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Barriers to exercise participation among dialysis patients

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Abstract

Background. Physical inactivity is a strong predictor of mortality in patients with end-stage renal disease and is associated with poor physical functioning. Patients with end-stage renal disease are inactive even compared to sedentary individuals without kidney disease. We sought to identify patient barriers to physical activity.

Methods. Adult patients on hemodialysis in the San Francisco Bay Area were recruited and asked to complete a study survey composed of questions about self-reported level of physical functioning, physical activity participation, patient physical activity preference and barriers to physical activity. Univariate and multivariable linear regression analyses were performed to study the association between barriers to physical activity and participation in physical activity.

Results. A total of 100 patients participated in the study, the majority of whom were male (73%), with a mean age of 60 ± 15 years. Twenty-seven percent identified themselves as white, 30% black and 21% Hispanic. The majority of participants strongly agreed that a sedentary lifestyle was a health risk (98%) and that increasing exercise was a benefit (98%). However, 92% of participants reported at least one barrier to physical activity. The most commonly reported barriers were fatigue on dialysis days and non-dialysis days (67 and 40%, respectively) and shortness of breath (48%). In multivariate analysis, a greater number of reported barriers was associated with lower levels of physical activity ($P < 0.02$). Post-dialysis fatigue was not associated with differences in activity level in multivariate analysis. Lack of motivation was associated with less physical activity. Endorsement of too many medical problems and not having enough time on dialysis days were also associated with less activity in adjusted analysis.

Conclusion. We have identified a number of barriers to physical activity that can be addressed in studies aimed at increasing levels of physical activity. Inconsistent with nephrologists' reported assumptions, dialysis patients were interested in physical activity.

Keywords: chronic kidney disease; physical activity; quality of life

Introduction

Patients with chronic kidney disease are less active than sedentary individuals without chronic kidney disease [1,2]. O'Hare *et al.* [3] reported that sedentary dialysis patients had a higher risk of death within 1 year than those who reported at least some participation in physical activity. Physical inactivity is also a strong predictor of cardiovascular mortality in patients with earlier stages of chronic kidney disease [4] and represents a potentially modifiable risk factor. In addition to cardiovascular risks associated with physical

inactivity, several studies have also highlighted the link between inactivity and poor physical functioning and fitness in patients with chronic kidney disease [1, 3, 5].

Given these strong associations between physical inactivity and mortality in dialysis patients [3, 6] and the potential improvements in physical functioning associated with increasing activity [7], it is unclear why patients with chronic kidney disease do not exercise. The Surgeon General, and more recently, the Center for Disease Control and Prevention [8] and American Heart Association [9] recommend at least 150 min of weekly moderate intensity physical activity (i.e. 30 min on at least 5 days) [9, 10]. In the general population, reported barriers to achieving recommended levels of physical activity have included lack of access to exercise facilities and concerns about environmental safety [11]. Personal and social factors such as education, income, poor self-efficacy and lack of energy are also common correlates [12], especially among African-Americans [13]. A recent study reported that most nephrologists were not routinely assessing physical activity and counseling patients to increase their activity despite published guidelines recommending that they do so [14, 15]. However, lack of counseling among nephrologists is probably not the sole reason for the patients' low levels of physical activity. In a study by Goodman *et al.* [16], lack of motivation and interest were among the factors cited as limiting patient participation in physical activity. To date, there have been few studies to evaluate predictors of lack of physical activity in this patient population. Our aim was to carefully delineate patients' perceived barriers to physical activity in a racially and ethnically diverse hemodialysis population in the hope that this information can be used in the development of strategies to motivate patients to achieve adequate levels of physical activity.

Materials and methods

Participants receiving hemodialysis were recruited from centers affiliated with University of California, San Francisco or Satellite Healthcare. All participants provided informed consent, and the study was approved by the Committee on Human Research at UCSF and the Research and Development Committee at the San Francisco VA Medical Center. Participants completed a study survey composed of questions in the following areas: self-reported level of physical functioning, physical activity recall, patient physical activity preference and barriers to physical activity. In addition, questions designed to ascertain participants' opinions about the importance and safety of physical activity in persons who are on dialysis were included. Components of the Physical Activity Scale for the Elderly (PASE), which has been validated in original form [17, 18], was abstracted to create the physical activity assessment part of the study instrument. Questions were adapted from the PASE to focus on light activity. Responses from the PASE walking and light sports activity were combined and converted to minutes of light activity per day. The 7-day physical activity recall was administered to assess moderate activity to confirm the accuracy of limiting the study focus to light activity.

Questions regarding barriers to physical activity (i.e. physical, financial and psychosocial) were included in the study. These questions were designed as an outgrowth of previously studied categories of predictors of physical activity in this population [16] and correspond to the following broad categories of barriers to exercise: psychological barriers, physical barriers, lack of time and presence of comorbidities. Participants were classified as having endorsed a barrier if they reported that they 'sometimes', 'often' or 'always' experienced that barrier. Participants who reported that they 'never' experienced a barrier were classified as not having the barrier. Level of agreement with each physical activity opinion statement was ascertained on a 5-point scale from strongly disagree to strongly agree and then truncated to a binary variable by combining 'strongly agree' and 'agree' into a single category indicating agreement.

Statistical methods

Participant characteristics were described using mean + standard deviation for continuous normally distributed variables and percent for dichotomous variables. Characteristics were described using median with 25th and 75th percentile for variables that were not normally distributed. The proportion of patients endorsing each barrier and the average number of barriers perceived per patient were calculated. Chi-square and univariate regression were used to study the association between reported barriers to physical activity and patient characteristics as well as the association between barriers and reported levels of physical activity. For these analyses, minutes of walking and light activity per day ascertained solely from the PASE responses was used as the physical activity outcome variable of interest and was dichotomized, with patients who performed >30min/day characterized as active and all others considered inactive. Persons who reported moderate physical activity on the 7-day recall were classified as meeting surgeon general recommendations if >150 min of moderate activity per week were achieved. Multivariable regression analysis was used to determine which barriers were associated with light physical activity after adjustment for other patient characteristics often associated with activity (e.g. age, sex, comorbidity). Physical activity was treated as a categorical variable for these analyses. Linear regression analysis with physical activity as the outcome variable and each barrier or combination of barriers as the predictor, controlling for age and sex, were part of the final analysis. A standard two-tailed alpha ($P < 0.05$) was considered statistically significant. All statistical analysis was performed in STATA Version 11.0 (College Station, TX).

Results

A total of 100 dialysis patients were recruited to participate in the study, the majority of whom were male (73%) and half of whom were over the age of 60 (53%), with a mean age of 60 ± 15 years. Twenty-seven percent identified themselves as white, 30% as black and 21% as Hispanic (Table 1). More than half of the participants reported income below the federal poverty line ($21 203). Median dialysis vintage was 30 months among participants with a mean Kt/V of 1.6 + 0.3. The majority (59%) of participants had greater than three comorbidities.

Patients were generally very sedentary, spending an average of 25 min/week in walking or other light activity. The majority of activity reported was walking, with 85% of individuals not reporting any other leisure activity. Forty-six percent of individuals performed ≥30 min/week of walking or light leisure activity, but it should be emphasized that this was not activity of moderate intensity. Only 17% of individuals performed moderate physical activity for >150 min/week. With the exception of age, clinical parameters were not associated with differences in physical activity level in univariate analysis (Table 1). Patients >65 were less active than their younger counterparts ($P < 0.02$). Neither specific comorbidities nor number of comorbidities was associated with less activity ($P > 0.5$).

The majority of participants agreed that sedentary lifestyle was a health risk (98%) and that increasing exercise was a benefit (98%). Eight percent of participants were concerned about the risk of exercise among dialysis patients, while 84% agreed that physical activity was as important as other issues. Ninety-three percent of individuals believed that dialysis patients were interested in the topic of physical activity and would exercise if counseled to do so. Twenty-three percent of individuals felt that participation in physical activity three to five times per week was appropriate for cardiovascular health, while 52% of individuals

Table 1. Descriptive characteristics of study participants[a]

$N = 100$	All participants	Active participants ($N = 46$)	Inactive participants ($N = 54$)	P-value
Male	73%	72%	75%	0.67
Mean age (SD)	61 (15)	59 (14.8)	64 (13)	0.53
Median dialysis vintage (months)	30	33	26	0.21
Race				
White	27%	19%	33%	0.08
Black	30%	37%	24%	
Asian	9%	4%	13%	
Ethnicity				
Hispanic	21%	33%	11%	0.023
Education				
Grade 9–11	12	6	6	0.51
High school or GED	49	21	28	
Bachelors degree or higher	31	13	18	
Mean Kt/V (SD)	1.6 (0.32)	1.5 (0.30)	1.5 (0.35)	0.65
Mean hematocrit (mg/dL) (SD)	34 (4.14)	34.5 (4.4)	34.5 (4.0)	0.61
Mean albumin (mg/dL) (SD)	3.7 (0.5)	3.85 (0.5)	3.7 (0.5)	0.57
Congestive heart failure	32%	13	19	0.45
Hypertension	91%	42	49	0.92
Coronary artery disease history	37%	15	22	0.4
History of myocardial infarction	17%	5	12	0.13
Diabetes	46%	24	22	0.25
Anemia	92%	42	50	0.80
Smoking history	45%	22	23	0.60
Active smoker	13%	10	3	0.02

[a]GED, General Education Development.

considered participation in physical activity one to two times per week to be sufficient.

Only 8% of participants reported no barriers to physical activity. Of the 92% of participants who reported at least one barrier to physical activity, only 6% reported a single barrier; 40% endorsed 2–4 barriers, 28% endorsed 5–9 barriers and 18% endorsed >10 barriers to physical activity. Eleven different barriers were endorsed by at least 20% of participants. The most commonly reported barriers to physical activity were fatigue on dialysis days (67%), shortness of breath (48%), lack of motivation (i.e. 'I don't want to exercise'; 42%) and fatigue on non-dialysis days (40%). There were no differences in specific barriers endorsed based on gender or race nor was there a gender or race difference in the number of barriers endorsed. Income was not associated with number of barriers endorsed. However, younger patients endorsed fewer barriers ($P < 0.03$).

Association of barriers with physical activity

In univariate analysis, feeling helpless and having ulcers on the legs or feet were associated with inactivity ($P < 0.05$), but persons who endorsed amputation as a barrier were not less likely to be active ($P = 0.7$) (Table 2). Endorsement of having 'too many medical problems' or not having enough time to exercise on dialysis days was associated with inactivity ($P < 0.05$ and $P < 0.03$, respectively). Reporting feeling 'too old' was more common among participants who were inactive but this was not statistically significant ($P = 0.06$). Endorsing lack of a location to exercise was more common among persons who were inactive but not statistically significantly so ($P = 0.06$). Lack of general motivation to exercise was not more common among those who were inactive ($P = 0.07$). There was an inverse relation between number of endorsed exercise barriers and reported level of physical activity in univariate analysis ($P = 0.04$).

In multivariate analysis (Table 3), a greater number of reported barriers was associated with lower levels of physical activity ($P < 0.02$), after adjustment for age and sex. Although fatigue was the most commonly reported barrier to exercise, it was not associated with differences in activity level in multivariate analysis. However, the relation demonstrated a trend toward significance ($P = 0.06$) when adjusting for age and sex. Lack of motivation was associated with less physical activity. In addition, endorsement of too many medical problems and not having enough time on dialysis days were also associated with less activity in adjusted analysis. Finally, having too many medical appointments, not having a safe place to exercise and lacking an exercise partner were also associated with less physical activity after adjusting for age and sex.

Discussion

The National Kidney Foundation recommends physical activity for patients on dialysis with a goal toward reaching 30 min of moderate intensity activity on most days if not all [19]. Only a small number of individuals met moderate intensity activity criteria when confirmed by the 7-day recall. Similar to other hemodialysis cohorts [1], participation in physical activity of any kind was limited in this cohort since 54% of patients did not perform even 30 min of light activity per day. In this study, we found that barriers to physical activity were common, with 92% of patients reporting at least one barrier and 86% reporting more than one. Many barriers were endorsed by substantial numbers of participants. Both a greater

Table 2. Percent of participants endorsing barriers

	Total participants, $N = 100$	Active participants, $N = 46$	Inactive participants, $N = 54$	P-value
Fatigue on dialysis days	67	65	69	0.72
Shortness of breath	48	43	52	0.82
'I don't want to'	42	33	50	0.07
Fatigue on non-dialysis days	40	35	44	0.33
Pain on dialysis days	38	37	38	0.84
Lack of time on dialysis days	31	22	38	0.06
Too many medical problems	26	15	35	0.02
Fear of getting hurt	24	24	24	0.98
Pain on non-dialysis days	23	19	26	0.45
No exercise partner	21	17	24	0.41
Lack of time because of too many medical appointments	20	17	22	0.54
Chest pain	17	19	15	0.52
Sadness	16	13	18	0.45
Feelings of helplessness	16	6	24	0.02
Lack of time on non-dialysis days	13	10	15	0.55
Inability to travel	13	10	11	0.55
Can't afford to exercise	11	10	11	0.97
Not wanting to be seen doing exercise	11	8	13	0.49
Feeling too old	9	4	13	0.13
No place to exercise	9	6	11	0.42
Ulcers on legs and feet	7	0	13	0.01
Lack of safe place for exercise	7	6	7	0.86
Family concern	5	2	7	0.23
Physician concern	2	2	2	0.29
Amputation	1	0	2	0.35

Table 3. Multivariate logistic regression models for the association between barriers to exercise endorsed and activity controlling for age and sex

Barrier	Beta coefficient	P-value
Number of barriers endorsed	−2.6 (−4.17, −1.08)	0.001
Feeling helpless	−0.17 (−0.32, −0.01)	0.03
Lower extremity ulcers	−0.11 (−0.22, −0.005)	0.04
Having too many medical problems	−0.3 (−0.45, −0.09)	0.003
No time on hemodialysis days	−0.24 (−0.43, −0.05)	0.01
'Just don't want to exercise'	−0.23 (−0.44, −0.02)	0.03
Shortness of breath	−0.22 (−0.42, −0.02)	0.03
Fatigue on non-dialysis days	−0.17 (−0.4, 0.04)	0.1
Fatigue on dialysis days	−0.07 (−0.3, 0.1)	0.5

number of reported barriers and endorsement of several specific barriers were associated with lower levels of physical activity in this cohort. The most commonly reported barriers to physical activity were fatigue on dialysis and non-dialysis days, lack of motivation and shortness of breath. Two of these barriers, lack of motivation and shortness of breath, were associated with decreased physical activity, and the negative association between fatigue on dialysis days and physical activity approached statistical significance.

The deficit in physical activity among patients on dialysis has been theorized to be due to a lack of motivation secondary to patient barriers, including socioeconomic, psychological and perceived physical disability [16]. In a previous study of barriers to physical activity among predominantly Caucasian dialysis patients from Massachusetts, investigators reported that lack of motivation, interest, access to exercise facilities and fear of falling were associated with low exercise levels, but these barriers were not commonly endorsed [16]. In our evaluation, access to facilities, interest and fear were not significant factors associated with lack of physical activity, but lack of motivation was also frequently cited as a barrier to exercise and was associated with lower activity levels. Because our cohort was more racially, ethnically and socioeconomically diverse, we were able to test whether these characteristics, which have been reported to be associated with physical activity in the general population, were associated with differences in activity level [12]. However, we did not find any associations between sociodemographics and physical activity level.

We also assessed patients' attitudes toward physical activity, and the majority of participants strongly agreed that a sedentary lifestyle was a health risk and that increasing exercise was a benefit. Few participants (8%) were concerned about the risk of exercise among dialysis patients, although 24% acknowledged a fear of getting hurt. There was general disagreement that physical activity was not as important as other issues. We previously reported on the lack of exercise counseling by nephrologists [15]. Similar to the patients in the

current study, nephrologists also overwhelmingly agreed that exercise was potentially beneficial, but interestingly, the barriers that physicians reported to counseling their patients did not match the patients' opinions. Specifically, a substantial proportion of physicians (35%) reported that they thought dialysis patients would not be interested in the topic of exercise, but only 4% of the patients in the current survey said that they were not interested. In addition, physicians were more concerned about the risks of physical activity (40%) than were these patients (8%). Finally, a large percentage of physicians thought that patients would not increase their physical activity even if counseled to do so, whereas the majority of the patients reported that they would increase activity if so advised.

The major challenge now is to translate patients' stated interest in physical activity to true increases in physical activity, overcoming the identified barriers to doing so. The information gathered so far from physicians and patients suggests that physicians need tools and training and encouragement to increase their rates of assessment, discussion and recommendation of exercise [14, 15], and our current results can shed some light on potential successful strategies to increase activity. For example, patient endorsement of not having enough time to exercise and of having too many medical problems to exercise were both associated with lower physical activity, whereas the actual number of comorbid conditions was not associated with physical activity. This suggests that patients' perception of the burden of their disease, perhaps including the substantial time burden involved in the dialysis procedure itself, may be more relevant than specific diseases or number of diseases. Patients' emphasis on time and burden is important because it has implications for strategies to motivate individuals to increase their participation in physical activity. For example, strategies that involve linking exercise to the dialysis procedure itself, either during or before dialysis, may be especially promising, and there is some support for the success of this approach [20–22]. However, given the potential obstacles to providing exercise opportunities in the dialysis unit, a potential alternative would be to help patients to identify times in their daily routine (outside of dialysis) when they could incorporate physical activity. Any counseling and encouragement should be guided by recommendations targeting older individuals [23]. These recommendations stress the importance of tailoring exercise recommendations to an individual's fitness level, such that the exercise is of moderate intensity for that individual, rather than moderate intensity on an absolute scale. Moreover, given that non-physician dialysis unit staff often have more frequent contact with patients than physicians, incorporation of dialysis staff into the paradigm of future interventions will increase the likelihood of success [24, 25]. A comprehensive approach with all healthcare providers, including experts in physical therapy, is important in addressing known challenges of the sustainability of an exercise program [24].

While our study included a fairly diverse group of patients with regard to socioeconomic status, urban versus suburban residence and race/ethnicity, a number of limitations remain. This study represented a convenience sample in the Bay Area of Northern California, so participants may not be representative of the entire US dialysis population. In addition, the survey instrument was focused on walking and a subset of leisure activities because previous studies had already confirmed that dialysis patients are inactive. Thus questions did not exhaustively catalog all activities, and it is possible that patients performed some activities that were not assessed. Questions aimed at determining whether individuals knew what to do for physical activity and if they had already received such counseling from nephrologists were not addressed. Information ascertained from respondents on whether they received exercise counseling from a nephrologist would have limited to a small group of nephrologist who practice in the bay area and therefore not generalizable to all practicing nephrologist. Finally, the limited range of participation in physical activity in this population combined with a modest sample size might have limited our power to detect associations of barriers or patient characteristics with physical activity.

Conclusion

The benefit of physical activity in patients with chronic kidney disease has been well documented. The patients in this study indicated substantial interest in physical activity but also endorsed many barriers to being active. While a few centers have implemented successful physical activity programs, it is time for an intervention directed at addressing barriers to improve physical activity levels on a wider scale.

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Conflict of interest statement. None declared.

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