Frailty, health literacy and self-care in patients admitted with acute heart failure

ORIGINAL ARTICLE

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BACKGROUND

There is limited knowledge from Norway on clinical characteristics, self-care and health literacy in patients admitted to hospital with acute heart failure. Our aim was to identify these factors in this group.

MATERIAL AND METHOD

We included patients admitted with acute heart failure over a period of six months (2022/2023) at Drammen Hospital and Vestfold Hospital Trust. Cardiac nurses collected information from the patients, including self-assessed knowledge on an ordinal scale from 0 (little knowledge) to 10 (good knowledge). Clinical frailty scores were calculated and data from the hospital records were recorded.

RESULTS

Of 136 patients with acute heart failure, 81 were included. Median age was 79 (range 35–95) years, 35 (43 %) were women. A total of 35 (43 %) had been admitted with heart failure exacerbation in the past year. The patients had a median of 5 (1–10) diagnoses, and the median score on the clinical frailty scale was 4 (1–7), corresponding to 'vulnerable'. A total of 63 (78 %) had been diagnosed with heart failure before admission to hospital. Of these, 13 (21 %) were unaware of the diagnosis, and their self-assessed knowledge was median 3 (25th and 75th percentile, 0–5) for management of heart failure, 2 (25th and 75th percentile, 0–5) for lifestyle interventions and 0 (25th and 75th percentile, 0–2) for heart medications. Altogether 42 out of 63 (67 %) weighed themselves weekly, 13 (21 %) measured their blood pressure, while 3 (5 %) had a self-care plan. Of 50 patients with left ventricle ejection fraction ≤ 40 %, 32 (64 %) were discharged with betablockers and angiotensin II receptor blockers or a combination drug with a neprilysin inhibitor, whereas 11 (22 %) were also prescribed SGLT2 inhibitors and mineralocorticoid receptor antagonists.

INTERPRETATION

The included patients were multimorbid and had a low level of self-care and health literacy. There is potential to optimise well-documented medicinal treatment.

Main findings

A total of 81 out of 136 patients admitted to hospital with acute heart failure at two large local hospitals in Norway were included on a rolling basis.

The study participants had a median age of almost 80 years and were multimorbid. Thirty-seven per cent were frail.

A total of 63 patients (78 %) had been diagnosed with heart failure before admission to hospital, and more than half of these had been hospitalised due to exacerbation in the last year.

Self-care and health literacy levels among patients diagnosed with heart failure before admission to hospital were low, and few patients were discharged with recommended medications.

Heart failure is characterised by objective evidence of structural and/or functional cardiac abnormalities that prevent the heart muscle from pumping a sufficient amount of oxygen-rich blood to the body (1). Traditionally, heart failure has been classified into distinct phenotypes (systolic and diastolic failure) based on the measurement of left ventricle ejection fraction by echocardiography, but recent data indicate that patients with heart failure have a similar prognosis regardless of phenotype and ejection fraction (1). The prevalence of heart failure is currently > 10 % in the population aged over 70 years (2). Increased life expectancy and improved treatment are key reasons for the rising incidence. Heart failure is one of the leading causes of hospital admissions and years of life lost (1, 3). Norwegian data show a 30-day mortality rate of 25 % (4), and Swedish register data indicate that more than half of the patients die or are readmitted within the first year after discharge from hospital (5).

In heart failure with ejection fraction ≤ 40 %, there are four drug classes that improve prognosis and are highly recommended: betablockers, ACE inhibitors/angiotensin II blockers, or combination drugs with neprilysin inhibitors, mineral receptor antagonists and sodium-glucose cotransporter 2 (SGLT2) inhibitors (1). It has also recently been documented that SGLT2 inhibitors reduce the combined risk of mortality from cardiovascular disease and readmissions for heart failure in patients with mildly reduced (40–50 %) or preserved (> 50 %) ejection fraction (6). It is concerning that recently published register data show suboptimal prescription rates and low medication adherence in patients with heart failure (7).

Good health literacy (the ability to understand and utilise health information) and self-care (self-management) are associated with improved quality of life and prognosis in patients with heart failure (8). European guidelines emphasise the importance of information and patient education to help patients with heart failure make necessary lifestyle changes, take medications as prescribed and monitor their own symptoms and signs through, for example, regular weighing (1, 8). Furthermore, self-care plans are recommended so that patients can take the appropriate action in response to any changes in symptoms and signs (1, 8).

A meta-analysis that included studies of hospitalised patients and outpatients with heart failure showed that self-care and health literacy levels were consistently too low (9). However, the quality of these studies varied, and few were conducted in Europe. Male gender, a recent diagnosis of heart failure, older age and poor cognition are factors that have been associated with poorer self-care (10). In Norway, health literacy and self-care have not been surveyed in hospitalised patients with heart failure.

The Norwegian Heart Failure Registry provides valuable knowledge about risk factors and the quality of treatment and follow-up care after discharge from hospital, but it only contains information on the 19 % of discharged patients with heart failure who are followed up at outpatient heart failure clinics (4). The purpose of this study was to identify clinical characteristics, self-care, health literacy and use of heart failure medications in patients hospitalised with acute heart failure.

Material and method

This is a prospective observational study conducted at two local hospitals in Norway, with a combined catchment area population of 428,000, corresponding to 8 % of the population. The medical records of all hospitalised patients were screened twice a week at Drammen Hospital's Department of Medicine in the period 4 August 2022 to 30 January 2023, and at Vestfold Hospital Trust's Department of Cardiology in the period 14 October 2022 to 14 March 2023.

The inclusion criteria for heart failure followed the criteria from the European Society of Cardiology (ESC): over 18 years of age and admitted with acute heart failure defined by symptoms (dyspnoea, fatigue), elevated levels of NT-proBNP in the blood and clinical findings (crackles upon auscultation, pulmonary congestion on chest CT, oedema) (1). For a new diagnosis, we also required findings from echocardiography (reduced ejection fraction and/or structural or functional signs of heart failure). We included patients regardless of whether acute heart failure was the primary diagnosis or a secondary diagnosis. Patients were typically invited to participate on the day they were screened, and we attempted to include them the following day.

Exclusion criteria were preterminal illness/clinical diagnosis of a high degree of frailty, in-hospital death, admission from/discharge to a nursing home, and conditions clinically deemed to entail incapacity to give informed consent (including substance abuse, psychosis, cognitive impairment). In patients with multiple reasons for exclusion, we only noted the reason we considered most significant. For example, several patients were discharged to a nursing home, but many of them had cognitive impairment or a high degree of frailty noted as the reason for exclusion.

The study was approved by the Regional Committee for Medical and Health Research Ethics, South-East (reference number 464460) and the data protection officers in Drammen (22/05735 – l) and Vestfold (23/00582). All participants provided written informed consent.

Registered variables

Using the interview guide we developed (see Appendix 1), cardiac nurses collected information about clinical factors during patients' hospital stay, primarily on the day of discharge, but in some cases 1–2 days before. The interviews took approximately 15 minutes. Self-care was assessed based on measurements of blood pressure, weight and, where applicable, blood glucose at home, use of a self-care plan for changing heart medications in cases of, for example, weight gain or intercurrent illness, and adherence to heart failure medication (1, 8). Self-assessed knowledge about heart failure in general and about lifestyle advice and pharmacotherapy was assessed using our adapted Likert scale, from 0 (least) to 10 (most). Patients were also asked if they were aware of their heart failure diagnosis.

Typical symptom level was assessed using the Norwegian version of the New York Heart Association (NYHA) Functional Classification, which is widely used in clinical practice (4): Class I: No symptoms of heart failure during physical activity or daily activities; Class II: Slight limitation of physical activity, no symptoms at rest or light physical exertion; Class III: Marked limitation of physical activity, no symptoms at rest; Class IV: Symptoms at rest.

Nurses scored degree of frailty based on a clinically validated ordinal frailty scale (Clinical Frailty Scale, older version) ranging from 0 (very fit) to 9 (terminally ill) (11, 12). This simple screening tool assesses the patient's condition and function 14 days before admission. Information about frailty is based on medical records and clinical assessment during the hospital stay.

The following data were recorded from the patient's hospital records by a specialty registrar in cardiology and quality assured by two cardiologists with research expertise: living situation and potential need for primary healthcare services before admission (also based on information collected in the interview), information about the heart failure diagnosis (less recent diagnosis vs. recent diagnosis of heart failure in accordance with guidelines (1)), including underlying aetiology and causal trigger of the current exacerbation, comorbid somatic and psychiatric diagnoses, prescribed medication at discharge and information about planned follow-up at the outpatient heart failure clinic. The heart failure diagnoses were classified based on whether the current or previous echocardiography findings showed reduced ejection fraction (≤ 40 %) or mildly reduced or preserved ejection fraction (> 40 %) (1).

For patients with reduced ejection fraction, we examined the proportion who were discharged without medication, the proportion who were discharged with < 50 % of the target dose or ≥ 50–100 % of the target dose, and the target dose for each of the four heart failure medications with prognostic significance (13). We also examined the proportion in the entire population who were discharged with SGLT2 inhibitors and loop diuretics.

Statistical analysis

We used descriptive statistics with proportions, percentages and medians, along with the lowest and highest observed values, as well as 25th and 75th percentiles. Data were analysed using SPSS version 26.0.

Results

Over a period of six months, we screened 136 patients, 81 of whom could be included (Figure 1).
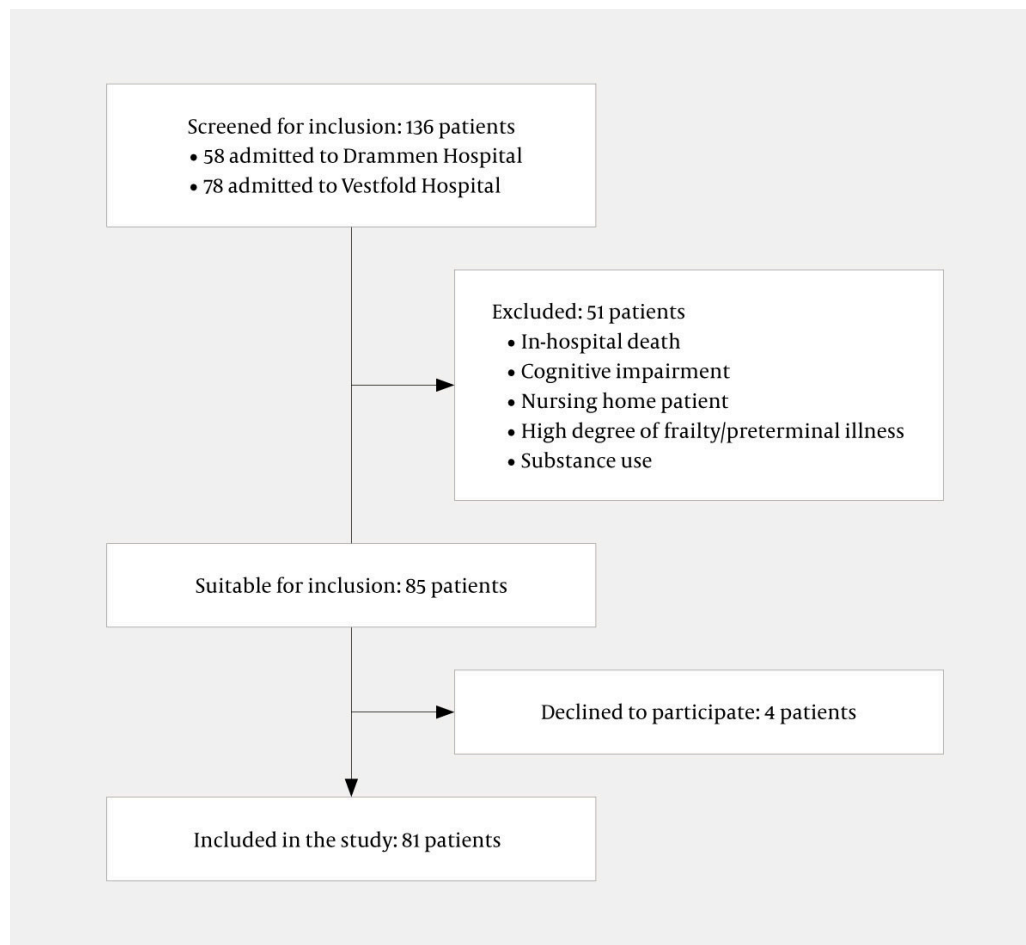

Figure 1 Flowchart for the study.

The median age of the participants was 79 years, and eight (10 %) were below the age of 70 (Table 1). The median score on the clinical frailty scale was 4 (vulnerable), and 30 (37 %) had a score ≥ 5. The patients had a median of five comorbid diagnoses, and 29 (35 %) were receiving home nursing care. Sixty-three patients (77 %) had been diagnosed with heart failure before admission to hospital, and 35 (56 %) of these had been admitted with exacerbation of symptoms over the preceding 12 months. The most common reason for admission to hospital was overhydration/congestion without a confirmed causal trigger (n = 52). Tachyarrhythmias (atrial fibrillation and/or atrial flutter) were the most common intercurrent condition leading to admission (n = 16), while other intercurrent cardiological conditions like myocardial infarction were the reason for admission in ten patients. Twenty-three patients (28 %) were referred to the outpatient heart failure clinic for follow-up. These patients had a median age of 74 years, compared to 82 years among those who were not referred.

Table 1

Demographic and clinical data for 81 patients admitted with heart failure at the hospitals in Drammen and Vestfold during a six-month period in 2022/2023. The figures are presented as absolute numbers (%) unless stated otherwise.

Age in years, median (range)	79 (35–95)
Female	35 (43)
Living situation	
Living with a spouse/partner	51 (63)
Living alone	30 (37)
Daily home nursing care	29 (35)
Heart failure diagnosis	
NYHA class I	4 (5)
NYHA class II	33 (41)
NYHA class III	39 (48)
NYHA class IV	5 (6)
Diagnosed with heart failure before admission to hospital	63 (78)
Bed days, median (range)	5 (1–22)
Admitted for heart failure last 12 months	35 (43)
Proportion that had an echocardiogram in last three months	70 (86)
Left ventricle ejection fraction ≤ 40 %	50 (62)
Causal trigger for admission to hospital	
Overhydration and congestion	52 (64)
Tachyarrhythmias	16 (20)
Infection	3 (4)
Other acute cardiological conditions[1]	10 (12)
Comorbidity[2] and frailty	
Atrial flutter	55 (67)
Coronary artery disease	44 (54)
Chronic obstructive pulmonary disease	18 (23)
Anxiety and/or depression	11 (14)
Estimated glomerular filtration rate, median (range)[3]	43 (7–91)
Estimated glomerular filtration rate < 30 mL/min/1.73 m^2	17 (21)
Clinical frailty scale, median (range)	4 (1 - 7)
Total number of diagnoses including heart failure, median (range)	5 (1–10)
Planned outpatient follow-up after discharge	
Outpatient heart failure clinic	23 (28)

[1]Other conditions: acute myocardial infarction, myocarditis, aortic stenosis, rare conditions

[2]Comorbidities taken from the patient's medical record

[3]Estimated glomerular filtration rate measured upon admission to hospital

Of 50 patients with left ventricle ejection fraction ≤ 40 %, 32 (64 %) were discharged with both betablockers and an ACE/angiotensin II inhibitor or a combination drug with a neprilysin inhibitor, while 11 (22 %) were discharged with all four medications (Table 2). A total of 5–20 patients (10–40 %) were discharged with the target dose for these medications. Of the 31 patients with ejection fraction > 40 %, six were discharged with an SGLT2 inhibitor. All patients with ejection fraction > 40 % and 46 out of 50 patients with ejection fraction ≤ 40 % were discharged with loop diuretics. A total of 53 out of 81 patients (65 %) used a pill box or multidose dispenser.

Table 2

Number (proportion) of patients admitted with acute heart failure at the hospitals in Drammen and Vestfold during a six-month period in 2022/2023 with left ventricle ejection fraction ≤ 40 % (N = 50) who were prescribed recommended heart failure medications at discharge, and fraction of target dose.

	No treatment	Less than half dose	More than half dose but less than full dose	Full dose
SGLT2 inhibitors	30 (60)	0 (0)	0 (0)	20 (40)
Mineralcorticoids	28 (56)	6 (12)	11 (22)	5 (10)
Betablockers	6 (12)	23 (46)	9 (18)	12 (24)
ACE/angiotensin II inhibitor or a combination drug with a neprilysin inhibitor	12 (24)	13 (26)	10 (20)	15 (30)

Self-reported health literacy, self-care and follow-up needs in 63 patients diagnosed with heart failure before admission to hospital are shown in Table 3. A total of 21 out of 63 patients (33 %) weighed themselves less than once a week, while three had a self-care plan. Thirteen patients (21 %) were not aware of their heart failure diagnosis at discharge, even though they had been admitted for the condition previously. Thirty-four patients (54 %) reported a need for more follow-up, and 49 (78 %) and 59 (94 %) were open to follow-up via telephone and digital remote monitoring, respectively.

Table 3

Self-reported health literacy, self-care and follow-up needs in 63 patients who were readmitted with heart failure at the hospitals in Drammen and Vestfold. The figures are presented as absolute numbers (%) unless stated otherwise.

Health literacy	
Knowledge about heart failure management, median (25th and 75th percentiles)[1]	3 (0–5)
Knowledge about heart medications, including when they should be temporarily discontinued, median (25th and 75th percentiles)[1]	0 (0–2)
Knowledge about lifestyle interventions, median (25th and 75th percentiles)[1]	2 (0–5)
Aware of own heart failure diagnosis	50 (79)
Self-care at home	
Has a self-care plan	3 (5)
Measures blood pressure at least once per week	13 (21)
Measures weight at least once per week	42 (67)
Uses pill box or multidose dispenser	56 (89)
Adherence to heart failure medication	
7 out of 7 days in the last week	58 (92)
≤ 6 out of 7 days in the last week	5 (8)
Follow-up needs	
Current need for more follow-up	34 (54)
Open to digital remote monitoring	59 (94)
Open to follow-up via telephone	49 (78)
Open to home visits from cardiac nurse	32 (50)
Open to outpatient follow-up with cardiac nurse	20 (32)

[1]Measured using an adapted Likert scale from 0 (least) to 10 (most).

Dicussion

This observational study presents the clinical characteristics of patients admitted to two large local hospitals in Norway with acute heart failure. Only 81 out of 136 screened patients with heart failure met the inclusion criteria. Preterminal illness, a high degree of frailty and in-hospital death were the main reasons for exclusion. The participants had a median age of 79 years (10 % were < 70 years old) and multimorbidity, and 8 out of 10 had previously been admitted to hospital for heart failure. Self-care and health literacy levels of patients diagnosed with heart failure before admission to hospital were low, and few patients with ejection fraction ≤ 40 % were discharged with recommended medication. Patients reported a need for more follow-up and

primarily wanted follow-up at home via telephone or digital remote monitoring. To the best of our knowledge, this is the first Norwegian study of a patient cohort from daily clinical practice admitted to hospital with acute heart failure on a rolling basis. The study inclusion criteria were broad and only required that patients could attend a 15-minute interview with a cardiac nurse near the end of their hospital stay. It is therefore thought-provoking that almost 40 % were considered too ill/frail or cognitively impaired to participate. Acute and potentially reversible cardiological conditions such as myocardial infarction, tachyarrhythmia, aortic stenosis and myocarditis were the reason for admission in one-third. The findings in the study, especially the significant proportion of frail older patients, highlight the need for close cooperation between cardiologists and geriatricians in the treatment of patients admitted to hospital with heart failure (14).

The need for prioritisation and the lowest effective level of care principle as the basis for the division of labour in the healthcare service has recently been highlighted (15). In light of the study's findings, it is worth considering whether palliative care at home or in a nursing home might be a better alternative for many of these patients.

The patient's own wishes in terms of care and treatment, such as hospitalisation, life-sustaining interventions and symptom relief in the end-of-life phase, can be identified through advance care planning (ACP) (16, 17). The effect of implementing ACP in clinical practice will now be tested in a Norwegian multicentre study (ClinicalTrials.gov: NCT05681585).

Demographic and clinical characteristics (including age, sex, comorbidity and left ventricle ejection fraction) of the patients in our study are well-aligned with Swedish data from clinical practice (5) and data from a recently published intervention study in the United States (13). In line with data from these studies and from the Norwegian Prescription Database (7), we find suboptimal prescription of the four drug classes that are strongly recommended for patients with heart failure with ejection fraction ≤ 40 % (1). There was suboptimal prescription of SGLT2 inhibitors and mineral receptor antagonists in almost 60 % of patients and ACE/angiotensin II inhibitors or combination drugs with neprilysin inhibitor in 24 %. Severe renal failure is the main contraindication for these medications, but more than eight out of ten patients had an estimated glomerular filtration rate above 30 mL/min/1.73 m^2. Nevertheless, many of the participants are multimorbid. Hypotension with a risk of falls, and polypharmacy with an increased risk of adverse effects and interactions may partly explain the low prescription rate of highly recommended heart failure medications.

Self-reported adherence to heart failure medication in the week prior to admission to hospital was high (> 90 %) in our study, while 12-month persistent adherence in a Norwegian registry study was 60–80 % (7). This difference may be the result of variations in when and how adherence was measured. The patients in our study were interviewed about adherence by a nurse. It has been shown that a high level of adherence is often over-reported by patients (18). Furthermore, it is not inconceivable that the patients have taken their medications more regularly in the period prior to admission to

hospital when they experienced exacerbated symptoms. On the other hand, the majority of patients in our study used a pill box or multidose dispenser, which improves drug adherence (1, 8). Six out of 31 patients with heart failure with an ejection fraction above 40 % were prescribed an SGLT2 inhibitor, which is now strongly advised (1). It is likely that the prescription rate will increase as soon as an independent reimbursement system is established.

Outpatient heart failure clinics in Norway are mainly staffed by nurses with specialist expertise in working closely with a cardiologist (4). They provide patient education, self-care support, clinical examinations, functional testing and medication adjustments (1, 5). An older Norwegian study (19) and international literature reviews (20) have documented that an outpatient follow-up programme led by a specialist nurse improves medication adherence, enhances self-care, increases physical capacity and improves quality of life. Despite strong recommendations (class 1A) and robust scientific evidence of the benefits of outpatient heart failure clinics in the specialist health service (1), only a few patients in Norway receive these services due to limited capacity (4). Accordingly, more than 70 % of the patients in our study were discharged without planned outpatient follow-up. It is also worth noting that about 1 in 3 patients wanted such follow-up. Lack of follow-up can be one of several reasons for the low level of self-care.

The low scores in terms of knowledge about the condition and heart medications in patients who had previously been hospitalised for heart failure is concerning, and almost none of the patients had a self-care plan, including adjustments of diuretics after weight changes, lifestyle advice and temporary discontinuation of certain medications (particularly ACE/A2 inhibitors and SGLT2 inhibitors) in cases of intercurrent illness. Since gradually increasing overhydration and congestion were the predominant reasons for admission, education on regular weighing and adjustment of diuretics and fluid intake is essential.

Overall, there appears to be a marked potential to strengthen both self-care and health literacy in patients readmitted with heart failure. International consensus documents highlight low health literacy and self-care skills as key challenges among heart failure patients, and they call for measures to strengthen this (8). More than half of the patients reported a need for further follow-up, and it is interesting that significantly more patients preferred digital or telephone follow-up at home rather than physical attendance at the outpatient clinic.

The main strengths of the study are the prospective and continuous inclusion of patients at two large hospitals. The 30-day mortality rate of all patients with heart failure in Drammen and Vestfold is lower than the national average, while the proportion attending outpatient heart failure clinics, as well as other quality indicators at these hospitals, is higher than the national average (4). It is therefore reasonable to assume that the heart failure population at these hospitals is not more frail or multimorbid than at other Norwegian hospitals, but given the high proportion of patients who were excluded, we cannot rule this out. We consider the quality of the data to be high since interviews were

conducted by cardiology nurses who work with heart failure patients on a regular basis. Cardiologists with research expertise have quality assured all heart failure diagnoses and clinical data.

Based on the median frailty score of 4, it was somewhat surprising that self-care was not better, but the high median age may be a possible explanation. The interview guide used has not been validated, and reporting bias cannot be ruled out. The clinical frailty scale has also not been validated in patients admitted to hospital with heart failure. Although most patients (85 %) had an echocardiogram performed during their hospital stay or within the last three months, we cannot rule out the reported ejection fraction having changed in some patients. Patients were screened two days per week throughout the inclusion period. There may therefore be patients who meet the inclusion criteria but who were not included due to a lack of screening. Based on length of stay, this will only apply to a small number of patients, and we have no reason to believe that this has led to systematic biases in the dataset.

We have initiated a randomised controlled trial (ClinicalTrials.gov: NCT05447598) in which we will investigate whether individually tailored digital remote monitoring by hospitals is feasible after admission for heart failure. We will also examine whether it enhances self-care and reduces the risk of readmission.

Summary

The study participants who were included during hospital stays for acute heart failure had a median age of 79 years, significant comorbidity, one-third were frail and many had previously been admitted to hospital for heart failure. Self-care and health literacy levels were low in the patients who had already been diagnosed with heart failure, and there was a marked potential to optimise well-documented pharmacotherapy for heart failure.

The article has been peer-reviewed.

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