Original Article

Strategies to address the shortcomings of commonly used advanced chronic heart failure descriptors to improve recruitment in palliative care research: A parallel mixed-methods feasibility study

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Abstract

Background: Recruitment challenges contribute to the paucity of palliative care research with advanced chronic heart failure patients.
Aim: To describe the challenges and outline strategies of recruiting advanced chronic heart failure patients.
Design: A feasibility study using a pre–post uncontrolled design.
Setting: Advanced chronic heart failure patients were recruited at two nurse-led chronic heart failure disease management clinics in Ireland
Results: Of 372 patients screened, 81 were approached, 38 were recruited (46.9% conversion to consent) and 25 completed the intervention. To identify the desired population, a modified version of the European Society of Cardiology definition was used together with modified New York Heart Association inclusion criteria to address inter-study site New York Heart Association classification subjectivity. These modifications substantially increased median monthly numbers of eligible patients approached (from 8 to 20) and median monthly numbers recruited (from 4 to 9). Analysis using a mortality risk calculator demonstrated that recruited patients had a median 1-year mortality risk of 22.7 and confirmed that the modified eligibility criteria successfully identified the population of interest. A statistically significant difference in New York Heart Association classification was found in recruited patients between study sites, but no statistically significant difference was found in selected clinical parameters between these patients.
Conclusion: Clinically relevant modifications to the European Society of Cardiology definition and strategies to address New York Heart Association subjectivity may help to improve advanced chronic heart failure patient recruitment in clinical settings, thereby helping to address the paucity of palliative care research this population.

Keywords

Heart failure, palliative care, recruitment, patient-reported outcome measures

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What is already known about the topic?

- Recruitment of advanced chronic heart failure (CHF) patients is challenging due to high illness burden.
- Palliative care needs assessment research is lacking for advanced CHF patients.

What this paper adds?

- The New York Heart Association (NYHA) Functional Classification does not capture the fluctuating health status of advanced CHF patients.
- The NYHA classification as a stand-alone inclusion criterion can act as a recruitment barrier to palliative care studies.
- The 2012 European Society of Cardiology definition of advanced CHF used in this study is too narrow to reflect the multi-morbidity and fluctuating status frequently associated with advanced CHF.

Implications for practice, theory or policy

- The 2016 European Society of Cardiology definition better reflects indicators of worsening CHF and has removed NYHA as a criterion for end-of-life care.
- More emphasis is required on a palliative care approach throughout the disease trajectory in this definition.
- Strategies to address NYHA subjectivity may help to improve advanced CHF patient recruitment in clinical settings including the American College of Cardiology Foundation (ACC)/American Heart Association (AHA) CHF staging system.

Introduction

Chronic heart failure (CHF) is a progressive condition with a comparable mortality rate to cancer,[1] predominantly affecting older adults with multi-morbidity.[2] It is a condition with a risk of sudden or premature death[3] and can necessitate therapeutic decision-making between life-prolonging treatments and quality of life.[4] Older CHF patients with multi-morbidity particularly require a holistic patient-centred approach to care[5] to facilitate therapeutic decision-making around quality of life versus life prolongation.[6] Many CHF patients experience palliative needs. A palliative care needs assessment presents one way to integrate palliative care into CHF management and potentially improve patient care.[7]

Recruitment challenges contribute to the paucity of CHF palliative care needs assessment research. Recruitment is difficult for many reasons: advanced CHF is difficult to define;[8] it has unclear inconsistent descriptive nomenclature;[9] it has a variable progression rate[10] and unpredictable prognosis;[11] there is high patient attrition due to illness burden and high mortality;[12] and gate-keeping often occurs.[13]

This article describes recruitment challenges experienced in a feasibility study of a palliative-specific patient-reported outcome measure (PROM) intervention and how these challenges were addressed. It provides recruitment solutions for future studies involving CHF patients.

Methods

Study design

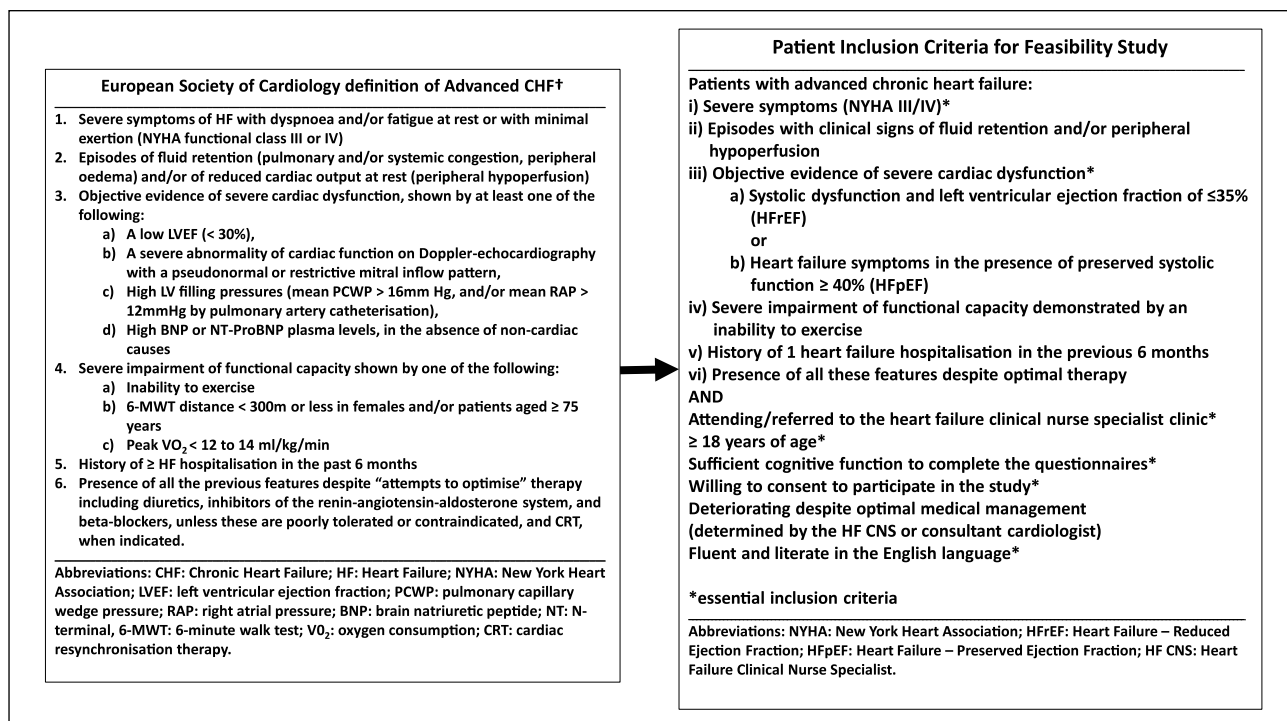This parallel mixed-methods feasibility study[14] involved a pre–post uncontrolled longitudinal study design. This study examined the feasibility and acceptability of the palliative-specific PROM intervention to improve identification and management of palliative symptoms and concerns in advanced CHF patients. As part of this feasibility study, we examined our ability to recruit participants.

Setting

Study settings were CHF disease management clinics in two tertiary referral centres in Ireland led by heart failure nurses (HFN) and supported by CHF physicians.

Inclusion criteria development

Inclusion criteria (Figure 1) were developed by the study lead (P.M.K.), the HFNs and the research team. The criteria were informed by the advanced CHF definition in the 2012 European Society of Cardiology (ESC) Heart Failure Association position statement[11] and by the ESC palliative care position statement.[15,16] Although not included in the 2012 ESC definition,[11] a definition of Heart Failure with preserved Ejection Fraction (HFpEF) as per the 2016 ESC definition[17,18] was included in the criteria at the HFNs' recommendation as this constituted over 50% of their patient population. Of note, HFpEF is included in the 2016 ESC definition which was not published at the time of this study.[18] Once recruitment commenced, P.M.K. and the HFNs frequently reviewed the inclusion criteria. Subsequently, the requirement for a heart failure–related hospitalisation in the preceding 6 months was removed because it was not appropriate in a

European Society of Cardiology definition of Advanced CHF†

1. Severe symptoms of HF with dyspnoea and/or fatigue at rest or with minimal exertion (NYHA functional class III or IV)
2. Episodes of fluid retention (pulmonary and/or systemic congestion, peripheral oedema) and/or of reduced cardiac output at rest (peripheral hypoperfusion)
3. Objective evidence of severe cardiac dysfunction, shown by at least one of the following:
   a) A low LVEF (< 30%),
   b) A severe abnormality of cardiac function on Doppler-echocardiography with a pseudonormal or restrictive mitral inflow pattern,
   c) High LV filling pressures (mean PCWP > 16mm Hg, and/or mean RAP > 12mmHg by pulmonary artery catheterisation),
   d) High BNP or NT-ProBNP plasma levels, in the absence of non-cardiac causes
4. Severe impairment of functional capacity shown by one of the following:
   a) Inability to exercise
   b) 6-MWT distance < 300m or less in females and/or patients aged ≥ 75 years
   c) Peak VO$_2$< 12 to 14 ml/kg/min
5. History of ≥ HF hospitalisation in the past 6 months
6. Presence of all the previous features despite "attempts to optimise" therapy including diuretics, inhibitors of the renin-angiotensin-aldosterone system, and beta-blockers, unless these are poorly tolerated or contraindicated, and CRT, when indicated.

Abbreviations: CHF: Chronic Heart Failure; HF: Heart Failure; NYHA: New York Heart Association; LVEF: left ventricular ejection fraction; PCWP: pulmonary capillary wedge pressure; RAP: right atrial pressure; BNP: brain natriuretic peptide; NT: N-terminal, 6-MWT: 6-minute walk test; VO$_2$: oxygen consumption; CRT: cardiac resynchronisation therapy.

Patient Inclusion Criteria for Feasibility Study

Patients with advanced chronic heart failure:
i) Severe symptoms (NYHA III/IV)*
ii) Episodes with clinical signs of fluid retention and/or peripheral hypoperfusion
iii) Objective evidence of severe cardiac dysfunction*
   a) Systolic dysfunction and left ventricular ejection fraction of ≤35% (HFrEF)
   or
   b) Heart failure symptoms in the presence of preserved systolic function ≥ 40% (HFpEF)
iv) Severe impairment of functional capacity demonstrated by an inability to exercise
v) History of 1 heart failure hospitalisation in the previous 6 months
vi) Presence of all these features despite optimal therapy
AND
Attending/referred to the heart failure clinical nurse specialist clinic*
≥ 18 years of age*
Sufficient cognitive function to complete the questionnaires*
Willing to consent to participate in the study*
Deteriorating despite optimal medical management (determined by the HF CNS or consultant cardiologist)
Fluent and literate in the English language*

*essential inclusion criteria

Abbreviations: NYHA: New York Heart Association; HFrEF: Heart Failure – Reduced Ejection Fraction; HFpEF: Heart Failure – Preserved Ejection Fraction; HF CNS: Heart Failure Clinical Nurse Specialist.

Figure 1. Adaptation of the European Society of Cardiology's advanced chronic heart failure definition for the study inclusion criteria. CHF: chronic heart failure; HF: heart failure; NYHA: New York Heart Association; LVEF: left ventricular ejection fraction; PCWP: pulmonary capillary wedge pressure; RAP: right atrial pressure; BNP: brain natriuretic peptide; NT: Nterminal; 6-MWT: 6-minute walk test; VO$_2$: oxygen consumption; CRT: cardiac resynchronisation therapy; HFrEF: Heart Failure with Reduced Ejection Fraction; HFpEF: Heart Failure with Preserved Ejection Fraction; HF CNS: Heart Failure Clinical Nurse Specialist.
*Essential inclusion criteria.
†Source: Metra et al.[15]

setting where nurse-led clinics work to avoid heart failure–related admissions.

Ethics

Ethical approval was obtained from the Research Ethics Committees: Ref: 13/70, Ref: 1/378/1579 and Ref: BDM/13/14-25. Written informed consent was obtained from participants.

Intervention

The intervention involved administration of the Integrated Palliative care Outcome Scale (IPOS)[19] together with HFN training. Training involved patient-centred education, the role of PROMs to facilitate patient-centred care, training in IPOS interpretation and use in consultation. The IPOS is a 20-item questionnaire measuring patient's physical symptoms, psychological, emotional, spiritual, information and support needs.

## Strategies to address recruitment challenges

To increase engagement, HFNs and service users helped develop study participant documentation. Posters advertising the study were placed in study sites. Screening logs were developed with HFN input. HFNs reviewed the clinical roster daily to identify eligible patients and completed weekly logs recording: numbers of screened and eligible patients, number approached, number recruited, reasons why patients were deemed ineligible, were not approached or declined participation.

Patients were given information on three occasions before written consent was requested. HFNs were provided with summary cards outlining key study points for eligible patients.[20] They provided patients with documentation and obtained permission for the researcher to explain the study in depth. Potential participants returned signed consent forms. The researcher arranged a telephone appointment to complete the first set of questionnaires, which otherwise acted as a patient reminder for those who had not returned consent forms.

Analysis

Analysis of recruited patients was undertaken to determine whether the inclusion criteria modifications identified the same population (advanced CHF patients). We applied the Meta-analysis Global Group in Chronic Heart Failure (MAGGiC) heart failure mortality risk score[21] to
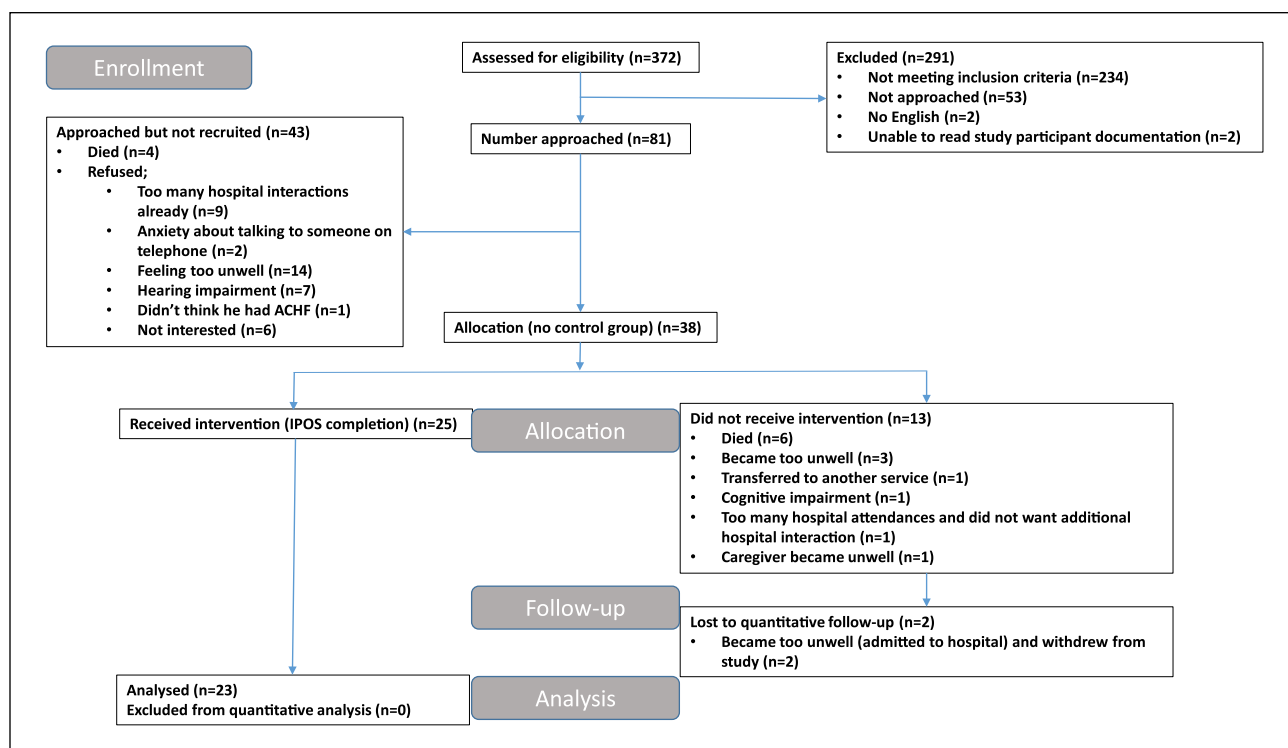
Figure 2. Modified CONSORT flow diagram showing patient recruitment.
ACHF: advanced chronic heart failure.

calculate the median 1-year mortality risk for each recruited patient[21] to determine participant homogeneity. The Kruskal–Wallis Test was applied to selected clinical markers to test for difference between participants assigned different New York Heart Association (NYHA) classes.

Results

Recruitment

Patients were recruited from September 2014 until February 2015 at the nurse-led clinics. Of 372 patients screened, 81 were approached, 38 were recruited (46.6% conversion to consent[22]) and 25 completed the IPOS. Figure 2 shows the modified CONSORT flow diagram.[23]

Recruited patients' characteristics

Table 1 reports the demographic and clinical data for participants. To ensure a representative sample of advanced CHF patients, comparison was made with data from Pocock et al.'s[21] study. This demonstrated comparability with deceased patient data (Table 1).

A review of recruitment activity showed that Site A recruited low numbers. Two issues were identified. First, patients were deemed too unwell to be approached for recruitment. Second, patients frequently declined to participate. On exploration, a difference was identified in the

manner in which Site A and Site B applied NYHA classification. Site A patients classified as NYHA III frequently had lower functional ability than Site B patients classified as NYHA III. Where Site B classified patients as NYHA III, Site A classified comparable patients as NYHA II. This resulted in Site A identifying a more unwell population of NYHA III patients than Site B limiting recruitment. To ensure recruitment homogeneity, eligibility criteria were modified to allow Site A to recruit patients who were currently classified as NYHA II, who had been NYHA III/IV in the previous 6 months. This resulted in an increase in the total median number approached monthly from 8 to 20, and in the median numbers recruited monthly, from 4 to 9 (Figure 3).

The MAGGIC mean integer mortality risk score was 27.9 ± 4.9 (median: 29.0) with a mean 1-year mortality proportional risk of 22.2 ± 9.2 (median: 22.7). A Kruskal–Wallis Test demonstrated no statistical difference in creatinine levels between patients assigned NYHA II ($n = 8$) or assigned NYHA III/IV ($n = 17$), χ^2 (20, $n = 25$) = 17.75, $p = 0.63$ between the two sites (Table 2). A Kruskal–Wallis Test demonstrated no statistical difference in 1-year mortality risk between patients assigned NYHA II ($n = 8$) or assigned NYHA III/IV ($n = 17$), χ^2 (12, $n = 25$) = 17.75, $p = 0.12$ between the two sites (Table 2). Median scores for creatinine and 1-year mortality were 117 and 14.7 for the NYHA II group and 122 and 24.8 for the NYHA III/IV group.

Table 1. Comparative demographic and clinical patient data between this feasibility study and living patient data from Pocock et al.'s[21] study.

	Recruited participants to this study (*n* = 25)	Living patient data from Pocock et al.'s[21] study (*n* = 23,521)	Deceased patient data from Pocock et al.'s[21] study (*n* = 15,851)
Age (years), mean ± SD	75.7 ± 9.2	64.3 ± 11.8	71.9 ± 10.9
Male (%)	56.0	69.0	65.1
Body mass index (kg/m²), mean ± SD	27.1 ± 4.8	27.5 ± 5.1	26.0 ± 5.0
Current smoker (%)	4.0	34.2	29.0
Ejection fraction (%)	39.2	36.6 ± 14.0	33.6 ± 14.0
Systolic blood pressure (mmHg)	118.6 ± 19.1	131.0 ± 21.8	130.5 ± 25.6
Diastolic blood pressure (mmHg)	66.5 ± 9.7	77.7 ± 12.1	75.5 ± 13.5
Heart failure duration ⩾ 18 months (%)	80.0	48.8	49.7
NYHA class (%)			
II	32.0	53.8	37.1
III	64.0	31.3	42.8
IV	4.0	4.1	13.4
Creatinine (µmol/L)	129.7 ± 46.8	109.4 ± 55.8	126.9 ± 58.4
Medical history (%)			
Diabetes mellitus	32.0	20.6	25.7
MI	48.0	45.6	43.6
Atrial fibrillation	68.0	17.8	23.5
Stroke	32.0	6.2	12.2
COPD	32.0	5.7	17.0
Hypertension	56.0	41.3	39.3
Ischaemic heart disease	68.0	52.9	51.8
CABG	48.0	15.4	13.9
PCI	36.0	11.7	7.9
Depression	20.0	–	
Medications (%)			
Beta-blocker	100	40.4	24.4
ACE-I/ARB	80.0	71.3	60.5
CRT-D	48.0	–	4.3

ACE-I: angiotensin-converting-enzyme inhibitor; CRT-D: cardiac resynchronisation therapy defibrillator; SD: standard deviation; NYHA: New York Heart Association; MI: Myocardial Infarction; COPD: Chronic Obstructive Pulmonary Disease; CABG: Coronary Artery Bypass Grafting; PCI: Percutaneous Coronary Intervention; ARB: Angiotensin II Receptor Blocker.

Kruskal–Wallis Test revealed a statistically significant difference in NYHA classification across sites (Site A, *n* = 10; Site B, *n* = 15), χ^2 (1, *n* = 25), 16.94, *p* = 0.0001 (Table 3). The median NYHA class for Site B was 3, that is, NYHA III, while in Site A, it was 2, that is, NYHA II. There was no statistical significant difference in systolic blood pressure, Charlson comorbidity index,[24] creatinine or 1-year mortality risk[21] between patients recruited at each site (Table 3).[21]

Discussion

This study highlights that commonly used advanced CHF descriptors do not comprehensively identify advanced CHF patients, necessitating a different approach in palliative care study inclusion criteria development. The 2012 ESC advanced CHF definition[15] which we used to inform our inclusion criteria (Figure 1) was too narrow to capture fluctuating health status.[25] Patients who were initially too unwell to be approached were too well post-treatment to fulfil inclusion criteria based on this definition. This study demonstrates that the subjectivity of the application of NYHA classification and heterogeneity of this population mean using NYHA as a stand-alone inclusion criterion risks excluding patients from studies and reducing generalisability. Restricting participation to NYHA III/IV excludes more stable patients classified as NYHA II at the time of study recruitment, yet these patients may have palliative care needs.

The NYHA classification was designed to classify heart disease patients based on functional capacity, in the absence of more objective evidence.[26,27] Its lack of inter-rater reliability,[28] poor reproducibility and validity have been acknowledged.[29] Yet it continues to play a role in inclusion criteria[11,30] and as a determinant for palliative care access.[31] To address NYHA limitations, the American College of Cardiology Foundation (ACC)/American Heart Association (AHA) CHF staging system describes CHF in stages of disease progression,[32] while contextualising NYHA class to provide a more objective and reliable approach to identification (Figure 4).[32]
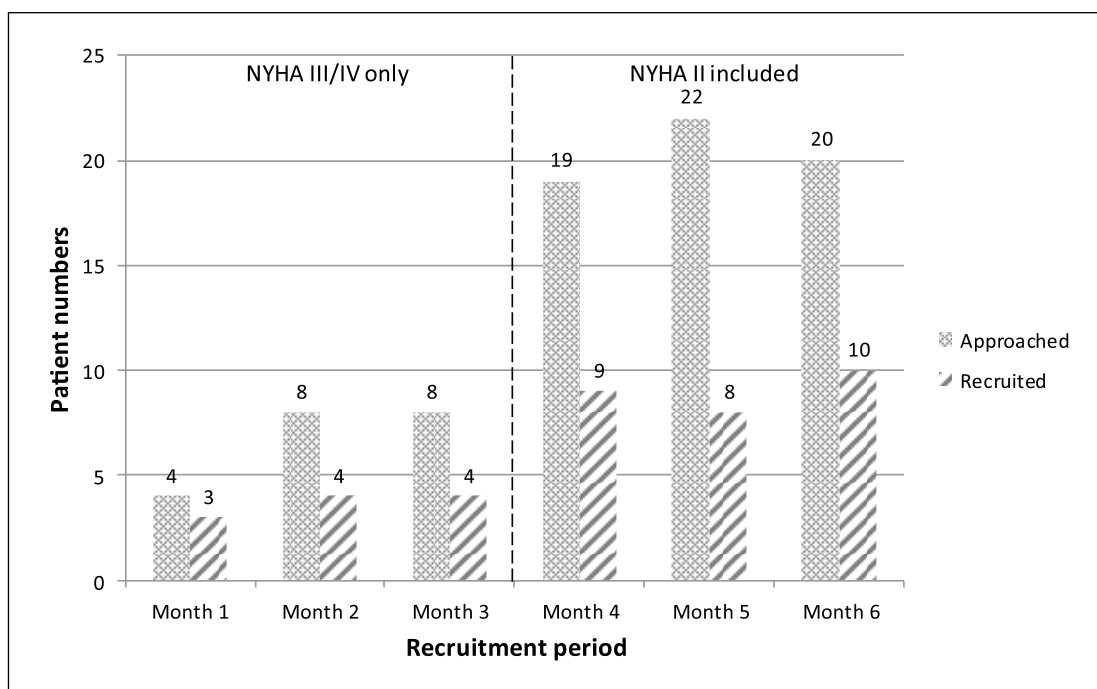
Figure 3. Number of patients recruited per month before and after change in NYHA inclusion criteria.
*Patients who were currently assigned NYHA II functional class but had recently been assigned NYHA functional class III or IV were included.

Table 2. Kruskal–Wallis Test for difference between NYHA II or NYHA III/IV grade using grouping variables *Creatinine* and *1-year mortality risk score*.

Test variable	NYHA II or NYHA III/IV	
Grouping variable	*Creatinine*	*1-year mortality risk score*
df	20	12
Chi-square	17.38	17.75
Degree of freedom	20	12
Asymptotic significance	0.63	0.12

NYHA: New York Heart Association.

Table 3. Kruskal–Wallis Test for difference between Site-A participants and Site-B participants using grouping variables: creatinine and 1-year mortality risk score NYHA II or NYHA III/IV grade.

Test variable	Grouping variable	Chi-square	Degree of freedom	Asymptotic significance
Site A or Site B	*NYHA II or NYHA III*	16.94	1	0.0001
	Systolic blood pressure	21.3	22	0.5
	Charlson comorbidity score	1.67	3	0.64
	Creatinine	18.0	20	0.59
	1-year mortality risk score	5.42	7	0.61

NYHA: New York Heart Association.

CHF is characterised by symptom volatility meaning NYHA class can change over short time periods[33] affecting eligibility for study inclusion criteria applied at a single time-point. We extended recruitment to patients classified as NYHA II, with a NYHA III/IV history.

There was no statistical difference in clinical parameters between these patients and those recruited as class NYHA III/IV. Limiting recruitment to NYHA III/IV excludes symptomatically stable NYHA II patients who have been NYHA III/IV previously and are at risk of
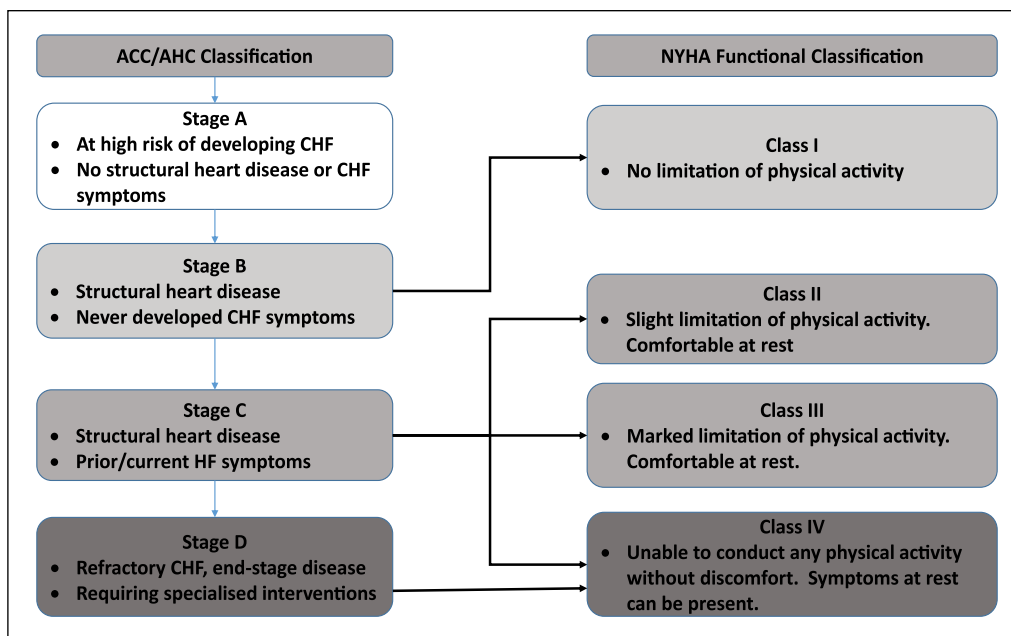
Figure 4. American College of Cardiology–American Heart Association (ACC-AHA) CHF stage and NYHA functional classification of Heart Failure.
CHF: chronic heart failure; NYHA: New York Heart Association.

deterioration from underlying heart disease or multi-morbidity.[3]

A limitation of this study is that it may not reflect CHF patients without access to nurse-led clinics. Additionally, we did not conduct quality assurance of the HFNs' assessment of eligibility and information provision to patients.

Conclusion

The recently updated 2016 ESC definition[18] better reflects the interplay of comorbidities with CHF but more emphasis is required on a palliative care approach throughout the disease trajectory. Despite its shortcomings, NYHA classification is widely used. Strategies to address NYHA subjectivity including the ACC/AHA CHF staging system may improve advanced CHF patient recruitment and advance palliative care research.

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Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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