructive pulmonary disease, coronary artery disease (CAD) and dyslipidaemia. There was a significant difference in the number of patients with hypertension, CAD, dyslipidaemia and in New York Heart Association (NYHA) class III between year 2014 and 2015 (Table 1). The number of patients discharged on ACEI/ARB and BB, and with immunisation as per the guidelines is shown in Fig. 1.

The use of ACEI/ARB was 75.59% in 2014 at discharge and 81.17% in 2015 ($p = 0.249$). BB at release increased from 87.83% in 2014 to 94.53% in 2015 ($p = 0.021$). The flu vaccine was given to 48.24% of patients in 2014 and 75.13% of the patients in 2015 ($p < 0.001$). The pneumococcal vaccine was administered to 44.22% of patients in 2014 and 75.13% of patients in 2015 ($p < 0.001$) (Table 2).

Table 3 shows significant improvement in short-term outcomes, namely the 30-day re-hospitalisation rate. Patients' re-admission within 30 days in 2014 was 14.21%, which was significantly reduced to 4.25% in 2015 after commencement of the programme ($p < 0.001$).

Clinical improvement was evident after implementation of the GDMT as there was a statistically significant improvement in EF from 30.21% in the first month to 39.56% by the end of the 12th month ($p = 0.001$) in patients managed in 2015, whereas there was no significant improvement in EF in patients managed

Table 1. Baseline characteristics

Variables	*Total*	*2014*	*2015*	p-*value*
Socio-demographic characteristics				
Age, years, mean ± SD	58.94 ± 15.33	59.82 ± 14.63	58.02 ± 16.00	0.282
Gender, *n* (%)				
Male	257 (76.26)	135 (78.95)	122 (73.49%)	0.239
Female	80 (23.74)	36 (21.05)	44 (26.51%)	
BMI, mean ± SD	28.99 ± 8.94	29.79 ± 9.71	28.17 ± 8.01	0.095
Nationality, *n* (%)				
Saudi	242 (71.81)	129 (75.44)	113 (68.07)	0.133
Non-Saudi	95 (28.19)	42 (24.56)	53 (31.93)	
Past co-morbidities, *n* (%)				
Obesity	102 (30.27)	53 (30.99)	49 (29.52)	0.768
Diabetes mellitus	195 (57.86)	101 (59.06)	94 (56.63)	0.650
Hypertension	220 (67.2)	123 (75.19)	97 (58.43)	0.001*
Atrial fibrillation	47 (13.95)	21 (12.28)	26 (15.66)	0.370
Stroke	19 (5.64)	13 (7.60)	6 (3.61)	0.113
Hypothyroidism	22 (6.53)	8 (4.68)	14 (8.43)	0.163
Anaemia	165 (48.96)	88 (51.46)	77 (46.39)	0.384
COPD	20 (5.93)	14 (8.19)	6 (3.61)	0.076
CAD	185 (54.90)	105 (61.40)	80 (48.19)	0.015*
Dyslipidaemia	190 (56.38)	110 (64.33)	80 (48.19)	0.003*
NYHA class I	53 (15.73)	25 (14.62)	28 (16.87)	0.571
NYHA class II	198 (58.75)	93 (54.39)	105 (63.25)	0.098
NYHA class III	86 (25.60)	53 (30.99)	33 (20.00)	0.021*
NYHA class IV	0	0	0	–
Haemoglobin (g/dl)	12.32 ± 2.25	12.01 ± 2.26	12.65 ± 2.20	0.009*
Creatinine (µmol/l)	138.9 ± 78.74	151.1 ± 93.16	126.4 ± 58.08	0.004*
Pro-BNP (pg/ml)	7189 ± 9839	7651 ± 7910	6747 ± 11393	0.410

BMI, body mass index; COPD, chronic obstructive pulmonary disease; CAD, coronary artery disease; BNP, brain natriuretic peptide; NYHA, New York Heart Association; SD, standard deviation. *$p < 0.05$ significant.

in 2014 (32.21% in the first month and 34.61% in the 12th month, $p = 0.40$). Furthermore, there was a significant difference in the frequency of re-hospitalisation episodes at the end of one year ($p < 0.001$) between the two groups.

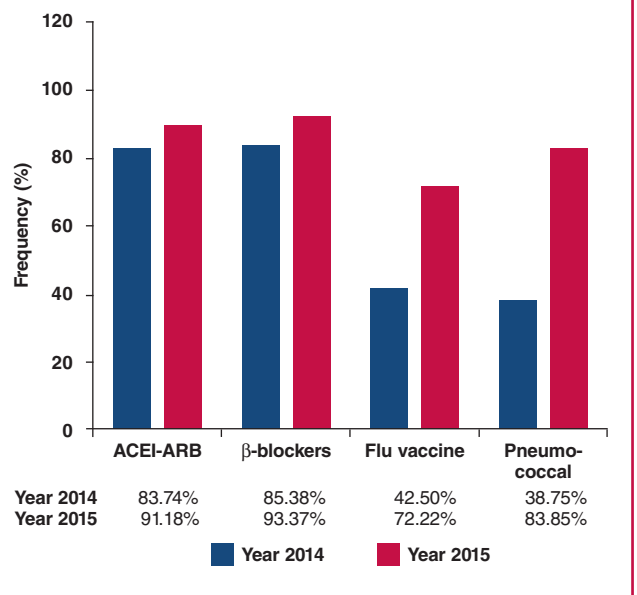

Fig. 1. Frequency (%) of patients discharged on ACEI/ARB and BB, and with immunisation.

Table 2. Comparison of medication use before and after the programme

Indicators	*2015*	*2014*	p-*value*
ACEI/ARB (%)	81.17	75.59	0.249
BB (%)	94.53	87.83	0.021*
Flu vaccine (%)	75.13	48.24	< 0.001*
Pneumococcal vaccine (%)	75.13	44.22	< 0.001*

ACEI/ARB, angiotensin converting enzyme inhibitors/angiotensin receptor blockers; BB, beta-blockers. *$p < 0.05$ significant.

Table 3. Thirty-day re-admission rate

	Indicators in 2015	*Indicators in 2014*	*Difference (95% CI)*	p-*value*
30-day re-admission rate (%)	4.25	14.21	–9.96 (–15.53, –4.36)	< 0.001*

*$p < 0.05$ significant.

Discussion

This study aimed to assess the effect of a multidisciplinary HF programme in the form of improved patient care after including a clinical pharmacist and nurse specialist, which showed a reduction in hospital re-admission in the first 30 days, from 14.21 to 4.25% ($p < 0.001$). A similar study by Rich *et al.*[3] demonstrated that a randomised, multidisciplinary intervention reduced re-admission rates for HF by 56% and saved almost $500 for each enrolled person. The study provided strong validation for the concept of a multidisciplinary approach.

The present study reported significant clinical improvement in EF ($p = 0.001$) and reduction in re-hospitalisation ($p < 0.0011$) between the first and 12th month in 2015 after commencement of the GDMT. Similar to our study, in a study by Joseph *et al.*, a statistically significant difference across the study groups was seen after the use of GDMT, which might be attributable to more targeted care offered by the HF clinic. HF clinics, which are extensively used in other countries, have been proven to minimise rates of re-hospitalisation and death, as well as to enhance patient outcomes by strict adherence to GDMT.[18]

The major contributor to the underutilisation of evidence-based HF therapies includes medication adherence. In some studies, there was a significant contribution of medication non-adherence to hospital admission in 7.9% of subjects, which was revealed during the analysis of HF hospitalisations in the light of conforming with the guidelines–HF registry.[19,20] The literature reports pneumonia as the leading cause of death in HF patients and it should be considered as a significant mortality indicator. In another study, one of the significant findings was the administration of pneumococcal vaccine, which was found to be increased by 31%.[21]

MRA and ARNI were not used to track patient progress in our HF patients. The investigators added new medications to the treatment regimen based on the outcomes of the present trial, and the findings of the analytical process will be released shortly. With the exception of ACEI, the present study found a considerable effect of a multidisciplinary approach employing a guideline-translated toolkit, leading to a significant improvement in usage and compliance with recommendations. However, there was a tendency towards improvement in patients as well.

To the best of our knowledge, this research is the first to be reported in this context from our region. There were a few limitations of the study. The study design was cross-sectional and in future, prospective studies should be conducted. Also the

study period of one year might not be justifiable to describe a causal relationship.

Conclusion

Implementing a multidisciplinary HF programme improved the use of GMDT in HF patients and increased immunisation awareness and adherence to prescriptions. The interdisciplinary approach in the HF programme is crucial in implementing the guidelines and delivering the appropriate education to the team and patients. This eventually showed a reduction in 30-day hospital re-admission rates. The EF did not improve in 2014, but significantly improved in 2015 with the execution of the programme. More outcomes, including mortality rate and cost, would be essential to investigate in future follow ups.

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References

1. Straburzyńska-Migaj E, Kałużna-Oleksy M, Maggioni AP, Grajek S, Opolski G, Ponikowski P, *et al*. Patients with heart failure and concomitant chronic obstructive pulmonary disease participating in the Heart Failure Pilot Survey (ESC-HF Pilot) – Polish population. *Arch Med Sci* 2015; **11**: 743–750.
2. Bui AL, Horwich TB, Fonarow GC. Epidemiology and risk profile of heart failure. *Nat Rev Cardiol* 2011; **8**: 30–41.
3. Mozaffarian D, Benjamin EJ, Go AS, *et al.* American Heart Association Statistics Committee; Stroke Statistics Subcommittee. Heart Disease and Stroke Statistics – 2016 Update: A report from the American Heart Association. *Circulation* 2016; **133**: e38–e360.
4. Shehab A, Al-Dabbagh B, Almahmeed W, Bustani N, Nagelkerke N, Yusufali A, *et al.* Characteristics and in-hospital outcomes of patients with acute coronary syndromes and heart failure in the United Arab Emirates. *BMC Res Notes* 2012; **5**: 534. https://doi.org/10.1186/1756-0500-5-534
5. Agarwal AK, Venugopalan P, de Bono D. Prevalence and etiology of heart failure in an Arab population. *Eur J Heart Fail* 2001; **3**: 301–305.
6. Fihn SD, Gardin JM, Abrams J, Berra K, Blankenship JC, Dallas AP, *et al*. 2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS guideline for the diagnosis and management of patients with stable ischemic heart disease. *J Am Coll Cardiol* 2012; **60**: e44–164.
7. Holmes DR. President's page: Zeroes, San Jose, Phoenix, Dallas, San Diego. *J Am Coll Cardiol* 2012; **59**: 88–89.
8. McMurray JJ, Adamopoulos S, Anker SD, Auricchio A, Böhm M, *et al*. ESC guidelines for the diagnosis and treatment of acute and chronic heart failure 2012: The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. *Eur Heart* 2013; **15**: 361–362.
9. Milfred-LaForest SK, Chow SL, DiDomenico RJ, Dracup K, Ensor CR, Gattis-Stough W, *et al*. An opinion paper from the Heart Failure Society of America and American College of Clinical Pharmacy Cardiology Practice and Research Network. *J Card Fail* 2013; **19**: 354–369.
10. McConnell KJ. Transitions in Care for Congestive-Heart-Failure-Patients-Pharmacy-S-Role.pdf. 2015th edn. Colorado: ACCP Updates in Therapeutics® 2015: Ambulatory Care Pharmacy Preparatory Review and Recertification Course.
11. Riley JP, Masters J. Practical multidisciplinary approaches to heart failure management for improved patient outcome. *Eur Heart J* 2016; **18**(suppl_G): G43–52.
12. Results of the Cooperative North Scandinavian Enalapril Survival Study (CONSENSUS). Effects of ealapril on mortality in severe congestive heart failure. *N Engl J Med* 1987; **316**: 1429–1435.
13. Cohn J, Tognoni G. For the Valsartan Heart Failure Trial Investigators. A randomized trial of the angiotensin-receptor blocker valsartan in chronic heart failure. *N Engl J Med* 2001; **345**: 1667–1675.
14. CIBIS-II Investigators and Committees. The cardiac insufficiency bisoprolol study II (CIBIS-II): a randomised trial. *Lancet* 1999; **353**: 9–13.
15. Pitt B, Zannad F, Remme W, Cody R, Castaigne A, Perez A, Palensky J, Wittes J. For the randomized aldactone evaluation study investigators. The effect of spironolactone on morbidity and mortality in patients with severe heart failure. *N Engl J Med* 1999; **341**: 709–717.
16. McMurray JJ, Packer M, Desai AS, Gong J, Lefkowitz MP, Rizkala AR, *et al.*, Investigators P-H and Committees. Angiotensin-neprilysin inhibition versus enalapril in heart failure. *N Engl J Med* 2014; **371**: 993–1004.
17. Bhatt AS, DeVore AD, Hernandez AF, Mentz RJ. Can vaccinations improve heart failure outcomes? Contemporary data and future directions. *J Am Coll Cardiol Heart Failure* 2017; **5**(3): 194–203.
18. Joseph J, Stephy PS, James J, Abraham S, Abdullakutty J. Guideline-directed medical therapy in heart failure patients: impact of focused care provided by a heart failure clinic in comparison to general cardiology out-patient department. *Egyptian Heart J* 2020; **72**(1): 1–8.
19. Nigro SC, Garwood CL, Berlie H, Irons B, Longyhore D, McFarland MS, *et al*. Clinical pharmacists as key members of the patient-centered medical home: an opinion statement of the Ambulatory Care Practice and Research Network of the American College of Clinical Pharmacy. *Pharmacotherapy* 2014; **34**: 96–108.
20. Fonarow GC, Abraham WT, Albert NM, *et al*. Factors identified as precipitating hospital admissions for heart failure and clinical outcomes: findings from OPTIMIZE-HF. *Arch Int Med* 2008; **168**: 847–854
21. Pellicori P, Cleland JG, Clark AL. Chronic obstructive pulmonary disease and heart failure: a breathless conspiracy. *Cardiol Clin* 2022; **40**(2): 171–182.