BMJ Open Quality

Feasibility of frailty screening among patients with advanced heart failure

Hanna-Riikka Lehto ,[1,2] Nelia Jain,[1,2] Rachelle E Bernacki,[1,2] Michael J Landzberg,[2,3] Akshay S Desai,[2,4] Ariela R Orkaby [2,5]

To cite: Lehto H-R, Jain N, Bernacki RE, *et al*. Feasibility of frailty screening among patients with advanced heart failure. *BMJ Open Quality* 2023;**12**:e002430. doi:10.1136/bmjoq-2023-002430

► Additional supplemental material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/bmjoq-2023-002430).

H-RL and NJ are joint first authors.

Received 24 May 2023
Accepted 21 September 2023

[1]Department of Psychosocial Oncology and Palliative Care, Dana-Farber Cancer Institute, Boston, Massachusetts, USA
[2]Harvard Medical School, Boston, Massachusetts, USA
[3]Department of Cardiology, Boston Children's Hospital, Boston, Massachusetts, USA
[4]Division of Cardiovascular Medicine, Brigham and Women's Hospital, Boston, Massachusetts, USA
[5]New England GRECC, Veterans Affairs Boston Healthcare System, Boston, Massachusetts, USA

Correspondence to
MD, PhD Hanna-Riikka Lehto; hanna-riikka_lehto@dfci.harvard.edu

ABSTRACT

Background Frailty is common among patients with advanced heart failure (HF), and screening for frailty to guide care is recommended. Although multiple tools are available to screen for frailty, the feasibility of routinely incorporating frailty screening into daily clinical practice among hospitalised advanced HF patients has not been rigorously tested.

Methods This was a prospective, single-centre, quality improvement study. Two brief frailty screening tools were incorporated into palliative care consultations for all patients ≥50 years from August 2021 to October 2022. In the first phase, the Clinical Frailty Scale (CFS) was implemented, followed by the Study of Osteoporotic Fracture (SOF) tool or a modified SOF (mSOF) version in the second phase. The primary outcome was feasibility (%) of performing frailty screenings for this high-risk population.

Results A total of 212 patients (mean age 69±10 years, 69% male, 79% white, 30% with ischaemic HF) were referred for palliative care consultation during the study period. Overall, frailty screens were completed in 86% (n=183) of patients. CFS and mSOF reached >80% of adoption, while SOF adoption was 54%. Altogether, 52% of the population screened frail by use of CFS and 52% also by mSOF. All clinicians (n=6) participating in the study reported that frailty screening tools were useful and acceptable, and 83% reported plans for continued utilisation in future clinical practice.

Conclusions Frailty screening with CFS or mSOF tools was feasible in hospitalised patients with advanced HF. Tools that require physical assessment were more challenging to implement. These data support the feasibility of incorporating questionnaire-based frailty screening in a busy hospital setting.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Frailty is common among patients with advanced heart failure. Multiple tools exist to screen for frailty, yet implementation into routine palliative care assessments to guide care has been limited.

WHAT THIS STUDY ADDS

⇒ Screening for frailty is feasible using the Clinical Frailty Scale and modified Study of Osteoporotic Fractures tool which rely on patient and caregiver reports among hospitalised patients with advanced heart failure, whereas tools requiring physical measurements are challenging to implement at scale.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ We have demonstrated that it is feasible and sustainable to implement questionnaire-based frailty screening even in a busy hospital caring for some of the most complex and ill patients. Such rapid screening tools for frailty should be considered in all care settings that serve the older adult populations.

INTRODUCTION

Frailty, a multidimensional syndrome of vulnerability to stressors, is present in up to 80% of patients with heart failure (HF) and impacts illness trajectory, prognosis and response to advanced heart therapies.[1–4] Frailty and HF share a bidirectional relationship,[5] and when both are present, patients are at increased risk for hospital readmission, poorer quality of life and mortality.[6–8] Brief screening tools that can rapidly identify frail individuals have been developed, but their use in hospitalised patients with HF has been limited.

The transition to advanced HF marks a critical stage of a patient's illness trajectory, with a proportion of patients becoming eligible for advanced HF therapies, such as left ventricular assist device or cardiac transplantation. Frailty has the potential to identify subsets of populations within the advanced HF population that may be responsive to advanced HF treatments and distinguish from those who may be treatment unresponsive, resulting in significant downstream impact on patients' quality of life and life expectancy.[9] Additionally, the importance of frailty screening and recognition that frailty may worsen outcomes after advanced HF therapies has been reflected in HF guidelines.[10–13] Due to the unreliability of clinical judgement alone to correctly identify patients who are frail,[14] there is a need to identify feasible and acceptable frailty screening tools for advanced HF patients to improve individualised care planning.[15–17]

There are two leading theories of frailty: the physical phenotype[18] and cumulative deficit model.[19] Numerous frailty tools have

been developed based on these frameworks[20–22]; however, many comprehensive assessments are time-intensive and/or labour-intensive. Moreover, completion of measurements for physical domains may be prohibitive in acutely ill HF patients who are often constrained by invasive monitoring and parenteral treatments (eg, pulmonary artery catheters or inotrope infusions). Therefore, we sought to identify the feasibility of incorporating brief frailty screening within the care of hospitalised advanced HF patients using two distinct frailty tools that are drawn on these two different theoretical frameworks. We conducted a phased clinical quality improvement (QI) initiative to encourage routine frailty screening in all patients aged 50 years or older referred to a palliative care service integrated within an advanced heart disease programme. The specific objectives of the study were to (1) evaluate the feasibility to adopt and sustain routine frailty screening within palliative care assessments for hospitalised patients with advanced HF, (2) assess acceptability of frailty screening to clinicians and (3) determine the prevalence of frailty in this population and compare concordance between the two screening tools.

METHODS

We report our study design, analysis and outcomes according to the Standards for Quality Improvement Excellence 2.0.[23] This was a prospective, QI intervention to increase frailty screening for hospitalised patients with advanced HF at an academic tertiary medical centre, Brigham and Women's Hospital (BWH), in Boston, Massachusetts, USA. This study was carried out by a specialty-aligned palliative care team (HeartPal) caring for patients within the BWH advanced HF service. The HeartPal team consists of a palliative care physician, nurse practitioner and licensed social worker and completes an average of 250 new consults annually. The HeartPal service receives inpatient and outpatient referrals for goals of care, symptom management, and advance heart therapies evaluations. Prior to study onset, frailty was not routinely assessed among advanced HF patients or other palliative care consult services at BWH.

Implementation plan and target patients

After literature review and discussion with the clinical teams, we selected validated, primarily questionnaire-based frailty screening tools.[24–26] Due to the lack of a universal definition for frailty, the different screening tools were selected to reflect the two differing predominant conceptual models for frailty.[18 19] The primary aim was to achieve an adoption rate of 80% in frailty screening for each of the tools among all advanced HF patients aged 50 and over who were referred to the HeartPal service.

Frailty screening tools

Clinical Frailty Scale

Rockwood and Theou defined frailty as the accumulation of multiple health related deficits over the lifespan. The Clinical Frailty Scale (CFS) was developed from the Comprehensive Geriatrics Assessment-Frailty Index by Rockwood to further simplify the cumulative deficit frailty assessment.[24] CFS is based on responses by patients and/or caregivers on functional capabilities in the context of chronic diseases in the 2 weeks prior to the acute illness. The tool assesses different domains: morbidity, function and cognition, and categorises patients across nine levels of frailty from level 1 (very fit) to level 9 (terminally ill). Continuous CFS scores can be further divided into three classes: robust (CFS 1–3), vulnerable (CFS 4) and frail (CFS 5–9).

The Study of Osteoporotic Fracture frailty score and modified SOF frailty score

The original Fried phenotype, validated in large cardiovascular cohort studies, defines frailty using a combination of exhaustion, unintentional weight loss, low activity, weakness measured with grip strength and slow measured gait speed. However, limitations on time and staffing have precluded routine adoption of the Fried frailty tool in clinical practice. As a result, briefer versions have been developed such as the Study of Osteoporotic Fractures (SOF) tool.[25 26] The SOF frailty score assesses fatigue (replies 'No' to the question, 'Do you feel full of energy?'), weight loss (>5% or more in the last 2–3 years) and ability to complete five chair stands. The SOF frailty score has been further modified by replacing chair stands assessment with the question: 'Do you have difficulty kneeling, bending or stooping?'[27] Each item on both the SOF and modified SOF (mSOF) frailty scores yield one point. Total scores range from 0 to 3 and can be further classified into three categories: 0 points (robust), 1 point (prefrail) and ≥2 points (frail).

Implementation of frailty screening tools

The frailty screening tools were implemented between August 2021 and October 2022 (figure 1) using a phased approach per Exploration, Preparation, Implementation and Sustainment framework.[28 29] The exploration phase consisted of focus groups with leadership from the BWH Advanced Heart Disease Programme and Department of Rehabilitation Services, resulting in identification of significant need for frailty screening without existing standardisation around approach or measurement tools. We then identified project champions within the departments of cardiology, palliative medicine and geriatrics, and achieved consensus on selection of suitable screening tests. The preparation/preimplementation phase consisted of staff education around CFS, SOF and mSOF tools and presentation of associated training materials and note templates in a team meeting. Two subsequent refresher training sessions were held during the study period to capture new HeartPal staff and rotating clinicians. During the implementation phase, smart phrases designed to prompt clinicians to record results of CFS and SOF/mSOF frailty screens were included in the palliative care service note templates. Use of the documentation template was voluntary, and clinicians could delete the

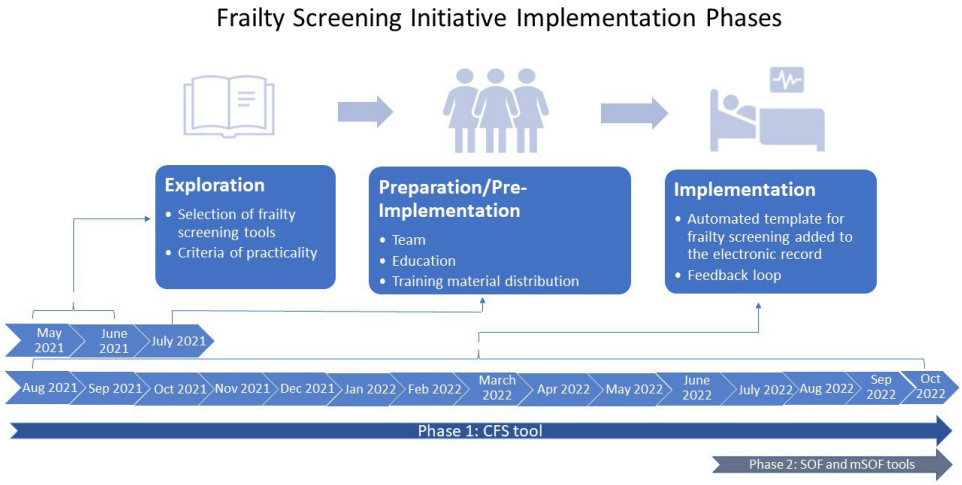

Figure 1 Frailty screening implementation phases and timing. CFS, Clinical Frailty Scale; mSOF, modified Study of Osteoporotic Fracture; SOF, Study of Osteoporotic Fracture.

smart phrase from the note. The CFS was implemented in the first phase in August 2021, followed by SOF and mSOF implementation in July 2022. We intended to implement each phase sequentially once sustainability achieved for initial screening tool. However, implementation of the second phase was delayed due to staff turnover and was initiated once new staff was onboarded and trained. After implementation, the second phase was continued until sustainability was achieved. We actively surveilled the adoption rate of frailty screening tools and feedback was shared with stakeholders and clinicians to encourage continued utilisation of screening tools. Reminders of the frailty screening QI initiative were provided at quarterly team meetings to encourage sustainability.

Outcomes

Feasibility was evaluated using the Bowen *et al* framework, which defines feasibility by implementation, adoption, sustainability, practicality and acceptability measures.[30 31] Adoption and sustainability were measured by calculating percent completion rate of the frailty screening tools at monthly time intervals. Adaptation measured the frequency of occurrences in which a frailty tool was adapted to accommodate the clinical context. To assess acceptability and practicality, as defined by Bowen *et al*,[30] we conducted an anonymous survey for all physicians and nurse practitioners working on the HeartPal service during the study period (n=6). The questions in the anonymous survey are presented in online supplemental appendix 2.

Data collection and statistical methods

Patient records were manually reviewed to extract frailty scores. Data were collected for up to 12 months following an initial consultation. Patient baseline demographics and comorbidities were gathered from the Research Patient Data Registry through the Mass General Brigham Healthcare System using unique medical record identifiers. Comorbidities were identified based on ICD-10 codes documented in the patient's EHR within the 2 years prior to palliative care consultation (online supplemental appendix table 1). An acceptability survey was sent to clinicians via an online platform requesting voluntary participation, and anonymous responses were collected (online supplemental appendix 2).

Demographic and morbidity data are presented as frequency distributions and prevalence. Continuous data are expressed as means and SDs. All analyses were performed using SPSS, V.27 (SPSS) and QI Macros (KnowWare International, Denver, Colorado) software.

RESULTS

A total of 212 advanced HF patients aged 50 years and older were seen by the HeartPal service during the study period, and 183 (86.3% of all eligible referred patients) were screened for frailty. Baseline characteristics for all eligible patients referred to the service are presented in table 1. Mean age was 69.1 (±10.2) years. The majority (69.3%) were male, and 65.1% were classified New York Heart Association (NYHA) functional class III–IV at the time of palliative care consultation. Most patients had non-ischaemic HF, and 23.1% had previous experience with advanced heart therapies (temporary mechanical circulatory support, durable left ventricular assist device and/or heart transplantation). Most patients (64.2%) were referred to the HeartPal service for goals of care discussion.

Feasibility of CFS, SOF and mSOF tools

At the end of the first month of the study period, CFS was completed in 41.7% of all patients. By the end of the second month, CFS adoption rate exceeded 90%. After the initial 7 months, the target adoption rate of >80% monthly CFS frailty screens was sustained for the remainder of the study period (figure 2). Overall, during the study period, 86.3% of eligible patients were screened for frailty using the CFS. During the second phase, overall

Table 1 Demographics of patients ≥50 years old referred to the HeartPal service from August 2021 to October 2022

	All eligible patients (n=212)	Screened with CFS (n=183)	Screened with mSOF (n=25)	Screened with SOF (n=19)
Frailty* prevalence	–	95 (51.9%)	13 (52.0%)	11 (57.9%)
Age (mean±SD)	69.1±10.2	69.6±10.3	68.7±11.1	68.9±11.5
Male	147 (69.3%)	123 (67.2%)	15 (60.0%)	13 (68.4%)
Race				
White	167 (78.8%)	148 (80.9%)	20 (80.0%)	16 (84.2%)
Black	31 (14.6%)	25 (13.7%)	4 (16.0%)	2 (10.5%)
Other	10 (4.7%)	7 (3.8%)	1 (4.0%)	1 (5.3%)
Unknown, declined	4 (1.9%)	3 (1.6%)	0 (0%)	0 (0%)
Ethnicity				
Non-Hispanic	202 (95.3%)	174 (95.1%)	24 (96.0%)	18 (94.7%)
Hispanic	6 (2.8%)	5 (2.7%)	0 (0%)	0 (0%)
Unknown, declined	4 (1.9%)	4 (2.2%)	1 (4.0%)	1 (5.3%)
LVEF % (mean±SD)	33.6±16.8	33.8±16.7	33.5±17.7	33.4±18.1
BMI (mean±SD)	27.9±7.5	27.6±7.5	26.7±5.9	26.7±6.5
Type of cardiomyopathy				
Ischaemic	63 (29.7%)	74 (40.4%)	10 (40.0%)	7 (36.8%)
Non-ischaemic	83 (39.2%)	52 (28.4%)	5 (20.0%)	3 (15.8%)
Other	66 (31.1%)	57 (31.1%)	10 (40.0%)	9 (47.4%)
Prior Advanced Heart Therapies†	49 (23.1%)	40 (21.9%)	3 (12.0%)	2 (10.5%)
NYHA				
I	6 (2.8%)	6 (3.3%)	1 (4.0%)	1 (5.3%)
II	40 (18.9%)	35 (19.1%)	6 (24.0%)	3 (15.8%)
III	86 (40.6%)	76 (41.5%)	9 (36.0%)	8 (42.1%)
IV	52 (24.5%)	42 (23.0%)	5 (20.0%)	4 (21.1%)
Unknown	28 (13.2%)	24 (13.1%)	4 (16.0%)	3 (15.8%)
MAGGIC‡ (mean±SD)	28.4±7.2	28.4±7.4	27.4±8.0	28.0±7.9
Reason for palliative care consult				
Goals of care	136 (64.2%)	118 (64.5%)	11 (44.0%)	8 (42.1%)
Advanced heart therapy evaluation	27 (12.7%)	25 (13.7%)	5 (20.0%)	4 (21.1%)
Goals of care and advanced heart therapy evaluation	49 (23.1%)	40 (21.9%)	9 (36.0%)	7 (36.8%)
History of any type of frailty screening by any other teams	69 (32.5%)	57 (31.1%)	11 (44.0%)	6 (31.6%)
Medical conditions				
Cancer	53 (25.0%)	45 (24.6%)	4 (16.0%)	2 (10.5%)
Coronary artery disease	138 (65.0%)	118 (64.5%)	15 (60.0%)	12 (63.2%)
Atrial fibrillation	117 (55.2%)	102 (55.7%)	12 (48.0%)	9 (47.4%)
Stroke or TIA	56 (26.4%)	52 (28.4%)	11 (44.0%)	8 (42.1%)
Peripheral vascular disease	89 (42.0%)	74 (40.4%)	10 (40.0%)	7 (36.8%)
Diabetes	108 (50.9%)	89 (48.6%)	10 (40.0%)	7 (36.8%)
Chronic kidney disease	146 (68.9%)	45 (24.6%)	19 (76.0%)	14 (73.7%)
COPD	32 (15.1%)	31 (16.9%)	3 (12.0%)	3 (15.8%)
Obstructive sleep apnoea	48 (22.6%)	37 (20.2%)	2 (8.0%)	1 (5.3%)
Morbid obesity	16 (7.5%)	14 (7.7%)	2 (8.0%)	2 (10.5%)

Continued

Table 1 Continued

	All eligible patients (n=212)	Screened with CFS (n=183)	Screened with mSOF (n=25)	Screened with SOF (n=19)
Dementia or cognitive impairment	41 (19.3%)	33 (18.0%)	5 (20.0%)	5 (26.3%)
Hypertension	116 (54.7%)	99 (54.1%)	17 (68.0%)	13 (68.4%)
Depression	58 (27.4%)	51 (27.9%)	6 (24.0%)	6 (31.6%)
Arthritis	74 (34.9%)	62 (33.9%)	8 (32.0%)	6 (31.6%)

*Frailty defined as CFS classes: 5–9, mSOF: ≥2 points, SOF: ≥2 points.
†Advanced heart therapies defined as: temporary or long-term mechanical circulatory support, orthotopic heart transplant.
‡MAGGIC available for n=184 of all patients, n=159 among screened with CFS, n=21 among patient screened with modified SOF, n=16 among patients screened with SOF, n=25 among patients not screened with frailty (Pocock *et al*).[48]
BMI, body mass index; CFS, Clinical Frailty Scale; COPD, chronic obstructive pulmonary disease; LVEF, left ventricular ejection fraction; MAGGIC risk score, Meta-analysis Global Group in Chronic Heart Failure risk score; mSOF, modified Study of Osteoporotic Fractures Score; NYHA, New York Heart Association; SOF, Study of Osteoporotic Fractures Score; TIA, transient ischemic attack.

adoption rate for the SOF tool was 54.3%, whereas adoption rate for the mSOF tool, that did not require chair stands, reached 90% after 2 months of implementation. The SOF tool was adapted to mSOF in 7 of 25 patient visits, corresponding to an overall adaptation rate of 28% from SOF to mSOF. The frequency of positive responses for each of the domains in patients screened as vulnerable or frail by the mSOF tool are shown in table 2.

Frailty prevalence and screening tool concordance

The prevalence of frailty differed between the two screening tools. The CFS identified 39 (21.3%) patients as robust, 49 (26.8%) as vulnerable and 95 (51.9%) as frail, while the mSOF identified 4 (16.0%) as robust, 8 (32.0%) as vulnerable and 13 (52.0%) as frail. In the 25 patients screened with both screening tests (CFS and mSOF), the results were concordant in 15 (60%) patients and discordant in 10 (40%) patients. Table 3 shows the detailed number and prevalence of patients with concordant and discordant screening results between CFS and mSOF.

Acceptability and practicality for clinicians

There was a 100% response rate to the acceptability survey (online supplemental appendix 2) by palliative care clinicians (n=6, 3 physicians, 3 nurse practitioners) staffing the HeartPal service and engaging in the QI initiative during the study period. Most (66.7%, n=4) had no prior training on use of frailty screening tools. Frailty screening tools were considered practical: five out of six clinicians considered the CFS to be easiest to use, and the average time to evaluate CFS was 4 (SD 3) min. The tools were also considered acceptable to clinicians: five out of six reported an intention to continue to use frailty screening in future clinical practice.

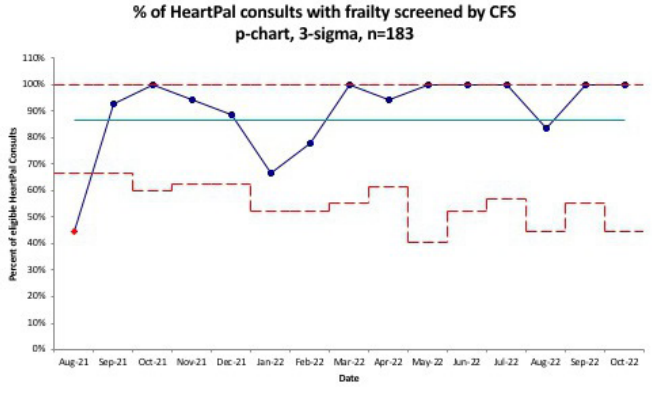

Figure 2 CFS adoption over time. CFS, Clinical Frailty Scale.

Description of those patients lacking frailty screening

During the study period, 29 patients (13.8% of overall cohort) were not screened for frailty. Patient characteristics did not differ between those patients who were screened for frailty and those who were not (online supplemental appendix table 2). 48.3% (n=14) of patients not screened were seen during the first implementation month in August 2021. Among the remaining 15 patients who did not undergo frailty screening, 4 (26.6%) were able to participate in the interview at time of consultation but were not assessed for frailty (reason for lack of frailty screening was not documented). The remaining 11 patients were unable to directly engage in assessment with the HeartPal team at time of consultation due incapacitated state, and frailty assessment via discussion with family or healthcare proxies was not available.

Table 2 Frequency and percentage of vulnerable and frail patients with positive responses to mSOF score domains (n=21)

	Vulnerable (n=8)	Frail (n=13)
Reduced energy level	6 (75.0%)	12 (92.3%)
Weight loss >5%	1 (12.5%)	7 (53.8%)
Difficulty bending, kneeling or stooping	1 (12.5%)	11 (84.6%)

mSOF, modified Study of Osteoporotic Fracture.

Table 3 Prevalence of concordant and discordant classifications between the CFS and mSOF tools (n=25)

Concordant classifications between the CFS and mSOF tool	15 (60%)
Robust	3 (12%)
Vulnerable	2 (8%)
Frail	10 (40%)
Discordant classifications between the CFS and mSOF tool	10 (40%)
No of patients changed from robust in CFS to vulnerable mSOF	3 (12%)
No of patients changed vulnerable in CFS to robust in mSOF	1 (4%)
No of patients changed vulnerable in CFS to frail in mSOF	3 (12%)
No of patients changed frail in CFS to robust in mSOF	0
No of patients changed frail in CFS to vulnerable in mSOF	3 (12%)

CFS, Clinical Frailty Scale; mSOF, modified Study of Osteoporotic Fracture.

DISCUSSION

In this clinical QI study, we demonstrate that incorporation of question-based frailty screening assessments is feasible for palliative care consultants seeing hospitalised advanced HF patients. Frailty screening reached adoption rate thresholds of >80% for two of the three frailty screening methods implemented, and clinician use of these tools was sustained through the duration of the study. Additionally, the CFS had adoption rates of 93% after the first month of the implementation phase. Implementation of routine frailty screening was rated as acceptable by all involved clinicians in the study, and the majority of clinicians noted plans for utilisation of frailty screening in future clinical practice.

The adoption rates achieved by the inpatient palliative care consultation service in our study achieved and exceeded the 80% completion rate achieved by an inpatient preoperative service.[32] Our adoption rates were also significantly higher compared with the rates of 43%–48% among older trauma patients assessed in emergency departments.[33 34] Our study cohort was unique due to the diversity of reasons for referral to palliative care within the HeartPal programme and overall younger population included. The majority of previously published literature has limited screening for frailty to patients 65 years or older.[35 36] However, our decision to expand eligibility criteria for frailty screening to patients 50 years and older addresses considerations specific to the HF population: frailty can be accelerated by the presence of underlying HF independent of age and NYHA classification, and the population of patients considered for advance heart therapies evaluations tend to be younger.[37] Indeed, 14% of younger patients (ages 50–64) in our study were screened as frail with CFS, supporting the theory that stressors associated with chronic HF may accelerate biological ageing processes.[38]

Our findings expand on a growing literature base on the role of palliative care teams in the care of patients with advanced HF. Despite the increased recognition of the importance of palliative care referrals to address symptom management, goals of care conversations, and prognostic awareness, the types of assessments conducted and resultant interventions by palliative care teams remain varied.[39–42] Additionally, frailty has often been used as a screening tool to determine need for palliative care consultation rather than being considered as a useful assessment tool within palliative care consultation.[43] As palliative care teams increasingly receive referrals for patients with chronic illness(es) and multimorbidity who are facing high-risk decision-making, including for all patients undergoing advance heart therapies evaluations as is the practice at our institution, there is a need to further refine clinicians' ability to incorporate geriatric principles to better understand the risks and benefits of treatment decisions based on individual patient characteristics. To our knowledge, ours is the first study demonstrating the role palliative care clinicians may have in assessing frailty as part of the care of advanced HF patients. The successful integration of frailty screening into routine palliative care practice has value not only in satisfying HF society guidelines' recommendation to screen for frailty in adults with advanced HF,[10–13] but also may lay the groundwork for palliative care clinicians to further map individual aspects of care onto discussions around goals of care and prognostication with respect to function and quality of life.

While our study demonstrated that the incorporation of questionnaire-based frailty screens was feasible in a population of seriously ill hospitalised HF patients, implementation of a screening tool including physical testing parameters to measure fitness was more challenging. This finding is consistent with prior studies demonstrating that although incorporation of chair stands measurements as part of frailty screenings can be done in outpatient settings and in preoperative evaluations,[44 45] frailty screens that rely on questionnaires rather than direct assessment of physical function may be the most feasible and ideal when measuring frailty in hospitalised populations.[46 47]

Strengths and limitations

Our results offer encouragement and guidance on the types of frailty screening tools that are feasible for use in further research examining the prevalence and impact of frailty for hospitalised HF patients. Moreover, our results demonstrate the potential for multidisciplinary teams to collaborate towards optimising quality care for patients with advanced HF. We also acknowledge limitations. This was a single-centre study piloted within a single team, and feasibility and acceptability may vary depending on unique characteristics specific to a single institution or team, thus limiting the generalisability of

the results. In addition, as the nature of the study was to evaluate feasibility, further study is warranted to evaluate the impact of frailty screening on the content of goals of care discussions in clinical practice. Looking ahead, long-term follow-up on outcomes for patients who have undergone frailty screening will further our understanding of the role frailty screening may play in improving clinical practice.

CONCLUSIONS

This prospective clinical process improvement study demonstrated that question-based frailty screening tools are feasible and acceptable to inpatient palliative care consult clinicians caring for patients with advanced HF. We are hopeful that further study of application and outcomes of frailty scoring in this population may help refine our understanding of the diverse HF population, risk stratify patients undergoing advanced heart therapy evaluations and optimise treatment plans.

Twitter Ariela R Orkaby @DrAROrkaby

Contributors H-RL contributed to conceptualisation, methodology, investigation, data curation, visualisation, figure design—review and editing, writing—original draft and writing—review and editing; NJ was involved in conceptualisation, methodology, investigation, data curation, visualisation, figure design—review and editing, writing—original draft, and writing—review and editing, RB was involved in conceptualisation, methodology, investigation, visualisation, figure design—review and editing, writing—review and editing, and supervision; MJL contributed to conceptualisation, methodology, figure design—review and editing, writing—review and editing; ASD contributed to figure design—review and editing, writing—review and editing; ARO was responsible for conceptualisation, methodology, investigation, visualisation, figure design—review and editing, writing—review and editing, and supervision. All authors approved the final draft. The corresponding author (H-RL) attested that all listed authors met the criteria for the authorship. H-RL and NJ acted as guarantors for the study.

Funding H-RL received personal grant support from the Finnish post-doc pool: Päivikki and Sakari Sohlberg Foundation, and Finnish Cultural Foundation; no grant numbers. NJ received funding support from the Eleanor and Miles Shore Faculty Development Awards Program.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval Massachusetts General Brigham Institutional Review Board has previously approved the development of a HeartPal registry of all patient's seen by the service including data from frailty assessments. The project was carried out as a quality improvement initiative at BWH, and thus, was not formally supervised by the institutional review board per their policies nor was obtaining informed consent needed.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as online supplemental information. Data are available on request and per the requirements of the local Institutional Review Board.

ORCID iDs
Hanna-Riikka Lehto http://orcid.org/0000-0001-7090-9701
Ariela R Orkaby http://orcid.org/0000-0002-4297-6306

REFERENCES

1 Clegg A, Young J, Iliffe S, *et al*. Frailty in elderly people. *Lancet* 2013;381:752–62.
2 Flint KM, Matlock DD, Lindenfeld J, *et al*. Frailty and the selection of patients for destination therapy left ventricular assist device. *Circ Heart Fail* 2012;5:286–93.
3 Zhang Y, Yuan M, Gong M, *et al*. Frailty and clinical outcomes in heart failure: a systematic review and meta-analysis. *J Am Med Dir Assoc* 2018;19:1003–8.
4 Uchmanowicz I, Lee CS, Vitale C, *et al*. Frailty and the risk of all-cause mortality and hospitalization in chronic heart failure: a meta-analysis. *ESC Heart Fail* 2020;7:3427–37.
5 Pandey A, Kitzman D, Reeves G. Frailty is intertwined with heart failure. *JACC: Heart Failure* 2019;7:1001–11.
6 Vidán MT, Blaya-Novakova V, Sánchez E, *et al*. Prevalence and prognostic impact of frailty and its components in non-dependent elderly patients with heart failure. *Eur J Heart Fail* 2016;18:869–75.
7 Rodríguez-Pascual C, Paredes-Galán E, Ferrero-Martínez A-I, *et al*. The frailty syndrome is associated with adverse health outcomes in very old patients with stable heart failure: a prospective study in six Spanish hospitals. *Int J Cardiol* 2017;236:296–303.
8 Vitale C, Spoletini I, Rosano GM. Frailty in heart failure: implications for management. *Card Fail Rev* 2018;4:104–6.
9 Morris AA, Khazanie P, Drazner MH, *et al*. Guidance for timely and appropriate referral of patients with advanced heart failure: a scientific statement from the American Heart Association. *Circulation* 2021;144:e238–50.
10 Walston J, Bandeen-Roche K, Buta B, *et al*. Moving frailty toward clinical practice: NIA intramural frailty science symposium summary. *J Am Geriatr Soc* 2019;67:1559–64.
11 Rodríguez-Mañas L, Féart C, Mann G, *et al*. Searching for an operational definition of frailty: a Delphi method based consensus statement. The frailty operative definition-consensus conference project. *J Gerontol A Biol Sci Med Sci* 2013;68:62–7.
12 Taylor JK, Fox J, Shah P, *et al*. Barriers to the identification of frailty in hospital: a survey of UK Clinicians. *Future Healthc J* 2017;4:207–12.
13 Mehra MR, Canter CE, Hannan MM, *et al*. The 2016 International society for heart lung transplantation listing criteria for heart transplantation: A 10-year update. *J Heart Lung Transplant* 2016;35:1–23.
14 Hii TBK, Lainchbury JG, Bridgman PG. Frailty in acute cardiology: comparison of a quick clinical assessment against a validated frailty assessment tool. *Heart Lung Circ* 2015;24:551–6.
15 Montgomery C, Stelfox H, Norris C, *et al*. Association between preoperative frailty and outcomes among adults undergoing cardiac surgery: a prospective cohort study. *CMAJ Open* 2021;9:E777–87.
16 Tse G, Gong M, Wong SH, *et al*. Frailty and clinical outcomes in advanced heart failure patients undergoing left ventricular assist device implantation: a systematic review and meta-analysis. *J Am Med Dir Assoc* 2018;19:255–61.
17 Lee JA, Yanagawa B, An KR, *et al*. Frailty and pre-frailty in cardiac surgery: a systematic review and meta-analysis of 66,448 patients. *J Cardiothorac Surg* 2021;16:184.
18 Fried LP, Tangen CM, Walston J, *et al*. Frailty in older adults: evidence for a phenotype. *J Gerontol A Biol Sci Med Sci* 2001;56:M146–56.
19 Rockwood K, Song X, MacKnight C, *et al*. A global clinical measure of fitness and frailty in elderly people. *CMAJ* 2005;173:489–95.
20 Buta BJ, Walston JD, Godino JG, *et al*. Frailty assessment instruments: systematic characterization of the uses and contexts of highly-cited instruments. *Ageing Res Rev* 2016;26:53–61.
21 Sze S, Pellicori P, Zhang J, *et al*. Identification of frailty in chronic heart failure. *JACC Heart Fail* 2019;7:291–302.
22 Ijaz N, Buta B, Xue Q-L, *et al*. Interventions for frailty among older adults with cardiovascular disease: JACC state-of-the-art review. *J Am Coll Cardiol* 2022;79:482–503.

23 Ogrinc G, Davies L, Goodman D, *et al*. SQUIRE 2.0 (standards for quality improvement reporting excellence): revised publication guidelines from a detailed consensus process. *BMJ Qual Saf* 2016;25:986–92.
24 Rockwood K, Theou O. Using the clinical frailty scale in allocating scarce health care resources. *Can Geriatr J* 2020;23:210–5.
25 Ensrud KE, Ewing SK, Taylor BC. Comparison of 2 frailty indexes for prediction of falls, disability, fractures and death in older women. *Arch Intern Med* 2008;168:382.
26 Ensrud KE, Ewing SK, Cawthon PM, *et al*. A comparison of frailty indexes for the prediction of falls, disability, fractures, and mortality in older men. *J Am Geriatr Soc* 2009;57:492–8.
27 Orkaby AR, Hshieh TT, Gaziano JM, *et al*. Comparison of two frailty indices in the physicians' health study. *Arch Gerontol Geriatr* 2017;71:21–7.
28 Aarons GA, Hurlburt M, Horwitz SM. Advancing a conceptual model of evidence-based practice implementation in public service sectors. *Adm Policy Ment Health* 2011;38:4–23.
29 Moullin JC, Dickson KS, Stadnick NA, *et al*. Systematic review of the exploration, preparation, implementation, sustainment (EPIS) framework. *Implement Sci* 2019;14:1.
30 Bowen DJ, Kreuter M, Spring B, *et al*. How we design feasibility studies. *Am J Prev Med* 2009;36:452–7.
31 Lewis CC, Klasnja P, Powell BJ, *et al*. From classification to causality: advancing understanding of mechanisms of change in implementation science. *Front Public Health* 2018;6:136.
32 Amini S, Crowley S, Hizel L, *et al*. Feasibility and rationale for incorporating frailty and cognitive screening protocols in a preoperative anesthesia clinic. *Anesth Analg* 2019;129:830–8.
33 Schoenenberger AW, Bieri C, Özgüler O, *et al*. A novel multidimensional geriatric screening tool in the ED: evaluation of feasibility and clinical relevance. *Am J Emerg Med* 2014;32:623–8.
34 Maxwell CA, Mion LC, Mukherjee K, *et al*. Feasibility of screening for preinjury frailty in hospitalized injured older adults. *J Trauma Acute Care Surg* 2015;78:844–51.
35 Afilalo J, Eisenberg MJ, Morin J-F, *et al*. Gait speed as an incremental predictor of mortality and major morbidity in elderly patients undergoing cardiac surgery. *J Am Coll Cardiol* 2010;56:1668–76.
36 Chong E, Ho E, Baldevarona-Llego J, *et al*. Frailty and risk of adverse outcomes in hospitalized older adults: a comparison of different frailty measures. *J Am Med Dir Assoc* 2017;18:638.
37 Jha SR, Hannu MK, Chang S, *et al*. The prevalence and prognostic significance of frailty in patients with advanced heart failure referred for heart transplantation. *Transplantation* 2016;100:429–36.
38 Boilson BA, Larsen K, Harbuzariu A, *et al*. Regulation of circulating progenitor cells in left ventricular dysfunction. *Circ Heart Fail* 2010;3:635–42.
39 Rogers JG, Patel CB, Mentz RJ, *et al*. Palliative care in heart failure: the PAL-HF randomized controlled clinical trial. *J Am Coll Cardiol* 2017;70:331–41.
40 O'Donnell AE, Schaefer KG, Stevenson LW, *et al*. Social worker-aided palliative care intervention in high-risk patients with heart failure (SWAP-HF): a pilot randomized clinical trial. *JAMA Cardiol* 2018;3:516–9.
41 Woodburn JL, Staley LL, Wordingham SE, *et al*. Destination therapy: standardizing the role of palliative medicine and delineating the DT-LVAD journey. *J Pain Symptom Manage* 2019;57:330–40.
42 Gelfman LP, Sudore RL, Mather H, *et al*. Prognostic awareness and goals of care discussions among patients with advanced heart failure. *Circ Heart Fail* 2020;13:e006502.
43 Ernst KF, Hall DE, Schmid KK, *et al*. Surgical palliative care consultations over time in relationship to systemwide frailty screening. *JAMA Surg* 2014;149:1121–6.
44 Henry L, Halpin L, Barnett SD, *et al*. Frailty in the cardiac surgical patient: comparison of frailty tools and associated outcomes. *Ann Thorac Surg* 2019;108:16–22.
45 Somech J, Joshi A, Mancini R, *et al*. Comparison of questionnaire and performance-based physical frailty scales to predict survival and health-related quality of life in patients with heart failure. *J Am Heart Assoc* 2023;12:e026951.
46 Hope AA, Hsieh SJ, Petti A, *et al*. Assessing the usefulness and validity of frailty markers in critically ill adults. *Ann Am Thorac Soc* 2017;14:952–9.
47 Le Maguet P, Roquilly A, Lasocki S, *et al*. Prevalence and impact of frailty on mortality in elderly ICU patients: a prospective, multicenter, observational study. *Intensive Care Med* 2014;40:674–82.
48 Pocock SJ, Ariti CA, McMurray JJV, *et al*. Predicting survival in heart failure: a risk score based on 39 372 patients from 30 studies. *Eur Heart J* 2013;34:1404–13.