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Frailty-Associated Functional Assessment in Advanced Heart Failure: Predicting Postoperative Length of Stay

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Abstract

Background

Patients with advanced heart failure (HF) often demonstrate impaired physical function and/or frailty which may negatively impact outcomes following orthotopic heart transplantation (OHT) or left ventricular assist device (LVAD) implantation. Frailty assessment stratifies patients at higher risk for postoperative complications and/or mortality following solid organ transplants, however limited research identifies risk for individuals with HF. This study investigated whether four functional performance measures associated with frailty predicted postoperative outcomes following OHT or LVAD implantation.

Methods

A retrospective chart review collected data on individuals who underwent OHT or LVAD implantation between 2015 and 2018 at a single medical center. Patients were included if they underwent both occupational and physical therapy evaluations that recorded the investigated preoperative measures prior to decision for surgical intervention. Linear regression analyses were used.

Results

Lower performance on three functional outcome measures (composite activity of daily living level, Five Times Sit-to-Stand score, and assistive device use) were significantly associated with longer postoperative length of stays.

Conclusion

Frailty assessment inclusive of physical and occupational performance measures, such as those studied here, may help identify patients with greater operative risk and who may benefit from prehabilitation services. Occupational and physical therapists add value to interdisciplinary teams evaluating candidacy for advanced HF therapies.

Keywords**:** Acute care; cardiac rehabilitation; frailty; interdisciplinary health team; prehabilitation; quality improvement and patient safety; transplantation

Background

A greater number of individuals are living with chronic conditions such as heart failure (HF) due to a growing aging population and recent medical advances. HF is a condition in which one's heart does not pump enough blood to the body to meet physiological demand. People with end-stage HF may be candidates for advanced HF therapies including heart transplantation or LVAD implantation (Heidenreich et al., 2013). HF affects over 56.2 million people globally (Bozkurt et al., 2023). In the United States, approximately 6.7 million adults over the age of twenty are living with HF, and this number is expected to rise to 8.5 million adults by 2030 (Bozkurt et al., 2023). Following this trend, the number of individuals in end-stage HF requiring heart transplantation (OHT) or left ventricular assist device (LVAD) implantation has also increased (Hsich, 2016; Makdisi et al., 2017). There are currently more heart transplant candidates than there are available donor hearts (Hsich, 2016). Given this scarcity in resources and the growing number of individuals who may ultimately benefit from heart transplantation or LVAD implantation, it is essential to investigate which functional performance measures best predict postoperative outcomes following these surgical interventions, such as shorter inpatient length of stays.

Frailty has been shown to correlate with postoperative outcomes in individuals undergoing solid organ transplants including lung, liver, and kidney transplantation (DeMaria et al., 2019; McAdams-DeMarco et al., 2015; Wilson et al., 2016). Jha and colleagues (2016) define frailty as "a state of patient vulnerability in which there is an inability to withstand even minor stressors because of a diminished physiologic reserve" (p.1093). This definition has been extended by others to specify the inclusion of clinical criteria such as unintended weight loss, exhaustion, weakness, slowness, low physical activity, cognition, balance, and assistance required for completion of activities of daily living (Fried et al., 2001; Jha et al., 2016; Jones et al., 2004; Mauthner et al., 2017).

Assessment of frailty is pertinent to the HF population, as frailty is prevalent in an estimated 44.5% of individuals with HF and is associated with all-cause mortality and greater healthcare utilization (Denfeld et al., 2017; McNallan et al., 2013; Zhang et al., 2018). There is emerging evidence that frailty may be predictive of postoperative outcomes for individuals undergoing heart transplantation or LVAD implantation (Chung et al., 2014; Jha et al., 2016; Macdonald et al., 2021; Zhang et al., 2018), however the measures that best conceptualize frailty and predict postoperative outcomes in individuals with advanced HF require further investigation. In their 2016 guidelines, the International Society for Heart and Lung Transplantation (ISHLT) suggested that clinicians consider frailty assessment when evaluating an individual's candidacy for heart transplantation. The ISHLT, however, expressed concern with making frailty a definitive criteria at the time due in part to the lack of standardization, methods of frailty assessment being too time consuming or difficult to perform, and a limited understanding of how responsive frailty is to advanced HF therapies (Mehra et al., 2016). Thus, it is necessary to investigate measures that indicate an individual's baseline level of frailty, are quick to assess, are easy to evaluate in both the inpatient and outpatient settings, and relate to an individual's candidacy for advanced HF therapies and postoperative success.

There are many frailty assessments that aim to capture components of frailty including physical, cognitive, psychosocial, and functional domains (Bouillon et al., 2013; Fried et al., 2001; Jha et al., 2015; Mauthner et al., 2017; McDonagh et al., 2018). The two main conceptual approaches to measuring frailty are the Frailty Phenotype (Fried et al., 2001) and the Frailty Index (Rockwood et al., 2005). The Frailty Phenotype focuses on the physical aspects of frailty and consists of five components including unintentional weight loss, self-reported exhaustion, low level of physical activity, slow walk speed, and reduced grip strength (Mauthner et al., 2017). The Frailty Index uses a count of 70 deficits including comorbidities, physical and cognitive impairments, psychosocial factors, and common geriatric symptoms (Mauthner et al., 2017). Although both are validated and reliable tools, these assessments are extensive and can be difficult to complete in individuals undergoing work-up for advanced HF therapies with significant medical instability and invasive lines and devices (e.g., mechanical support devices). Considering the Frailty Phenotype, it is unclear if self-reported exhaustion would be representative of frailty in the HF population as exhaustion may be inherent to their HF condition. Additionally, individuals hospitalized due to their health condition may experience low levels of physical activity due to the nature of the environment rather than their physical capability. Further, a 70-item assessment is often too time-consuming to administer in the acute care setting. It is therefore beneficial to look at individual elements of these measures to see which components may be most useful in assessing for frailty, most feasible to administer, and most predictive of postoperative outcomes in this patient population.

Heart failure contributes to the economic burden both globally and nationally. Notably, caring for an individual with heart failure carries a nearly $30,000 annual cost in the United States (Heidenreich et al., 2022). Of this high financial cost, 75%-80% of the direct costs of caring for an individual with HF result from hospitalizations (Heidenreich et al, 2022). Individuals with HF who were at high risk for frailty had increased hospital length of stays and greater inpatient costs than those who were at low risk for frailty (Kwok et al., 2020). Furthermore, longer hospital stays may impact quality of life (QoL). One study investigating health-related QoL in older adults hospitalized for chronic HF found that length of hospital stay correlated inversely with overall health-related QoL (Erceg et al., 2013). Given the costliness of inpatient hospital care from both a financial and QoL perspective, investigating postoperative inpatient length of stay is a valuable measure of postoperative success.

Functional performance measures, such as independence with activities of daily living (ADLs), gait speed as measured by a 3-meter or 4-meter walk test, Five Times Sit-to-Stand (5xSTS) score, and use of an assistive device, are objective tools that are easily assessed in both the inpatient and outpatient settings by an occupational therapist (OT) and physical therapist (PT) to identify baseline functional status. Independence with ADLs indicates an individual's ability to complete one's daily activities and provides insight into activity tolerance, strength, coordination, and cognition, among other performance skills. Dependency in ADLs is one of the measures assessed in the Frailty Index (Mauthner et al., 2017), and research has demonstrated a strong relationship between frailty components and disability in ADLs (Provencher et al., 2017). Gill and colleagues (2004) found that in a sample of community-living persons aged 70 years and older, disability in ADLs was more likely in individuals who were physically frail. Given its link to frailty, ADL performance is an important functional measure to further investigate. Gait speed is a functional measure that can be used to predict fall risk and cardiovascular fitness (Middleton et al., 2015; Yates et al., 2017) and has been found to be an indicator of frailty (Abellan Van Kan et al., 2008; Pamoukdjian et al., 2015). Slower gait speeds have also been linked to higher mortality rates in patients following cardiac surgery (Afilalo et al., 2018). The Five Times Sit-to-Stand assessment highlights lower extremity strength and power during the functional task of standing from a chair and can predict fall risk (Buatois et al., 2008). A recent study investigating remote assessment of physical frailty found that individuals in the pre-frail/frail group were significantly slower at completing the 5xSTS test compared to individuals in the robust older adult group (Park et al., 2021). Lastly, the use of an assistive device (or lack thereof) relates to standing balance, muscular and aerobic endurance, and self-confidence, thus providing further insight into an individual's strength and independence (Sehgal et al., 2021). Amin and colleagues (2022) reported that in patients undergoing transcatheter aortic valve implantation, increased dependence on a mobility aid was associated with a worse postoperative prognosis.

The aim of this study was to investigate whether four measures of functional performance associated with frailty were predictive of postoperative outcomes following heart transplantation or LVAD implantation. It was hypothesized that greater independence with ADLs, faster gait speed, increased lower extremity power as measured by 5xSTS score, and nonuse of an assistive device would lead to shorter postoperative inpatient length of stays.

Methodology

This study was submitted to the Institutional Review Board (IRB) and approved as exempt from further IRB review (HS-18-00976). Retrospective chart review was performed to collect data from the electronic medical record (EMR). The study data was collected and managed using Research Electronic Data Capture (REDCap) electronic data capture tools hosted at the University of Southern California (Harris et al., 2019; Harris et al., 2009).

Study Population

This study included individuals with heart failure who received a heart transplant or LVAD between January 2015 and December 2018 at a single medical center in Southern California. Individuals were included in this study if they received both an occupational therapy (OT) and a physical therapy (PT) evaluation prior to decision for heart transplantation or LVAD implantation and had the investigated preoperative measures recorded in the EMR. OT and PT evaluations were performed in both the inpatient and outpatient settings. All individuals had a hospitalization when they received their surgical intervention, during which they received occupational therapy and physical therapy services in the acute care setting. Three hundred and sixty-nine patients were considered for evaluation for OHT or LVAD at the aforementioned medical center during the study time period. Two hundred thirty-nine individuals were excluded given that they did not receive both OT and PT evaluations prior to decision for OHT or LVAD implantation, they did not start or finish the evaluation in the specified time period, or they received an alternative surgical intervention. Of the remaining 130 individuals, 59 individuals were excluded for ultimately receiving medical management rather than OHT or LVAD implantation, and 23 individuals expired prior to receiving OHT or LVAD implantation. Individuals were also excluded if they died during their hospital stay post-operatively (n = 2), required right ventricular assist device support postoperatively (n = 1), or required extracorporeal membrane oxygenation support postoperatively (n = 2). After accounting for this inclusion and exclusion criteria, 43 individuals met criteria for this study.

Given this is a retrospective study and the nature of the acute clinical setting, every individual who received a heart transplant or an LVAD did not always have all four of the examined preoperative measures recorded in the EMR. As a result, each preoperative measure was investigated individually based on available data.

Procedure

Study investigators reviewed charts from the EMR to determine eligibility for the study as described in the “study population” section above. Study data (demographic information, preoperative measures, and postoperative length of stay) for each included individual was obtained from the EMR and entered into the REDCap data collection form as available. Three study investigators completed all phases of screening and data collection. All entered data was verified by, at minimum, two investigators to ensure accuracy and consistency of data entry. Once data entry was complete and verified, data was analyzed as described in the “statistical analysis” section below.

Preoperative Measures

Data for all preoperative measures were obtained from documentation by licensed occupational therapists, licensed physical therapists, and licensed physical therapy assistants in the EMR. The scores for gait speed, Five Times Sit-to-Stand, and assistive device use were obtained at the time point closest to the date of decision for heart transplantation or LVAD implantation; most were recorded from the initial occupational therapy and physical therapy evaluations. Factors related to the acute care setting, including hemodynamic instability of the patient, time constraints of the setting, patient refusal to participate, medical lines preventing certain activities, and interruptions during OT and PT sessions for needed medical procedures, contributed to the inability to obtain all measures in one time point at the initial evaluation for every individual in this study. The functional levels used in the composite ADL score were based on the individual's functional performance at the time point closest to surgical intervention as available in the EMR.

Composite Activity of Daily Living (ADL) Level

This score was obtained by calculating the average level of assistance an individual needed to complete the following twelve functional activities: feeding, grooming, bathing, upper body dressing, lower body dressing, toileting hygiene, bed mobility, chair transfer, toilet transfer, tub transfer, ambulation, and sit to stand. Scores for each activity ranged from 0 to 7 (0 = does not occur/unable to complete, 1 = dependent, 2 = maximum assist, 3 = moderate assist, 4 = minimum assist, 5 = supervision, 6 = modified independent, 7 = independent). Although calculation of this composite ADL level was not formally validated, scores were assigned or inferred based on Functional Independence Measure (FIM) self-care assessment scoring and speak to an individual's overall ADL performance. While the FIM is a validated, reliable, and widely utilized tool (Kidd et al., 1995), witnessing all self-care activities does not always occur, nor is always feasible, during therapy evaluations in the acute care setting. Limitations to assessment of these activities includes the vast range of patients' functional levels in this study (ranging from unable to complete or total assistance to independent) and the nature of the acute care setting where hemodynamic instability and lines and devices often limit certain self-care activities (e.g., showering). For these reasons, formal use of the FIM was not possible in this study, and the composite ADL measure was developed instead. If a score for any activity was not recorded in the medical record and could not be obtained based on the OT or PT documentation, the score was not included in the average. This method is similar to that used in the Disability Assessment for Dementia, a disability assessment with reasonable psychometric properties (Sikkes et al., 2009), which uses a weighted percentage that excludes non applicable answers when items were unable to be scored (Sikkes et al., 2013).

Gait Speed

This measure represented self-selected walking speed determined through completion of a 3-meter or 4-meter walk test. The 4-meter walk test has consistently demonstrated reliability for short distance gait assessment (Cabanas-Valdés et al., 2023), and the 3-meter walk test offers a valid alternative for space-limited environments (Lyons et al., 2015). Patients were encouraged to walk at their usual gait speed and scores were then recorded in meters per second. The use of an assistive device was allowed during this assessment if required for the patient to safely ambulate.

Five Times Sit-to-Stand (5xSTS) Score

This measure represented lower extremity strength and power through the amount of time, recorded in seconds, required for an individual to stand up and sit down five consecutive times from a standard height chair (43-45 centimeters) with a backrest without physical assistance, an assistive device, or upper extremity support. Muñoz-Burmejo and colleagues (2021) determined through meta-analysis that the 5xSTS test is a reliable tool for measuring muscle strength, balance, and mobility in both healthy people and people with various pathologies.

In the current study, individuals' scores were categorized into the following three categories: (1) could not perform, (2) able to perform in greater than or equal to 15 seconds, and (3) able to perform in less than 15 seconds. Given the lack of evidence supporting a cutoff score for falls risk in individuals with heart failure, a score of 15 seconds was used between groups based on the highest cutoff scores determined in other populations (Buatois et al., 2010).

Assistive Device (AD) Use

This measure represented preoperative use of an AD for ambulation and/or transfers. An AD was defined as a cane, walker, wheelchair, or mechanical lift. It was recorded as a dichotomous variable, "yes" the individual used an AD or "no" the individual did not use an AD. AD use represents a component of an individual's independence with mobility and supports functional performance in individuals with impairments in balance, endurance, and/or lower extremity strength.

Outcome Measure

Postoperative Length of Stay

This measure was defined as the number of days from surgical intervention to discharge home. This included both the acute hospital length of stay and the acute rehabilitation unit length of stay if the individual required further rehabilitation prior to discharge home. For statistical analyses, this measure was log transformed to normalize the data.

Statistical Analysis

Data analysis was conducted using IBM SPSS Statistics Version 26 software. Linear regression analyses were performed to investigate the effect of each preoperative measure on the outcome measure, namely postoperative length of stay. Separate models were performed considering the varied sample sizes based on the data that was available in the EMR. Given separate models were obtained, Bonferroni adjustment was performed.

Results

Demographic Data

After examining which preoperative measures were available in the EMR, same sizes were determined. The following sample sizes were obtained for each preoperative measure: composite ADL level (n = 43), gait speed (n = 27), 5xSTS score (n = 30), and assistive device use (n = 42). The demographic data in Table 1 summarizes the demographic data of each individual sample.

Table 1

Demographics Stratified by Preoperative Measure

Variable	Composite activity of daily living level (*n* = 43)	Gait speed (*n* = 27)	5xSTS score (*n* = 30)	Assistive device use (*n* = 42)
Age (years)	57.72±9.02	56.78±9.29	57.73±9.53	57.33±8.76
Sex				
Male	37	24	26	36
Female	6	3	4	6
Intervention received				
Orthotopic heart transplantation	29	20	22	29
Left ventricular assist device	14	7	8	13
Body mass index (kg/m^2)	26.91±5.24	27.04±5.66	26.73±5.62	27.01±5.26
Ejection fraction (%)	19.72±5.90	18.48±5.80	19.07±5.65	19.36±5.46
Total acute hospital length of stay (days)	76.21±53.32	82.48±64.60	83.57±60.47	77.17±53.59
Total length of stay prior to discharge home (days) [a]	82.21±54.46	88.89±66.12	90.87±61.27	83.05±54.84

Note. Continuous data are presented as mean ± standard deviation and categorical data are presented as number.

[a] This refers to time from acute hospital admission to date of discharge home, which may have been directly from the acute care setting or from the acute rehabilitation unit.

Measure Scores

Model results indicate significant effects ($p < .0125$) after adjustment for multiple comparisons for three predictors (composite ADL level, 5xSTS score, and AD use) and non-significant evidence for gait speed ($p = .032$). See Table 2 for measure scores.

Table 2

Preoperative Measure Scores

Measure (sample size)	Mean	*SD*
Composite ADL level (*n = 43)*	4.73	1.92
Gait speed (*n = 27)*	0.70 m/s	0.29

Measure (sample size)	Number of individuals	Percentage of sample
5xSTS score (*n* = 30)		
Could not perform	12	40%
Performed in < 15 seconds	11	36.7%
Performed in ≥ 15 seconds	7	23.3%
AD use (*n* = 42)		
Yes	16	38.1%
No	26	61.9%

Model Effects

Table 3 summarizes scores for model effects. These results are consistent with the hypothesis that preoperative assessment of components of frailty would predict inpatient postoperative length of stay as defined in the methodology section. Increased independence with ADLs, increased lower extremity power as measured by 5xSTS score, and nonuse of an AD preoperatively predicted significantly shorter postoperative length of stays.

Table 3

Model Effects for Postoperative Length of Stay

Predictor	*B (SE)*	*F, p*	R^2
Composite ADL level	-0.06 (0.02)	(1,41) = 14.44, *p* <.001*	0.26
Gait speed	-0.28 (0.12)	(1,25) = 5.13, *p* = .032	0.17
5xSTS score	-0.15 (0.05)	(1,28) = 10.75, *p* = .003*	0.28
AD use	0.22 (0.07)	(1,40) = 10.47, *p* = .002*	0.21

*Significant with Bonferroni adjusted critical value = 0.0125

Composite ADL Level

The mean composite ADL level score for this study population was 4.73 with a standard deviation of 1.92. The percent of variation of composite ADL level on the postoperative length of stay outcome measure was observed to be 26%. The model effect of composite ADL level on postoperative length of stay was significant ($p < 0.001$) such that patients who were more independent with ADLs preoperatively were more likely to have shorter postoperative length of stays.

Gait Speed

The mean gait speed for this study population was 0.70 m/s with a standard deviation of 0.29 m/s. The percent of variation of gait speed on the postoperative length of stay outcome measure was observed to be 17%. The model effect of gait speed on postoperative length of stay was not significant after Bonferroni adjustment ($p = 0.032$).

5xSTS Score

For this study population, 11 individuals were able to perform the 5xSTS test in less than 15 seconds (36.7% of sample); 7 individuals were able to perform the 5xSTS test, however required 15 or more seconds to complete the assessment (23.3% of sample); and 12 individuals (40% of sample) were unable to complete the 5xSTS test despite attempting the assessment. The percent of variation of 5xSTS score on the postoperative length of stay outcome measure was observed to be 28%. The model effect of 5xSTS score on postoperative length of stay was significant (p = 0.003) such that patients who preoperatively demonstrated greater lower extremity power as measured by the 5xSTS test were more likely to have shorter postoperative length of stays.

AD Use

For this study population, 16 individuals (38.1% of sample) used an assistive device preoperatively and 26 individuals (61.9% of sample) did not use an assistive device preoperatively. The percent of variation of AD use on the postoperative length of stay outcome measure was observed to be 21%. The model effect of AD use on postoperative length of stay was significant (p = 0.002) such that individuals who did not use an assistive device preoperatively were more likely to have shorter postoperative length of stays.

Discussion

The principal finding of this study is that individuals with advanced heart failure who presented with higher preoperative functional independence, greater lower extremity power, and nonuse of an assistive device were more likely to have shorter inpatient postoperative length of stays following heart transplantation or LVAD implantation. Individuals with faster gait speeds also demonstrated shorter postoperative length of stays, however this finding was not statistically significant following Bonferroni adjustment. Given limited evidence of a validated frailty instrument for individuals with heart failure and the need for more objective and easily administered measures (Jha et al., 2015; McDonagh et al., 2018), the results in this study provide preliminary evidence for the value of ADL and mobility assessment, gait speed, 5xSTS score, and assistive device use, in assessing for frailty and predicting postoperative outcomes.

The connection between functional performance, frailty, and postoperative outcomes highlights the beneficial roles and valuable insight provided by OTs and PTs in heart transplant and LVAD selection committees. Because mobility and ADL performance may improve with OT and PT intervention (Adler & Malone, 2012; Arbesman & Mosley, 2012; Hand et al., 2011; Liu et al., 2018), functional performance and risk for frailty may be modifiable factors that can be addressed preoperatively to improve candidacy for and potential outcome of advanced HF therapy interventions. Recent research on prehabilitation in individuals listed for heart transplantation shows promise in improving functional status, increasing exercise capacity, improving quality of life, and decreasing anxiety (Gimeno-Santos et al., 2020). This idea supports the value of OTs and PTs as part of a multidisciplinary team evaluating candidacy for advanced heart failure therapies. OTs and PTs can provide evaluation and intervention during both the preoperative and postoperative periods to assist with evaluating candidacy, optimizing functional independence preoperatively, and improving postoperative outcomes.

Numerous limitations exist in this study. Due to its retrospective nature, the data recorded in the EMR were not always available for all investigated preoperative measures. Furthermore, the composite ADL level score was not formally validated and calculated an average based on available scores. This measure would benefit from further investigation into its psychometric properties. In this study, assistive device use was scored as a dichotomous variable; future research may further investigate the impact of type of assistive device used. Additionally, although cognitive and psychosocial measures may also be useful preoperative measures to investigate in the future, assessments measuring these areas were not standard practice at the study facility during the study period; therefore, they were inconsistently administered and unable to be included in data analysis for this study. Standard practice of gait speed assessment at the study facility also differed based on the available testing environment; it is possible that the difference in gait distances over which speed was measured may have impacted the results, however short distance gait assessment has been shown to be reliable and valid (Cabanas-Valdés et al., 2023; Lyons et al., 2015). Another limitation is that this was a small sample from a single academic medical center. Further, all objective measures may be inherently affected by an individual's heart failure symptoms, and it is still unclear at this time if frailty and functional performance measures are responsive to advanced HF interventions. Therefore, the results of this study should be taken as preliminary evidence to the potential benefit of these measures for use in contributing to evaluation of candidacy for advanced HF therapies.

Practice Implications

Frailty may impact patient outcomes following advanced heart failure interventions. Occupational and physical therapists are uniquely positioned to objectively assess and address functional capacity and identify characteristics of frailty including reduced functional independence, impaired cognition, and weakness (Giles et al., 2019; Uchmanowicz et al., 2014; Vitale & Uchmanowicz, 2019). Objective measures are valuable in occupational and physical therapy practice to support and drive interventions and determine rehab prognosis. Objective assessment tools help to quantify an individual's functional status to highlight physical or cognitive strengths or impairments, and to demonstrate the value of therapy services. Despite their value, the acute care setting often presents challenges in administering these types of assessments including ease of use, time, accessibility, and clinician knowledge (Tsai & Peterson, 2019). The increased frequency of use and breadth of assessments will allow clinicians to capture data, communicate more clearly within multidisciplinary teams, highlight areas of patient need, and demonstrate value to health systems and payers. Quantitative assessment measures are valuable in demonstrating need, change, and utility regardless of clinical setting or population.

Specific to the heart failure population, occupational and physical therapists bring value by intervening both preoperatively and postoperatively to improve an individual's functional status and address components of frailty identified by quantitative assessment data. Frailty and physical function scores for individuals with HF can advise preoperative treatment priorities, inform risk for surgical interventions, provide a means for communication with a multidisciplinary team, help predict postoperative outcomes, and decrease inpatient length of stays.

Further research is needed to investigate the generalizability of these findings to larger sample sizes over a broader geographic area, as well as to look at additional outcomes measures of postoperative success such as mortality rate and hospital readmission rate. Future investigation into components of frailty and functional performance targeting the HF population may be beneficial in predicting postoperative outcomes following advanced HF interventions. In future research, stepwise linear regression analyses of these various components may lend to determining the best predictive model of postoperative outcomes. Exploration of individual components of frailty provides the opportunity to create a composite frailty measure incorporating functional performance measures that are feasibly implemented in both inpatient and outpatient settings and performed by the rehabilitation team. Occupational therapists are uniquely positioned to assess and address components of frailty given expertise in a variety of areas including the cognitive, psychosocial, physical, and functional components of frailty. Studying the role of prehabilitation in optimizing preoperative functional status and the modifiability of frailty components prior to surgical intervention adds value to understanding the management of individuals with advanced heart failure and how occupational therapy and physical therapy can support and contribute to this.

Conclusion

Frailty is prevalent in individuals with HF and has been shown to predict postoperative outcomes, however little evidence supports the optimal way to assess frailty in this population. This study used a retrospective design to collect data for individuals with HF who underwent OHT or LVAD implantation over a three-year period and received preoperative OT and PT evaluations. Increased independence with ADLs, increased lower extremity power as measured by 5xSTS score, and nonuse of an AD preoperatively predicted significantly shorter postoperative inpatient length of stays. Preoperative assessment investigating functional performance measures is feasible in the advanced heart failure population and has potential to provide information that aids in predicting postoperative success following surgical advanced heart failure therapies. Future research is needed to generalize these findings and to investigate the impact of preoperative measures on other postoperative outcomes including mortality and readmission rates. Occupational therapy is well positioned to conduct frailty assessments for the heart failure population to promote patient outcomes and contribute to multidisciplinary teams.

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