

Characterization of Physical Activity and Sitting Time Among Patients on Hemodialysis Using a New Physical Activity Instrument

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Objectives: Physical activity questionnaires usually focus on moderate to vigorous activities and may not accurately capture physical activity or variation in levels of activity among extremely inactive groups like dialysis patients.

Design: Cross-sectional study.

Setting: Three dialysis facilities in the San Francisco Bay Area.

Subjects: Sixty-eight prevalent hemodialysis patients.

Intervention: We administered a new physical activity questionnaire designed to capture activity in the lower end of the range, the Low Physical Activity Questionnaire (LoPAQ).

Main Outcome Measure: Outcome measures were correlation with a validated physical activity questionnaire, the Minnesota Leisure Time Activity (LTA) questionnaire and with self-reported physical function (physical function score of the SF-36) and physical performance (gait speed, chair stand, balance, and short physical performance battery). We also determined whether patients who were frail or reported limitations in activities of daily living were less active on the LoPAQ.

Results: Sixty-eight participants (mean age 59 ± 14 years, 59% men) completed the study. Patients were inactive according to the LoPAQ, with a median (interquartile range) of 517 (204-1190) kcal/week of physical activity. Although activity from the LTA was lower than on the LoPAQ (411 [61-902] kcal/week), the difference was not statistically significant ($P = .20$), and results from the 2 instruments were strongly correlated ($\rho = 0.62, P < .001$). In addition, higher physical activity measured by the LoPAQ was correlated with better self-reported functioning ($\rho = 0.64, P < .001$), better performance on gait speed ($\rho = 0.32, P = .02$), balance ($\rho = 0.45, P < .001$), and chair rising ($\rho = -0.32, P = .03$) tests and with higher short physical performance battery total score ($\rho = 0.51, P < .001$). Frail patients and patients with activities of daily living limitations were less active than those who were not frail or limited.

Conclusions: The LoPAQ performed similarly to the Minnesota LTA questionnaire in our cohort despite being shorter and easier to administer.

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Introduction

THERE ARE MYRIAD instruments available to quantify physical activity. Choice of instrument depends on the activity level of the population under study and the outcomes of interest, among other considerations. A number of different questionnaires of physical activity have been used to assess patients treated with hemodialysis, and this group has been found to be extremely inactive. Furthermore, level of physical activity has been associated with survival among patients on dialysis.^{1,2} However, previous studies have relied on questionnaires that were not specifically designed for this

population.³⁻⁶ Many of these instruments focus on moderate to vigorous activities because these are the levels that have been most consistently related to health benefits in healthy populations. As a result of the focus on higher intensity activity, these instruments may not accurately capture physical activity or variation in levels of activity among extremely inactive groups.⁷ The Human Activity Profile (HAP)^{3,4} has been relatively widely used in the dialysis population because it spans a wider range of activities than most questionnaires and does assess activity at the lower end of the spectrum. However, although HAP scores categorize participants according to general activity level, they do not quantify specific amounts or intensity of physical activity performed and thus do not translate well into benchmarks that can be used by clinicians and patients, such as calories of energy expenditure or minutes of moderate activity. In addition, because physical activity is not assessed over a specific time interval by the HAP, scores may not be sensitive to change with intervention. Finally, there is increasing recognition that, especially among sedentary populations, time spent sitting may have adverse effects on outcomes independent of the level of participation in activity.⁸⁻¹¹

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To address these limitations, we developed the Low Physical Activity Questionnaire (LoPAQ), which focuses on very low levels of physical activity, specifically walking, but also quantifies kilocalories of total leisure-time physical activity and time spent sitting. We hypothesized that physical activity measured using the LoPAQ would correlate with activity measured using a standard instrument used commonly among community-dwelling elderly populations and with physical performance and patients' self-reported physical function. We also hypothesized that sitting time would be inversely correlated with functioning.

Methods

Study Design and Participants

This was a cross-sectional study performed on a subset of participants in the United States Renal Data System ACTIVE/ADIPOSE (A Cohort To Investigate the Value of Exercise/Analyses Designed to Investigate the Paradox of Obesity in ESRD).¹² ACTIVE/ADIPOSE enrolled 771 prevalent adult hemodialysis patients from 14 dialysis facilities in the San Francisco Bay Area and the Atlanta metropolitan area from June 2009 and August 2011. Patients were eligible to participate if they were adults who had been receiving maintenance hemodialysis for at least 3 months, were able to provide informed consent, and spoke English or Spanish. The study was approved by the Institutional Review Boards at the University of California, San Francisco and Emory University, and all participants provided written informed consent.

Study coordinators interviewed participants before or during a dialysis session, abstracted recent clinical and laboratory data from medical records, and measured physical performance on the same day. For this ancillary study, all 68 English-speaking participants previously enrolled in ACTIVE/ADIPOSE who were scheduled for a study visit in the San Francisco area between February and June, 2013 were asked to complete the LoPAQ. All patients agreed to participate, completed the questionnaire, and were included in the analyses.

Low Physical Activity Questionnaire

The LoPAQ was developed with dialysis patients in mind based on the investigators' prior experience with measurement of physical activity in this population (see [Appendix](#)).^{7,13,14} Our goals were to create an instrument that would be short, would focus on physical activity at the low end of the physical activity range, and would produce quantitative results that could be used to compare patients with each other and to determine whether participants meet guideline-recommended levels of physical activity.^{15,16} For this study, coordinators administered the questionnaire and recorded participants' responses. We used a 1-week assessment period to minimize the burden of recollection and maximize the potential sensitivity to change in response to changes in

clinical status or interventions to increase activity. In an effort to produce quantitative data that can be used by patients, clinicians, and researchers to assess risk and to encourage physical activity, we used measures that are readily understandable and can be directly compared with available metrics, including minutes of walking per week and kilocalories expended in light, moderate, vigorous, and total physical activity. We asked participants about walking around the neighborhood, for transportation, and for fitness or pleasure. In addition, we asked about the average time spent in sitting activities over 1 week.

Other Measures

The Minnesota Leisure Time Activities (LTA) questionnaire¹⁷ was used as a standard reference. The LTA has been used in numerous epidemiologic studies, including the Cardiovascular Health Study.^{18,19} This instrument asks participants about participation in 18 different activities over the previous 2 weeks. Based on the responses, the total number of calories (kcal) expended in LTA per week is estimated.

Self-reported physical function was assessed using the Physical Function scale of the SF-36,²⁰ which asks participants whether they are limited in performing 10 activities and is scored from 0 to 100, with higher scores indicating better function.

Physical performance was assessed using the Short Physical Performance Battery (SPPB),²¹ and its individual components, which include gait speed, a timed sit-to-stand test, and balance tests. Performance tests were conducted immediately before a midweek dialysis session. Gait speed was measured twice over a 15-foot course, and the fastest time recorded. Patients were timed while rising from a standard chair 5 times as fast as possible without the use of their arms. Finally, patients were timed while maintaining a standing position with feet side by side, a semitandem position, and a tandem position for up to 10 seconds each. A total SPPB score was calculated based on the results of the performance tests, with each component scored from 0 (unable to perform) to 4 (best performance), with a total score ranging from 0 to 12.²¹ We measured grip strength in the nonfistula arm using a Jamar hand-held dynamometer (Sammons Preston Rolyan, Bolingbrook, IL) during 3 trials of maximal effort. The highest force generated was used as the outcome measure.

We assessed frailty according to Fried's criteria, which was originally developed among community-dwelling elderly¹⁸ and more recently applied to patients on hemodialysis.^{22,23} Patients were considered frail if they met 3 or more of the following 5 criteria: unintentional weight loss of 10 pounds or more in the prior year by self-report; exhaustion based on responses to 2 questions about energy; low physical activity based on the Minnesota LTA (<383 kcal/week for men or <270 kcal/week for women); slow gait speed (based on gender- and height-stratified cutoffs); and weak grip strength (based on

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