Physical Therapy Management of the Patient with Heart Failure in the Home Setting

Practice Committee

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ABSTRACT

Background and Purpose

Home health physical therapists and physical therapist assistants are routinely involved in the management of patients with heart failure (HF). Previous work by Dias, in 2018, described the best practice for the physical therapy (PT) management of older adults with HF in the home setting. The work summarized various examination techniques as well as evidence supporting specific outcome measures for this population. Shoemaker, Dias, Lefebvre, Heick, Collins, in 2020, published a clinical practice guideline (CPG) for the PT management of patients with HF. While not focused on a specific practice setting, the CPG supported Dias' observation that there is a paucity of literature regarding patients who were recently hospitalized for HF, such as those commonly seen in home health. This work is not intended to be a systematic review; however, this work is intended to expand upon previously published information to provide physical therapists a digestible, thorough source of information regarding recommended evaluation and treatment practices for patients with HF in the home setting. This paper includes a translation of recent evidence and information for physical therapists practicing in the home health setting.

Conclusion

There are factors unique to PT management of the patient with HF in the home setting. The benefits, barriers, and rationale for implementing best practice strategies have been identified. Other factors addressed and commonly encountered in the home setting include patient engagement, medication reconciliation and side effects, and rehospitalization.

Key Words

physical therapy, heart failure, home health care, exercise, rehospitalization

INTRODUCTION

Physical therapists caring for patients in their home environment work with persons who have complex medical conditions. Heart failure (HF) is one such condition and physical therapists need to be aware of how caring for a patient with HF is different from other community-based patients. This paper describes physical therapy (PT) management of the patient with HF in the home setting.

In 2018, Dias published a thorough article summarizing best practice for PT management of older adults with HF in the home health setting.[1] Readers are referred to this article for a summary of the sensitivity and specificity of various examination techniques, as well as evidence supporting specific outcome measures in this population.

In 2020, Shoemaker, Dias, Lefebvre, Heick, and Collins published a clinical practice guideline (CPG) for the PT management of patients with HF (hereafter, "2020 CPG").[2] This CPG reinforced Dias' previous observation that there is a paucity of literature surrounding the safe and effective implementation of PT interventions in those patients who are seen in home health immediately following an acute HF exacerbation.

In 2018, the Practice Committee of the then American Physical Therapy Association (APTA) Home Health Section requested the development of a CPG or clinical guidance statement for HF management in the home and participants were solicited to serve as part of this effort. Upon review of the 2018 Dias article, the consensus among the assembled team of experienced home health practitioners was that this article gave valuable specifics for examination techniques and outcome measures but did not address rehospitalization risk-reduction strategies. Given the focus of payors, hospitals, providers, and patients on preventing rehospitalization, it was determined that further work was needed. With the publication of the 2020 CPG, which presented evidence on the effectiveness of rehabilitative interventions, but did not translate application of these interventions to the home setting and did not address strategies for hospital risk reduction, this team decided to proceed with a white paper. These two articles illuminated the need for a publication which would simplify application of published research to practice in the home, and clarify strategies by which physical therapists and physical therapist assistants

could help prevent the rehospitalization of patients with HF. This team determined that these needs would best be met through development and publication of a white paper.

Scope of Effort

Given that the 2020 CPG publication was not specific to a practice setting, this work translates the recommendations for targeted use in the home health population. In addition, this work includes guidance on how to implement these best practice strategies in the home health patient with HF, while addressing other themes commonly encountered in this setting such as preventing rehospitalization, medication reconciliation and side effects, and patient engagement.

The purpose of this white paper is to provide a digestible, accessible, thorough source of information for home health physical therapists and physical therapist assistants regarding recommended evaluation and treatment practices for patients with HF. Physical therapists should utilize the APTA Guide to Physical Therapist Practice[3] (Patient and Client Management section) and best available current evidence in patient management decisions.

Background

A person with HF has a complex progressive condition in which the heart muscle is unable to adequately pump enough blood to meet oxygen demand. Compensation occurs in several ways: the heart enlarges, heart muscle mass increases, and the heart rate increases.[4] In addition, vasoconstriction leads to decreased blood supply to other organs.[4]

Associated signs and symptoms of HF include dyspnea, edema, fatigue, and activity intolerance; however, not all patients have this presentation. Heart failure symptoms are mostly due to left ventricular dysfunction with diastolic and systolic dysfunction often occurring simultaneously.[5]

The New York Heart Association (NYHA) functional classification provides guidance to assess severity of symptoms and the impact on physical activity.[6,7] The overview is in Figure 1:

FIGURE 1. Classification of functional capacity and objective assessment

Class	Functional Capacity
I	Patients with cardiac disease but without resulting limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, dyspnea, or anginal pain.
II	Patients with cardiac disease resulting in slight limitation of physical activity. They are comfortable at rest. Ordinary physical activity results in fatigue, palpitation, dyspnea, or anginal pain.
III	Patients with cardiac disease resulting in marked limitation of physical activity. They are comfortable at rest. Less than ordinary activity causes fatigue, palpitation, dyspnea, or anginal pain.
IV	Patients with cardiac disease resulting in inability to carry on any physical activity without discomfort. Symptoms of heart failure or the anginal syndrome may be present even at rest. If any physical activity is undertaken, discomfort is increased.
Class	**Objective Assessment**
A	No objective evidence of cardiovascular disease.
B	Objective evidence of minimal cardiovascular disease.
C	Objective evidence of moderately severe cardiovascular disease.
D	Objective evidence of severe cardiovascular disease.

The NYHA classification can vary from visit to visit and over time, and a patient could progress into a different classification, for example – from III to I and A to D. The NYHA and the American College of Cardiology with the American Heart Association (AHA) deviate on the details of movement within the system.

Home health clinicians need to closely monitor symptoms to determine appropriate intervention and have an awareness of progression within the classification system. It is important for clinicians to know that this is a functional classification system. While the NYHA classification does not predict outcomes, it can be used as a common language for care providers.

An important tool for diagnosing HF is echocardiography.[8] Assessment of heart chambers, valve function, and ejection fraction (EF) can be determined with this test. Normal EF is 50-70%.[9] An EF of less than 40% occurs in patients with heart failure with reduced ejection fraction (HFrEF) because the left ventricle is not pumping normally.[10] Preserved ejection fraction (HFpEF) is about 50% in patients diagnosed with HF.[5] Ejection fraction does not dictate functional status; however, it is used in Medicare's determination as to whether patients qualify for outpatient cardiac rehabilitation. Currently, Medicare reimburses outpatient cardiac rehabilitation only for patients with HFrEF, not HFpEF.[10]

Home health care occupies a large role in the American health care delivery system. Although HF can affect the young, the average age of a person with HF is 77 years.[12,13] Use of the home health care benefit under Medicare has grown rapidly in terms of volume of users, from 2.5 million in 2002 to 62.9 million in 2018 according to the US Centers for Medicare and Medicaid Services (CMS) Chronic Conditions Data Warehouse.[14] In 2018, 8.5% (5.4 million) of those 62.9 million Medicare beneficiaries had a diagnosis of HF. Of those 5.4 million Medicare beneficiaries with HF in 2018,[13] 29% (1.5 million) received home health care.[15] The most common post-acute care service for patients hospitalized with heart failure is home health care.[16] Patients with HF have the highest rehospitalization rate of all adult patient groups with nearly 1 in 4 being readmitted within 30 days of discharge at an estimated annual cost of more than $24.3 billion.[17] Similarly, home health patients with a diagnosis of HF also have the highest hospital readmission rate.[16–20]

Effective interventions are urgently needed for HF[16–20] as is highlighted by the highest readmission rate and the largest total cost of care among all conditions.[17]

In the setting of an aging population, with an increasing prevalence of HF diagnosis and the resulting increase in hospital readmission, there is a growing interest in reducing the hospital readmission rates of persons with HF.[22] The outcomes and cost of care for Medicare beneficiaries with a diagnosis of HF are driving new regulations as demonstrated in the Hospital Readmissions Reduction Program (HRRP) and the Value Based Purchasing Programs (VBP).[23] Heart failure readmission is increasingly being used as a quality metric, a basis for hospital and home health care reimbursement, and an outcome measure in HF clinical trials.[24]

Home health agencies and hospitals are setting goals to improve functional outcomes to reduce the rates of rehospitalization of patients with HF.[23] Some research has indicated that many of the rehospitalizations of home health recipients with HF are avoidable. Madigan et al[25] reported that 34% of 30-day hospital readmissions of home care patients for HF were considered potentially avoidable using the Agency for Healthcare Research and Quality Prevention Quality Indicators (AHRQ PQI)[26] measure for potentially avoidable hospitalizations. Some hospital readmissions are not linked to underlying disease

progression but may be linked to impaired functional status related to decreased physiological capacity.[27,28] In a 2013 article, the American Heart Association advised that addressing functional capacity in the post-discharge environment has a role in the prevention of rehospitalization.[29]

Physical therapists in home health have an important role in the evaluation and management of patients with HF. It is our conviction that home health practice presents physical therapists with a strategic opportunity to partner with their patients to keep the patients' functional goals within their home environment at the center of their home PT interventions. As healthcare providers work towards reducing hospital readmissions the patient's goals must be at the center of the plan of care with an emphasis on engaging the patient in improving their function within their environment, The concepts of patient-centered care, patient engagement, and reduction of hospital readmissions converge in effective home PT for the patient with HF.

MEDICATION RECONCILIATION

Patients with HF are commonly referred for PT as part of a multidisciplinary referral for home health care following hospitalization. While navigating the path of improving health and restoring function, a primary goal of care is to cultivate the patient's medical stability to minimize rehospitalization. In addition to regaining functional skills, the physical therapist has a role to play in medication reconciliation to protect the patient from the harms of an adverse drug reaction (ADR), a common cause of hospitalization and death.[30] Although an aspect of care many physical therapists would prefer to leave to their nursing counterparts, the expectation and necessity of physical therapists' involvement in medication management has long been acknowledged by the APTA,[31–33] CMS,[34] and The Joint Commission (TJC).[35] APTA Academy of Home Health has a member-access webinar with guidance on navigating the variations of state practice acts as they pertain to physical therapists' involvement in medication reconciliation.[36]

Transitions in care are time frames that are particularly prone to medication errors.[37] Older Americans are taking increasing numbers of medications.[38] Health literacy may be poor among aging adults which results in increased likelihood of errors.[39] The US Food and Drug Administration estimates

that serious ADRs occur more than 2 million times annually in the United States, resulting in more than 100,000 deaths.[30] Medication reconciliation initiatives have demonstrated a reduction in ADRs.[40]

Medication reconciliation includes the visualization of each medication a patient uses, with verification against what the patient should be using per the medication list from the patient's hospital stay or a recent physician visit.[34] Clinicians must notify physicians of discrepancies, duplications, and potential interactions so that they can resolve them. While full medication reconciliation is required at the start of care, both CMS and TJC medication safety initiatives require review of the medication regimen throughout the episode of care to identify and reduce medication risks.[34,35] The physical therapist can accomplish efficient medication review through a brief series of questions at the start of each visit, and observation throughout the visit. In the spirit of providing tools that clinicians can readily apply, a helpful mnemonic (Figure 2) is RALPh[41], which stands for:

FIGURE 2: Medication reconciliation pneumonic RALPh.

R	**R**eview medication profile against medications in home
A	**A**sk follow-up questions about common over-the-counter medications (e.g. NSAIDs, laxatives, vitamins, supplements) as well as drugs which frequently change dosage such as insulin, diuretics and anticoagulants
L	**L**ook around the treatment areas and ask about visible medications to catch omissions
P	**P**rint a current copy of the patient's medication list for their reference and ask them to double check it
h	To avoid re**h**ospitalizations

By routinely participating in medication reconciliation with appropriate follow up with the physician to resolve discrepancies, duplications and interactions, the home health physical therapist can help prevent avoidable rehospitalizations related to medication issues.

FALL RISK

In addition to the hospitalization risk posed by medication errors, medications such as antihypertensives and beta-blockers, which are commonly prescribed to patients with HF, are associated with an increased risk of falls.[42]

Patients over the age of 65 years with HF are at increased risk of falling in comparison to similar patients that do not have HF. According to Lee et al, among the most significant factors associated with increased fall risk in this population were patient-reported muscle weakness, difficulty performing activities of daily living (ADL) and instrumental activities of daily living (IADL), impaired mobility, and urinary incontinence.[43] Physical therapy intervention can address all these factors.

There are significant morbidity and mortality implications associated with this increase in fall risk. Patients who have an elevated fall risk score, have higher 30-day and 1-year hospital readmission and mortality rates in comparison to patients with lower fall risk scores.[44] As Manemann et al concludes, the prevalence of falls contributes to patient harm as well as rehospitalization in the HF population.[43] While use of a standardized fall risk assessment is a Medicare requirement[34p.17] for home health admissions, physical therapists should choose one or more measures that align with the individual patient needs and impairments. The APTA Academy of Home Health Practice Committee has published Home Health Toolbox II: Tests & Measures for Use in the Home, which includes a variety of outcome measures to assess patient fall risk.[45] This resource is free-access for APTA Academy of Home Health members.

Clinicians should also target interventions to address fall risk toward patient-specific limitations. Factors that commonly increase fall risk in this population and that PT can address include, but are not limited to, muscle weakness, timing of voiding, lack of adaptive equipment, and home setup.

ASSESSMENT

Patient assessment is an important part of every home health visit to determine appropriateness of PT treatment as well as to identify signs or symptoms of an impending exacerbation. This section will outline recommended assessment techniques for the home health physical therapist working with a patient who has HF.

Research has demonstrated that physical therapists often do not consistently assess vital signs in the outpatient setting, even in patients with known cardiovascular risk factors.[46] The Centers for Medicare & Medicaid Services does not have a specific requirement for the assessment of vital signs in the home. The Medicare Benefit Policy Manual does, however, state that clinicians should document physical

examination components relevant to that patient encounter, in addition to the patient's response to treatment.[47] While many agencies have a requirement for assessing vital signs at least once per visit, dynamic monitoring of vital signs, including heart rate (HR), blood pressure (BP), respiratory rate (RR), and peripheral oxygen saturation (SpO2), is essential in patients who have HF.[48(p111)] Clinicians should assess heart rate, BP, RR, and SpO_2 at rest, during exercise, and while the patient is recovering from exercise. Some situations may justify the measurement of body temperature as an additional vital sign, based upon signs or symptoms of infection, presence of an open wound, and/or institutional guidelines. Some changes in vital signs, such as a drop in systolic BP, HR, or SpO_2, can be indicative of decompensation and warrant the cessation of exercise.

Patients with HF have an increased incidence of dysrhythmias,[49] and these may only become apparent during exertion. Pulse oximetry may not detect abnormal rhythms and it is therefore important for the clinician to manually palpate the patient's pulse rather than only use a pulse oximeter to assess heart rate and pulse regularity. The clinician should monitor electrocardiogram data, if available, though this is not common in the home health setting.

Errors are common during BP assessment by healthcare practitioners,[50] and these errors can result in the physical therapist or physical therapist assistant under- or over-dosing exercise. We refer clinicians to APTA Academy of Cardiovascular and Pulmonary Physical Therapy's free-access webpage #VitalsareVITAL for detailed information regarding proper technique to obtain an accurate BP measurement.[51] One of the most common and easily remedied errors clinicians make is use of an improperly-sized cuff.[52] The American Heart Association recommends that the bladder length cover 80% of the patient's arm circumference, and that the bladder width be at least 40% of the arm circumference.[53]

Medications commonly prescribed to patients who have HF can have rate-altering effects.[48(p453)] Primary among these are beta-blockers, which decrease both resting and exercise HR to reduce myocardial oxygen demand.[47(p453)] Because of these effects, HR may not be the best indicator of workload in patients who are taking these medications, and clinicians should additionally use a subjective assessment such as the rate of perceived exertion (RPE) scale (6-20 or 0-10).[47(p453)] Heart rate response to

exertion can still be an indicator of activity tolerance and should be monitored even in the setting of these medications; however, the clinician should realize that the maximal attainable HR may be lower than anticipated.[47(p453)]

In addition to accurate and frequent assessment of vital signs and subjective level of exertion, it is imperative that clinicians who are treating patients with HF be comfortable with the assessment of heart and lung sounds. Development or worsening of abnormal heart sounds, especially a third heart sound (S3), and/or bibasilar pulmonary crackles is an indicator of decompensation and warrants modification or termination of the session as well as communication with the patient's physician.[47(p98,574)] Due to the need for clinical decision-making based upon auscultation findings, clinicians should monitor heart and lung sounds at rest, during exercise, and following exercise. Clinicians should additionally monitor for jugular venous distention (JVD), as the development of or worsening of this may also indicate decompensation.[47(p516)]

We recognize that many clinicians are not comfortable with heart and lung auscultation. There are many resources through APTA and other continuing education providers available to them to review basic cardiopulmonary assessment techniques. In particular, the Journal of Teaching and Learning Resources has free-access articles with supporting images and sound files that can be used to increase familiarity and competence with this skill.[54,55]

Exercise training, which we will describe in subsequent sections, is recommended and has been found to be beneficial in patients who have chronic, compensated HF.[2] It is important for home health clinicians to evaluate signs and symptoms of HF at the start of every visit to determine whether the patient is in a compensated or a decompensated state. Common signs and symptoms of decompensation include: edema, fatigue, dyspnea, chest pain, pulmonary crackles, JVD, S3, fourth heart sound (S4), and weight gain.[2] When a patient's heart failure is no longer compensated, PT is not indicated, and the clinician should instead refer the patient for further medical evaluation and treatment.[2] In the home health setting, clinicians may be the first to recognize and report signs and symptoms of decompensation, perhaps leading to the avoidance of an unnecessary hospitalization. Compensation status is dynamic and can

change throughout a treatment session, so it is vital that clinicians monitor the patient every visit, throughout the session.

Patient self-management is an essential part of living with HF and can help patients avoid exacerbations and hospitalizations. Clinicians who are seeing patients in the home setting have a unique opportunity to reinforce this education in addition to identifying any potential barriers to patient engagement. For example, patients may understand that they should weigh themselves daily; however, they may be hesitant to do so due to weakness, impaired balance, and/or fear of falling. Physical therapists should prioritize and address these patient-specific limitations, while also suggesting modifications to the home set-up or location of the scale for daily weights to improve safety and engagement with this vital component of self-monitoring. They should instruct patients in assessing and stratifying themselves into green, yellow, or red zones each day to qualify their current health status and trends. Clinicians should educate patients on how to determine their current zone, the implications of each zone, and clear action steps for them to take including finding and using relevant phone numbers. They should do this using home health agency-specific guidelines or the American Heart Association's Symptom Tracker.[56]

MOTIVATIONAL INTERVIEWING

Reducing hospital readmissions for HF is an elusive goal. Some recent research, which we describe below, has explored if motivational interviewing (MI) techniques have an impact on outcomes such as quality of life (QoL), exercise tolerance, proficiency in chronic disease management, self-care behaviors (SCBs), and rehospitalization rates for persons with HF. Motivational interviewing is a person-centered communication skill that has been used to address the challenge of helping patients engage in health behavior changes for chronic disease management and prevention.[57] Motivational interviewing techniques promote collaboration with patients, support autonomy in health-related goal setting and decision-making processes, and promote the development of a non-judgmental relationship between the care provider and the patient. The goal is to improve disease management, modify disease-related risk factors, prevent hospital readmission, and improve outcomes.

The research findings concerning the use of MI in HF management are encouraging. Motivational interviewing has been linked to improved self-care management behaviors.[58] The result of improved SCBs was noted to be longer event-free survival among symptomatic HF patients equivalent to that of symptom-free HF patients.[59] In 2020, Poudel et al conducted a modified Cochrane review on the use of MI to impact HF outcomes.[57] This research linked improved SCBs, through the use of MI, and reduced hospital readmission as well as improved patient reported QoL. Riegel et al have also postulated that MI could reduce the rates of hospital readmission and improve long-term outcomes of HF patients.[60] The investigators linked reported improved outcomes and reduced hospital readmissions to MI's effect on medication adherence, SCBs, and physical activity.[61] Finally, Vellone et al found that the effect of MI on SCBs extended to caregivers as well as patients.[62]

Motivational interviewing is another beneficial tool in the toolbox for home health clinicians when selecting HF PT interventions. Motivational interviewing holds promise in improving patients' subjective experience, including their sense of control over their disease. Even in the absence of objective changes in health status, increasing the autonomy of patients with HF can have a powerful and personally meaningful impact on their QoL.[63]

INTERDISCIPLINARY COMMUNICATION

Timely and effective interdisciplinary communication can result in more effective and efficient care of patients with HF.[64] Communication tools used with the patient, caregiver, and interdisciplinary team should be designed to promote communication with minimal effort. For example, in some agencies, the electronic medical record (EMR) may allow the development of shared interventions which multiple home health disciplines utilize. These interventions could include zone tools, patient education, and case communication notes. All team members could easily see the patient's reported status on the zone tool from visits that other disciplines provide. Case communication notes could be directed to specific team members or groups of team members and become part of the official medical record. If this type of interdisciplinary communication strategy is not currently available at the reader's agency, we recommend that the reader engage management, IT, or the appropriate party to propose implementation.

Patients and their caregivers, as well as home health clinicians, also utilize communication tools in the patient's home. These tools promote communication and confirm the patient's and caregiver's comprehension and implementation of critical chronic disease management skills and processes. Examples of these tools include a visit calendar, in-home record of vital signs and home exercise program (HEP) performance, home medication management sheet, and RPE exertion tool.

Virtual interdisciplinary case conferences are also useful for communication concerning the progress or obstacles to progress for home health patients with HF. In this type of scenario, team members can call a brief team conference in which participants discuss disease management challenges, hospital readmission risks, and discharge planning. After a conference, a case conference note should be entered into the medical record to summarize the discussion.

PATIENT EDUCATION

Physical therapists and physical therapist assistants should utilize a comprehensive approach in patient management. The management of co-morbidities and associated risk factors of HF will also decrease the symptoms and improve the function of the patient. Common comorbidities found in this population include hypertension, diabetes, smoking and alcohol use history, kidney failure, and chronic obstructive pulmonary disease (COPD). Patient education is an integral component of a comprehensive approach to patient management. Education should include, but is not limited to (Figure 3):

FIGURE 3: Components of patient education

- An overview of the disease process
- The terminology related to HF including the NYHA classification system
- Self-monitoring of signs and symptoms including weight gain, orthopnea, and activity tolerance
- Maintaining the recommended fluid intake and decreasing sodium intake
- Use of a stop-light tool to focus patients and caregivers on when to take action to address symptoms to prevent rehospitalization
- Benefits of activity and exercise
- Exercise prescription dosing and symptoms response to exercise and functional activities
- Referral to outpatient cardiac rehabilitation, when appropriate, to assure the best long-term outcomes.

Most patients referred to PT following an acute inpatient stay for HF also have a nursing referral. Patient education is a team effort. Nursing may take the lead role in educating on the disease process; however, the physical therapist and physical therapist assistant must be prepared to reinforce those concepts while instructing on the rehabilitation-specific education aspects. Clarifying educational roles and responsibilities within the interdisciplinary team will ensure all needed information is covered without gaps resulting from assumptions.

Acknowledging the team approach may be critical to helping novice clinicians avoid feeling overwhelmed by the educational needs if they were expecting to focus treatment sessions on physical functioning.

AEROBIC EXERCISE TESTING AND PRESCRIPTION

Aerobic exercise training is a mainstay of treatment in the patient with HF. The 2019 joint statement from the American Association of Cardiovascular and Pulmonary Rehabilitation/American College of Cardiology Foundation/American Heart Association Task Force (AACVPR/ACC/AHA) concludes that home-based cardiac rehabilitation is a feasible option for those patients who are unable to attend a community-based program, and that benefits the patient experiences are likely to be similar.[65] The home environment can provide unique challenges to implementing an effective exercise program, though offering this service in the home may in theory lead to improved patient participation in a historically under-utilized highly beneficial program. In this section, we will discuss exercise testing recommendations specific to the home environment. We will additionally reiterate the aerobic exercise recommendations from the 2020 CPG and describe how they apply to the home health patient.

To safely and effectively prescribe exercise, clinicians should first evaluate a patient's exercise capacity using a standardized exercise test. However, in a recent survey conducted among members of the APTA Academies of Home Health and Cardiovascular and Pulmonary Physical therapy, only 30% of respondents reported that they actually assess cardiorespiratory fitness in patients who have cardiovascular diagnoses.[65] While environmental challenges may be seen as barriers to performing an exercise test, there are several different tests that can be performed safely, easily, and within the confines

of limited space. Some specific recommendations include: 6-minute walk test (6MWT), 2-minute walk test (2MWT), and 2-minute step test (2MST). While the 2MWT and 6MWT have historically been performed with a straight walking path of at least 100 feet, modifying this distance for the given space constraints and/or using a circular path within the patient's home can still provide valuable information. Clinicians should recognize that when using a shorter path, the distance traversed may be slightly less.[66] The reader can find instructions for performing the 2MWT and 6MWT on websites like Shirley Ryan AbilityLab's Rehabilitation Measures.[67,68]

For those patients who are unable to stand or ambulate, informally assessing exercise capacity through a monitored and timed test of seated marching, wheelchair propulsion, unsupported sitting tolerance, etc. can still provide valuable information and show progression with regards to aerobic capacity when cardiovascular fitness level is contributing to the patient's limitations. Performing an exercise test while monitoring vitals, heart and lung sounds, and patient symptoms before, during, and after is an essential component of formulating a safe and effective exercise prescription. Clinicians can use a subjective assessment such as the Duke Activity Status Index (DASI),[70] which correlates with peak VO_2, instead for those patients they are seeing via telehealth or who are unable to participate in an exercise test.

Given the preponderance of high-quality evidence available, the 2020 CPG used strong language in regard to aerobic exercise prescription in the HF population, stating that physical therapists "must" do this.[2] The recommended parameters from this CPG are in figure 4:

FIGURE 4: Aerobic exercise prescription recommendations

Time	20-60 minutes
Frequency	3-5 times/week
Duration	≥ 8-12 weeks
Intensity	50-90% peak VO_2 or peak effort

This recommendation is specifically in relation to those patients who have stable, NYHA class II or III HF. Noting that the duration of an exercise program should be at least 2-3 months in length and that benefits are not maintained indefinitely in the absence of continued exercise, motivational interviewing, and patient engagement in determining the mode of exercise are essential. While the minimum time duration recommended is 20 minutes, patients should be encouraged that "something is better than nothing," and with more functionally impaired patients this may be a goal to work towards rather than a starting point. Interval training while gradually reducing rest time and increasing work time can be an effective strategy for patients with lower tolerance.

It is important for the home health therapist to prescribe both aerobic and resistance training at an effective intensity level. Rate of perceived exertion is one way to gauge intensity, and an RPE of 3-7/10 or 12-17/20 can be targeted to achieve the desired levels of effort. Using RPE as the intensity indicator does not negate the need for ongoing objective clinical assessment to assist in decision-making. Clinicians should use the results of exercise testing to formulate individualized and effective exercise prescriptions for patients. The reader is referred to the article by Dias et al for a detailed table summarizing how to formulate an exercise prescription of appropriate intensity based upon the results of various exercise tests.[71]

There is additionally some evidence pointing to the benefits of high-intensity (> 90% peak VO_2) interval training (HIIT) in the HF population; however, results of a baseline maximal cardiopulmonary exercise test (CPET) may be needed prior to safely implementing this.[2] Based upon current recommendations, in addition to the fact that CPET results and electrocardiogram monitoring are not routinely available in the home health setting, we do not currently recommend the use of HIIT with most home health patients who have HF.

MUSCLE STRENGTHENING

Many patients with heart failure return home following acute hospitalization with weakness; however, improved strength and power result in improved functional independence and reduced falls.[72] Strength training can be effectively and safely accomplished among the elderly at home by training at 60-

80% of their 1 rep max, which equates to an intensity that results in fatigue in 8-12 repetitions.[73,74] When the physical therapist determines that strength training is indicated, body weight exercises are particularly useful in this population as they require no additional equipment, translate directly to function, and are easily and safely performed in the home.

Exercise prescription is always determined by the physical therapist based on examination and evaluation findings. Some examples of exercises a physical therapist might include to strengthen a patient with heart failure include standing heel raises, toe raises, hip abduction, hip extension and marches, and seated sit-stand transfers focusing on speed and power.[75,76] These exercises can be progressed by reducing assistance of the upper extremities or adding resistance and are easily performed in the home. Among the very elderly, hip extensor range and strength appear to be predictive of function and as such may be particularly important to address.[77]

For more severely deconditioned patients, bridges, side-lying hip abduction, and straight leg raises can be performed in place of standing exercise. Some examples of upper extremity strengthening exercises, if indicated, include seated press ups in a chair with arms, arm curls, and overhead presses using a light hand weight. Upper extremity exercises also can be progressed by increasing the weight. The core musculature is activated when the weight is offset. If no hand weights are available, a laundry detergent jug can be easily substituted, and the weight adjusted by progressively increasing or decreasing the amount of liquid in it.

The focus in all areas of strengthening is to correctly dose the exercise intensity based on the findings of the assessment and the response of the patient to the treatment. The dose should be at a level which when performed with perfect technique, meaning the patient can stop the motion instantly or change directions without loss of control, can only be performed for 8-12 repetitions, which correlates to 60-80% of the patient's 1-repetition maximum.[73,78–80] Strength training benefit is seen with weight as low as 20-50% of the 1-repetition maximum performed for higher repetitions.[72,77–79] As with all aspects of therapy, the most effective care is that which results not only in exercise during treatment sessions, but also trains the patient to follow through with a home program daily between home PT sessions.

NEUROMUSCULAR ELECTRICAL STIMULATION

A biophysical agent, such as neuromuscular electrical stimulation (NMES), should be considered as an adjunct to other physical therapy interventions to improve muscle weakness when treating patients with heart failure. The small size of NMES units makes utilization of this intervention in the home care setting feasible.

The efficacy of NMES utilization for lower extremity musculature has been supported in persons with stable HF.[81] Some work is beginning to demonstrate evidence that use of NMES with lower extremity muscle weakness is beneficial in persons with decompensated HF.[82] While incorporating physical activity in the plan of care is the ultimate goal, NMES can be used as part of a home program especially in patients who are unable to perform other exercise due to comorbidities.

Other considerations for inclusion in the PT plan of care involve patient preference, patient tolerance, presence of pacemaker, implantable cardioverter defibrillator, and availability of necessary equipment.

INSPIRATORY MUSCLE TRAINING

Patients with heart failure typically demonstrate decreased inspiratory muscle endurance as seen with symptoms of dyspnea and fatigue.[83] The benefits of inspiratory muscle training (IMT) include, but are not limited to, increased pulmonary function, improved level of dyspnea, and improved QoL.[82]

While physical therapists and physical therapist assistants practicing in the home routinely see incentive spirometers provided in the acute care setting as pneumonia prophylaxis, home health clinicians may be less familiar with IMT. Unlike incentive spirometers which provide visual feedback on the volume of air inhaled, IMT devices provide a constant resistance to inspiration, regardless of the rate of flow, providing resistance training for inspiratory muscles. Although perhaps less broadly prevalent in the home, through strengthening of the inspiratory musculature IMT has demonstrated effectiveness at improving exercise tolerance and QoL.[2] Inspiratory muscle training alone has proven beneficial on 6MWT performance,[84] and as such may be worth considering for patients who are unwilling or unable to participate in aerobic exercise training. For patients willing to purchase and use an IMT device, benefits

have been demonstrated both through shorter high intensity training sessions (>60% maximal inspiratory pressure) and longer low intensity training sessions (>30% maximal inspiratory pressure). When the physical therapist determines that IMT is appropriate, 2-3 exercise sessions per week have produced measurable gains, with the greatest benefits seen when IMT continues for 12 weeks.[85]

More than any other practice setting, the home setting requires physical therapists and physical therapist assistants to make use of what is available in the home when considering interventions. Although IMT devices have been found to be effective, relatively few patients have them. Given the aim of this paper of improving practice by facilitating application of evidence, we should acknowledge the potential role of incentive spirometry (IS) in inspiratory muscle strengthening. As stated previously, IMT achieves inspiratory muscle strengthening by providing a constant resistance to inspiration while IS provides only visual feedback regarding the volume and rate of air inhaled. However, Paiva et al demonstrated that an IS protocol of 20 inspirations from residual volume to total lung capacity performed at a rate of 1 inspiration per minute, twice daily on three non-consecutive days per week for 30 days, resulted in inspiratory muscle strength gains in healthy and sedentary 18-40 year old non-smoking women.[86] Although these gains were smaller than those demonstrated in the IMT group, the IS group's gains were statistically significant compared to controls, and only statistically smaller than the IMT group at the 30 day mark. While research demonstrates that IMT devices are the superior of the two, given that IS may also be used to produce inspiratory muscle strengthening and the IS device is more prevalent in the home, clinicians should utilize IS when IMT devices are not available as both provide significant benefit when compared to controls.[85]

SUMMARY

The physical therapy management in the home of a person with HF requires collaboration with the patient and caregivers to ensure the best possible outcomes. The primary purpose of this paper is to provide home health physical therapists and physical therapist assistants a source of information regarding recommended assessment and intervention strategies in caring for a person with HF.

This paper synthesizes previously published information in addition to the unique challenges and opportunities faced by home health patients and clinicians to translate evidence and improve the overall care of patients with heart failure who are receiving physical therapy in their homes.

The home health environment provides unique challenges as well as opportunities for patient management. Through frequent assessment of signs/symptoms and vital signs, medication reconciliation, patient education, and assessment of fall risk, the home health physical therapist or physical therapist assistant plays a key role in the reduction of adverse events including rehospitalizations, an outcome which all stakeholders are interested in achieving.

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