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Patient and Caregiver Attitudes and Practices of Exercise in Candidates Listed for Liver Transplantation

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Abstract

BACKGROUND: Impaired physical capacity increases peri-liver transplant complications. Patient perceptions regarding exercise prior to transplantation are not known.

AIMS : This study aimed to assess patient and caregiver activity levels, perceptions of willingness to exercise, and of provider advice.

METHODS: Consecutive patients listed for liver transplant and caregivers presenting for routine outpatient visits were evaluated over a three month interval. Anonymous surveys adapted to patients and caregivers addressed the importance and safety of exercise, type and duration of exercise performed, barriers, willingness to wear a monitoring device, and perceived provider recommendations. Responses were logged on a Likert scale from 1–5.

RESULTS: Three-hundred-sixty-eight responses were received. Most participants perceived exercise as important. Patients exercised 3 times per week for 30 minutes. Eighty percent endorsed

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Author Contributions:

J. Lai, M. Dunn, A. Montano-Loza, M. Kappus, and E. Carey designed the study, collected the data and provided significant input regarding manuscript composition. D. Chascsa analyzed the data and composed the manuscript. S. Dasarathy assisted in study design and provided significant input regarding manuscript composition.

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walking (median response 2-agree; IQR 1–2). Most did not jog, swim, cycle or strength-train. Fatigue, reported by 70%, was the major barrier (2, IQR 1–3). Over 90% of caregivers endorsed exercise as important (1-strongly agree, IQR 1–2), and encouraged exercise (median response 2, IQR 1–2). Over 60% of patients (median response 2, IQR 1–3) and caregivers (median response 2, IQR 2–3) felt providers encouraged exercise.

CONCLUSIONS: Patients and caregivers are willing to exercise to optimize physical fitness prior to liver transplantation.

Keywords

Physical Capacity; Exercise; Liver Transplantation; Patient; Caregiver

Introduction:

Impaired physical capacity, expressed functionally as frailty or anatomically as sarcopenia, is increasingly appreciated as a cardinal manifestation of advanced cirrhosis and a key risk factor for death and morbidity before and after liver transplant (LT).[1–12] Under-appreciation of its clinical consequences, including pre-transplant waitlist mortality (independent of MELD score), increased infectious-related mortality, reduced quality of life, and risk of prolonged hospitalization, translates into a missed opportunity to effectively counsel patients.[13–16] Little is known about patients' understanding about this important and complex topic. Whether patients and their caregivers appreciate the significant implications of impaired functional status on transplant outcomes is not known.[17] Moreover, willingness to exercise, perceptions on the safety of exercise, and perceptions of provider advice have not been evaluated.

While consensus opinion is that improved fitness prior to LT is beneficial and may translate into improved post-LT outcomes, there are no proven strategies to achieve and sustain a desirable level of fitness, and no consensus on what that level should be.[18–20] Recommendations regarding exercise are mixed, in part due to concern for the theoretical risk of precipitating the complications of portal hypertension *(e.g.,* variceal bleeding) through exercise.[21,22] Intervention trials aimed at reversing or preventing the decline in functional status are needed, and a baseline understanding of patient and caregiver perceptions would be important for designing appropriate interventions.

Due to the clinical severity of advanced cirrhosis and the importance of adherence to treatment regimens, a designated caregiver is required for transplant candidates. Involvement of caregivers is critical for promoting adherence to any medical recommendation. Therefore, understanding the perceptions towards fitness in this population is important.

The Fitness, Life Enhancement, and Exercise in Transplantation (FLEXIT) Consortium includes investigators in 6 North American transplant centers whose long term goals are to define the natural course of and relationships among muscle loss, frailty, functional status and outcomes in advanced liver disease. We are focused on patients awaiting LT in order to improve their survival, health and quality of life with activity based interventions. To inform such interventions, we designed the present study to assess baseline self-perceived patient

and caregiver activity levels, willingness to exercise, perceptions on the safety of exercise, and impressions of provider advice focused on the importance and overall safety of exercise in the pre-transplant setting.

Methods:

This study was conducted within the FLEXIT Consortium centers which include: University of Alberta, Duke University, Mayo Clinic in Arizona, University of Pittsburgh, Cleveland Clinic, and University of California, San Francisco. Clinical research information is shared between these centers under a multi-institutional data use agreement. Consecutive patients with end-stage liver disease who were listed for LT and presented for routine scheduled outpatient evaluation as well as caregivers of these patients were administered anonymous English language paper-based surveys during the clinical encounter over a three month period from May 1 through July 31, 2016. The study interval was chosen to prevent sampling the same patient or caregiver more than once. All completed surveys were included for analysis. Incomplete surveys were included with unanswered questions omitted from data analysis. Data were omitted if the patient or caregiver intended response could not be determined.

The first survey was aimed at patients, who were asked to circle one response per question on a Likert scale of 1–5; ranging from strongly disagree (5), disagree (4), neither agree nor disagree (3), agree (2) to strongly agree (1). The first five questions gauged patients' perceptions of the importance of exercise and their current exercise habits (Supplemental Patient Survey). We asked patients about the activity they regularly performed including: walking, jogging, swimming/water aerobics, stationary bicycle, light resistance training, and or weight machines. Space was left for write-in activities. For the same exercises, we asked patients to rate their perception of the appropriateness of each for a patient with end stage liver disease. Next we asked patients to assess barriers to exercise, namely: access, fatigue, provider recommendation against exercise, hepatic encephalopathy, ascites, or medications. Space was left for write-in comments. Finally, we asked patients to describe whether their medical providers had encouraged or discouraged exercise, and whether or not patients would be willing to optimize health through exercise or by wearing a personal activity tracking device.

Caregivers were administered a similar but modified survey (Supplemental Caregiver Survey). We asked them to report the type and duration of exercise performed by patients for whom they cared, and to rate the same set of exercise modalities for appropriateness of performance by cirrhotic patients. We asked the caregivers to rate barriers to exercise and to describe whether providers encouraged or discouraged exercise.

Caregiver specific habits were also assessed. We asked caregivers whether they saw themselves as effective role models, whether they would be willing to encourage patients to exercise, and whether they would encourage patient use of a personal activity monitor. Lastly, information was collected on caregiver burdens, including whether caregiver-duties had a negative effect on the caregiver's own life and the patient-caregiver relationship.

Informed consent was obtained from each study participant. This study conformed to the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a priori approval by the institutional review board at each institution from which data was collected: University of Alberta, Duke University, Mayo Clinic in Arizona, University of Pittsburgh, and University of California, San Francisco. Data were shared under a data-usage agreement. A two-tailed T test was used to assess statistical significance between patient and caregiver responses. ANOVA was used to detect differences amongst the clinical centers. Statistical analyses were performed using Microsoft Excel 2010 (Microsoft, Inc., Redmond, WA).

Results:

A total of 368 anonymous responses were received from five clinical centers. There were 229 patient and 139 caregiver responses. Previously, a cohort of 396 patients within the FLEXIT Consortium was described extensively.[23] These patients were a majority male, non-Hispanic White, with a median age of 58 years, median MELD score 15 (11–21), and median BMI 27 (24–31) kg/m^2.

The vast majority of patients in our cohort agreed or strongly agreed that exercise is important for cirrhotic patients awaiting LT (Figure 1; median response 2; IQR1–2). The majority felt it was reasonable to expect such patients to exercise (median response 2; IQR 1–2). Moreover, over 95% reported a willingness to exercise to optimize health (median response 2; IQR 1–2). Seventy-three percent of patients would be willing to wear an exercise monitoring device (median response 2, IQR 1–2).

Exercises Perceived by Patients as Appropriate to Perform in Cirrhosis

Nearly 90% of patients agreed or strongly agreed that walking is appropriate exercise for cirrhotic patients (median response 1, IQR 1–2). Data were mixed with respect to jogging and weight training. There was statistically significant difference between centers with Alberta, Pittsburgh and UCSF reporting neutral responses, and Mayo and Duke trending toward agreement that weight machine use was appropriate.

Patient Performed Exercises

Types and duration of exercise performed by patients were recorded (Table 1). Half of patients reported regular exercise, with a median duration of 30 minutes (IQR 20–40) and median frequency of 3 days (IQR 2–5) per week. The median frequency of exercise at Pittsburgh was twice per week; patients at Mayo Clinic, Alberta and Duke reported exercising three times per week; UCSF patients exercised four times per week (p=0.006). The duration of exercise was not different between the sites (p=0.49).

Over 80% of patients reported walking regularly (median response 2, IQR 1–2). The majority of patients did not perform more strenuous exercise such as swimming (median response 4, IQR 3–5), cycling or strength training (median response 4, IQR 2–5). Write-in exercise responses included (number of patients reporting of 229 respondents): yard work/gardening (6), yoga (5), golf (4), bicycling (3), dog walking (2), housework (2), calisthenics (1), crafts (1), dance (1), fitness training (1), hiking (1), Pilates (1), tai chi (1), and water

aerobics (1).There was no significant difference between sites with regards to patient performed exercises.

Patient Perceived Limiting Factors to Exercise

The major limiting factor was fatigue, with 70% of patients citing fatigue as a factor limiting exercise (median response 2, IQR 1–3). Limited access, hepatic encephalopathy, ascites, and medications were all endorsed as barriers with a median response score of 3-neither agree nor disagree. Greater than 30% of patients endorsed access (median response 3, IQR 2–4) and encephalopathy (median response 3, IQR 2–5) as limiting their exercise, while over 40% of respondents reported ascites (median response 3, IQR 2–4) and medications (median response 3, IQR 2–4). Four percent (n=9) of patients wrote in free-text limitations, which included pain (typically musculoskeletal in nature), feeling too ill to exercise and lack of motivation.

Caregiver Impressions Regarding Exercise

Over 90% of caregivers felt it was important for patients with cirrhosis to exercise while awaiting LT (median response 1, IQR 1–2), and over 80% found it reasonable to expect someone with cirrhosis to exercise regularly (median response 2, IQR 1–2). Ninety-three percent of caregivers would encourage exercise (median response 2, IQR 1–2). Over half of caregivers reported that their patients exercised regularly (median response 2, IQR 2–3); median frequency of 3 days per week (IQR 2–4 days); median duration 30 minutes (IQR 10–40 minutes). A quarter of caregivers felt that weight machine use was inappropriate; a third felt that jogging was inappropriate exercise for a cirrhotic patient, though median responses for both weights and jogging was 3 (IQR 2–4). Fatigue was felt to limit exercise by 83% of caregiver respondents (median response 2, IQR 1–2). Encephalopathy and ascites were two additional limitations cited by 39% of caregivers, though median response was to neither agree nor disagree. Caregiver responses regarding medication as a limiting factor mirrored patient reports, with 35% feeling it did limit activity and 29% disagreeing (median response 3, IQR 2–4). Write-in patient barriers to exercise reported by caregivers included pain and underlying medical conditions.

Caregiver Exercise and Self Perceptions

Almost three-quarters of caregivers reported regular exercise (median response 2, IQR 2–3). Forty-one percent endorsed exercise three or more days per week (median response 3 days, IQR 3–4 days). Nearly two-thirds of caregivers reported themselves to be a good role model (median response 2, IQR 2–3). Seventy-nine percent of caregivers would encourage the use of an exercise monitoring device (median response 2, IQR 1–2).

Perceptions of Caregiver Burnout

We assessed the impact of caregiver duties on their overall well-being and social interaction with the patient. Caregivers largely disagreed that they were stressed due to their caregiver duties (median response 4, IQR 3–4) or that their duties impaired their self-time (median response 4, IQR 3–5). Additionally, they disagreed with statements that their responsibilities strained their relationship with their patients (median response 4, IQR 3–5).

Patient and Caregiver Perceptions of Provider Recommendations

Pooled patient and caregiver perceptions of provider recommendations are shown in Figure 2. The vast majority of patients (70%) and caregivers felt providers encouraged exercise. Statistically significant difference (p=0.003) was noted between patients and caregivers perceptions that providers recommended against exercise. While, 20% of caregivers cited providers' recommendation against exercise as a limiting factor (median response 3; IQR 3–4), only 14% of patients did (median response 4; IQR 3–5). However, only 5% of caregivers and patients perceived that providers discouraged exercise (median response 4; IQR 3–5).

Discussion:

We found that the large majority of 229 patients awaiting LT and 139 caregivers consider exercise to be important for health and report that they exercise regularly. The majority, in excess of 80% of our patients, reported regular walking, and almost 90% believe that walking is appropriate for cirrhotic patients. More vigorous exercises such as jogging, swimming, bicycling, resistance training, and weight training were performed by fewer than 40% of our patients. Over 50% of patients felt that swimming, bicycling, and resistance training were appropriate for patients with cirrhosis. We did not assess whether patients' preference for walking was influenced by provider recommendation, patient choice, or limitations due to medical comorbidities.

Previous small studies reported that highly supervised moderate exercise may significantly increase portal pressures, causing a theoretical increase in the risk of variceal bleeding, which may be mitigated by the use of appropriate variceal prophylaxis with beta-blockade.[22,24] Other small studies have challenged these results and shown that exercise with weight reduction may actually decrease portal pressures.[25,26] However, it is still not currently known what is the optimal strategy for preventing sarcopenia. Additionally, most patients are likely unable to participate in highly controlled exercise programs, though home-based exercise may remain an option.[27]

While it is encouraging that nearly all patients in our cohort reported willingness to exercise and that they performed regular exercise, there is reason to doubt whether their self-reported physical activity levels reflect actual performance. Dunn and colleagues found that LT candidates who reported nearly normal self-assessed activity were in fact highly sedentary, when their activity was objectively measured by wearable activity monitoring.[17] The actual physical activity of LT candidates was similar to that of patients with advanced heart failure, renal, and pulmonary disease. While our patients were receptive to using a personal activity monitor to help them sustain regular exercise, the effectiveness of that strategy, alone or combined with additional supportive measures, has not yet been tested over the length of time, as the majority of LT candidates must wait for a deceased donor organ, up to a year or more.

Patients with cirrhosis exercise less than the general population.[17] Decreased exercise capacity and physical barriers are likely contributors. Among our population, fatigue was the most common reported barrier to exercise, followed by ascites and medications. Currently there is no effective medication for fatigue in cirrhosis. A recent study assessing the efficacy

of modafinil to improve fatigue showed safety but no efficacy compared with placebo in patients with primary biliary cholangitis.[28] Likewise, a trial of fluoxetine showed no benefit over placebo and was associated with drug discontinuation due to adverse events.[29] While there is no easy solution to overcoming fatigue, it may be helpful to focus on an intervention that involves motivation such as training caregivers to support patients or encouraging an exercise program targeted to both patient and caregiver.

Our study's strength lies in the fact that we gathered previously unknown patient and caregiver perceptions, and have found that LT candidates appear motivated to make lifestyle modifications to improve health. Furthermore, we report patient-perceived barriers to fitness, which should be taken into account when developing a fitness plan. Our study has several limitations. First, all data were self-reported without the ability to validate the accuracy of responses. While we do have a previous description of patients within the FLEXIT consortium, due to the anonymous nature of our survey, no identifying data were collected on age, gender, race, body mass index, diet, etiology of liver disease or MELD score. Thus, assessment of demographic factors which might play a role in affecting activity levels was unable to be performed. Despite the study being anonymous, there is risk of bias with patients and caregivers wishing to provide the answer they perceive to be more approved by their medical provider. This may lead to reporting more exercise than actual exercise performed, in hope of gaining a positive response from provider. Additionally, it is possible that there is a response bias with more motivated patients submitting surveys, which could lead to an overestimate of the activity level performed, or an overestimate of perceived interest in exercise. Lastly, this study was conducted in the outpatient setting, amongst patients that were deemed well enough to come for a routine clinic visit, thus a healthier and more active-at-baseline group of patients may have been sampled that is not representative of the entire pre-transplant cohort.

Most importantly, we found that patients and caregivers are receptive and willing to exercise to improve their fitness for LT. Therapeutic trials of diet and exercise, with measurable performance endpoints, would provide insight as to whether functional status may be sustained or improved in LT candidates who say they are willing to make the needed effort. Finally, it appears that targeting caregiver engagement may enhance the efficacy of such interventions.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations:

FLEXIT	Fitness, Life Enhancement, and Exercise in Transplantation

LT	liver transplant
MELD	Model for End-Stage Liver Disease

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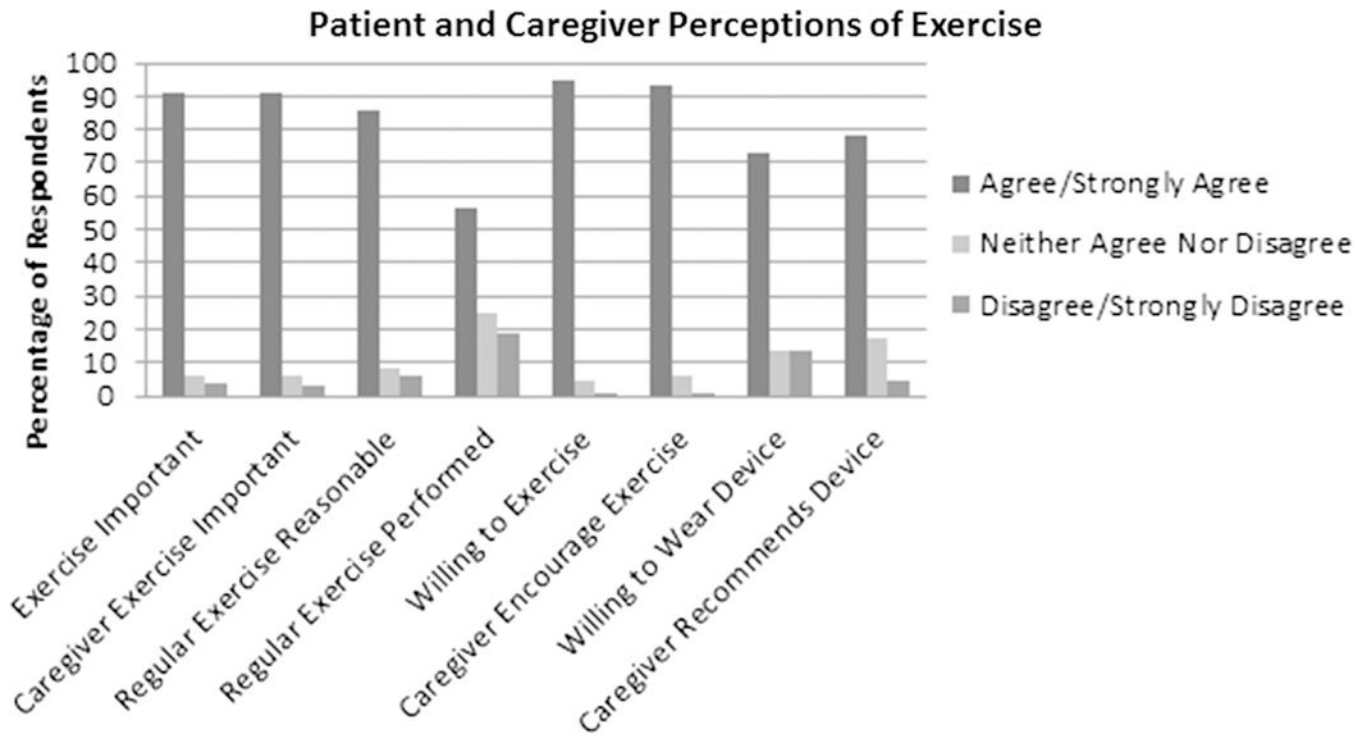

Figure 1.

Patient and caregiver perceptions of exercise. The chart displays patient perceptions of the importance of exercise, caregiver beliefs of the importance of exercise in cirrhotic patients, patient perceptions as to whether it is reasonable for a cirrhotic patient to exercise, whether the patient self-reports regular exercise, whether the patient is willing to exercise, whether the caregiver is willing to encourage exercise, and whether the patient is willing to wear and the caregiver willing to suggest the use of an exercise monitoring device.

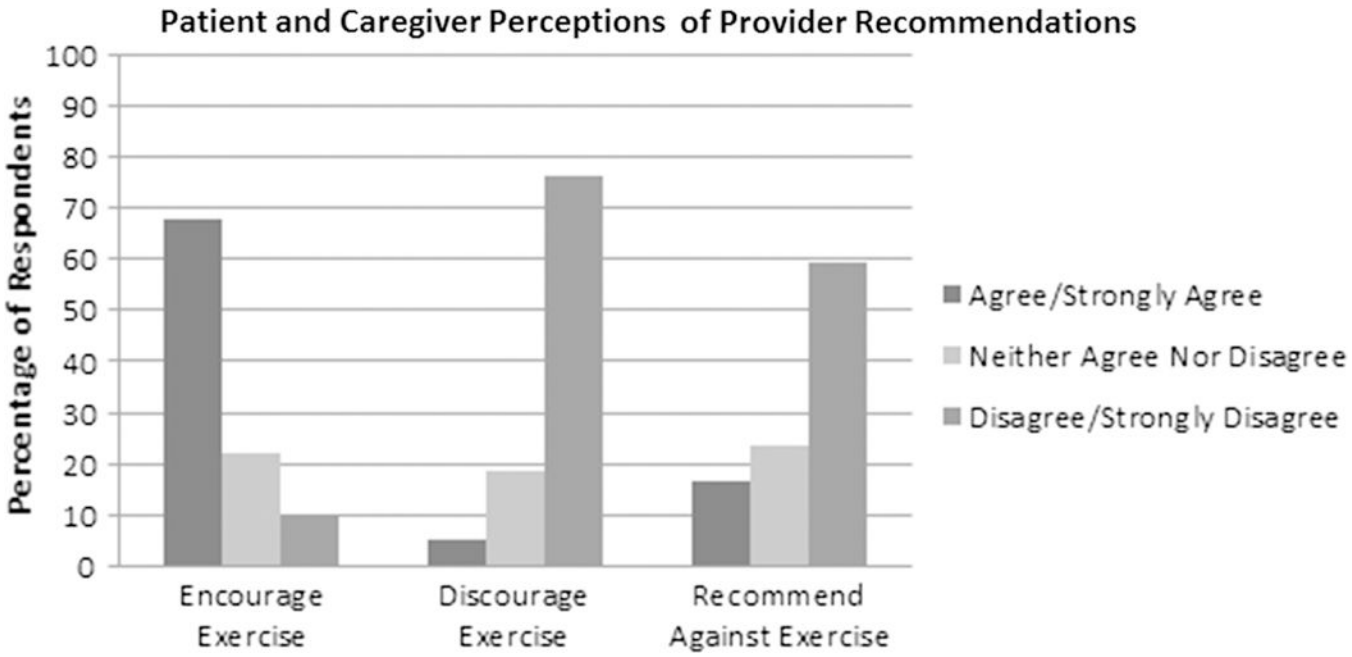

Figure 2.

Pooled patient and caregiver perceptions of provider recommendations regarding exercise. The chart shows the percentage of respondents' impressions of whether their provider encouraged or discouraged exercise, and whether the respondent felt provider recommendation against exercise was a barrier.

Table 1.

Patient and caregiver median response scores regarding patient self-reported activities, exercises considered appropriate in people with cirrhosis, and factors which limit patients' ability to exercise. Scores: 1-strongly agree; 2-agree; 3-neither-agree-nor-disagree; 4-disagree; 5-strongly disagree.

Patient and Caregiver Median Responses to Survey Questions		
	Patient Median Response Score (IQR)	**Caregiver Median Response Score (IQR)**
Number of Respondents	229	139
Patient Reported Activity		
Duration of Exercise	30 minutes (20–40)	
Frequency of Exercise	3 days (2–5)	
Walking	2 (1–2)	
Jogging	4 (3–5)	
Swimming/water aerobics	4 (3–5)	
Stationary bicycle	4 (3–5)	
Light resistance training	4 (2–5)	
Weight machines	4 (2–5)	
Exercise Considered Appropriate for Patients with Cirrhosis		
Walking	1 (1–2)	1 (1–2)
Jogging	3 (2–4)	3 (2–4)
Swimming/water aerobics	2 (2–3)	2 (1–2)
Stationary bicycle	2 (2–3)	2 (2–3)
Light resistance training	2 (2–3)	2 (2–3)
Weight machines	3 (2–3)	3 (2–4)
Factors Limiting Exercise		
Access	3 (2–4)	3 (2–4)
Fatigue	2 (1–3)	2 (1–2)
Physician Against	4 (3–5)	3 (3–4)
HE	3 (2–5)	3 (2–4)
Ascites	3 (2–4)	3 (2–3)
Medications	3 (2–4)	3 (2–4)