Self-reported Physical Function Decline and Mortality in Older Adults Receiving Hemodialysis

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Rationale & Objective: Timely recognition of functional decline in older adults receiving dialysis will allow clinicians to pursue interventions to prevent further disability and/or lead patient-centered goals of care discussions. Annual change in the 12-Item Short Form Health Survey (SF-12) physical component score (PCS) could identify patients with functional decline. Our objectives were to assess SF-12 PCS change over a year, risk factors associated with SF-12 PCS change, and the association of SF-12 PCS change with mortality in a survivor cohort of older adults receiving dialysis.

Study Design: Retrospective study.

Setting & Participants: 1,371 adults 65 years or older receiving hemodialysis for 6 or more months who completed SF-12 PCSs 300 or more days apart from 2012 to 2013.

Exposures: Serum albumin level; hemodialysis access type; SF-12 PCS change (for mortality analyses).

Outcomes: SF-12 PCS change and mortality.

Analytical Approach: Multivariable-adjusted linear regression model; Cox proportional hazards model.

Results: We excluded 24% (n = 801) of our cohort for death before the second SF-12 PCS. Among the 1,371 with sufficient SF-12 PCS data, mean age was 79.9 ± 4.5 years. Average SF-12 PCS change in 1 year was minimal (−0.9 ± 9.6), but 39.3% (n = 539) and 32.2% (n = 442) had clinically relevant SF-12 PCS decline and improvement, respectively. Albumin level and access type were not statistically associated with SF-12 PCS change. SF-12 PCS change was not associated with mortality (adjusted HR, 0.98; 95% CI, 0.96-1.00).

Limitations: 2 time points to assess SF-12 PCS change; covariate assessment only at baseline; survivor bias.

Conclusions: In this cohort of older adults receiving hemodialysis, nearly one-fourth died, while among survivors, it was more common for SF-12 PCS to decline than improve in a year. Annual SF-12 PCS change was not associated with traditional risk factors for functional impairment or mortality risk. Additional research is needed to identify appropriate measures and frequency of assessment for functional decline.

Poor functional status is highly associated with mortality in older adults after dialysis initiation.[1] Those who survive the first 6 months of dialysis remain at risk for functional decline, with nearly one-third of older community-dwelling dialysis patients requiring home health or assisted living within a year of dialysis initiation due to new or worsening difficulties completing activities of daily living (ADLs).[2] For nearly 75%, this need arises suddenly after an acute hospitalization,[3] but others experience a gradual decline in their functional status that is often unrecognized. Earlier recognition of gradual decline in functional status may allow for interventions to prevent or delay the onset of disability and need for increased level of care.[4]

The gold-standard approach for assessing functional status, the comprehensive geriatric assessment, is not routinely conducted in dialysis units, but one related measure is the 12-Item Short Form Health Survey (SF-12) physical component score (PCS).[5] The SF-12 PCS is derived from the SF-12, a 12-item instrument that measures general perceptions of physical and mental health and is routinely administered annually in dialysis units as part of the Centers for Medicare & Medicaid Services (CMS)-recommended Kidney Disease Quality of Life (KDQOL-36) instrument.

In prior work, we found that the SF-12 PCS is a valid instrument for older adults receiving dialysis,[6] and those with a low SF-12 PCS had greater risk for death than those with a higher SF-12 PCS.[7] Other studies demonstrate the validity of the SF-12 PCS in measuring change in health status among dialysis and nondialysis populations.[8-10] However, it is not known whether SF-12 PCS change is a clinically useful means of monitoring functional status change in older adults receiving dialysis. If so, then nephrologists and other dialysis unit staff could use SF-12 PCS decline to identify patients at high risk for further functional decline.

Further, although prior studies have found that hypoalbuminemia and hemodialysis access type are associated with limited functional status (as defined by dependence in ADLs or institutionalization),[1,11] we do not know whether these potentially modifiable risk factors are associated with SF-12 PCS change. This is important because subsequent clinical trials could be developed to investigate whether targeting these potentially modifiable risk factors could reduce functional decline as measured by SF-12 PCS change. It is also not known whether SF-12 PCS change is associated with immutable risk factors that are associated with survival in end-stage kidney disease, such as age, race, and time on dialysis.[12,13]

Toward an ultimate goal of improving both practical application of the SF-12 PCS and identifying potentially modifiable risk factors for declining functional status in older adults receiving dialysis, we sought to describe the extent of functional decline or improvement over a year, as measured using SF-12 PCS change; identify associated risk factors; and describe the extent that SF-12 PCS change is associated with subsequent mortality in a survivor cohort of older adults receiving hemodialysis.

METHODS

Study Design and Data Source

We performed a retrospective cohort study using statistically deidentified data from a large dialysis organization's electronic health records for 2012 and 2013. The large dialysis organization assembled a nationally representative random sample of 4,000 dialysis patients (oversampled with 3,500 aged ≥75 years) who had completed the KDQOL-36 in 2012. These data have been previously analyzed by the investigators to confirm the psychometrics and predictive validity of the KDQOL-36 in the older dialysis population.[7] For each patient in the cohort, the large dialysis organization provided KDQOL-36 responses, dates of hospitalization and death, comorbid conditions, and laboratory data from January 1, 2012, to December 31, 2013.

This study was approved by the Duke Institutional Review Board Protocol #00063355. Because this study involved deidentified data, the need for informed consent was waived.

Participants

The cohort for this study is limited to patients who were receiving hemodialysis for at least 6 months at the time of KDQOL-36 assessment in 2012, aged 65 years or older as of January 1, 2012, and had at least 2 complete SF-12 PCSs 300-plus days apart. As endorsed by CMS, the SF-12 PCS, as part of the KDQOL-36, is intended to be administered approximately annually. Because we sought to assess annual SF-12 PCS change, we excluded patients who did not have more than 1 completed SF-12 (n = 1,784, of whom 801 died before the expected date of their 2013 SF-12 PCS administration) and patients with SF-12 PCSs that were separated by fewer than 300 days (n = 129), resulting in a final analytic sample size of 1,371 (Fig 1).

Variables

The primary outcome was SF-12 PCS change calculated from the second minus the first SF-12 PCS. We calculated SF-12 PCSs from each cohort member's responses to the SF-12 items weighted to capture a composite of the following scales: physical functioning, bodily pain, role limitations due to impaired physical health, and general
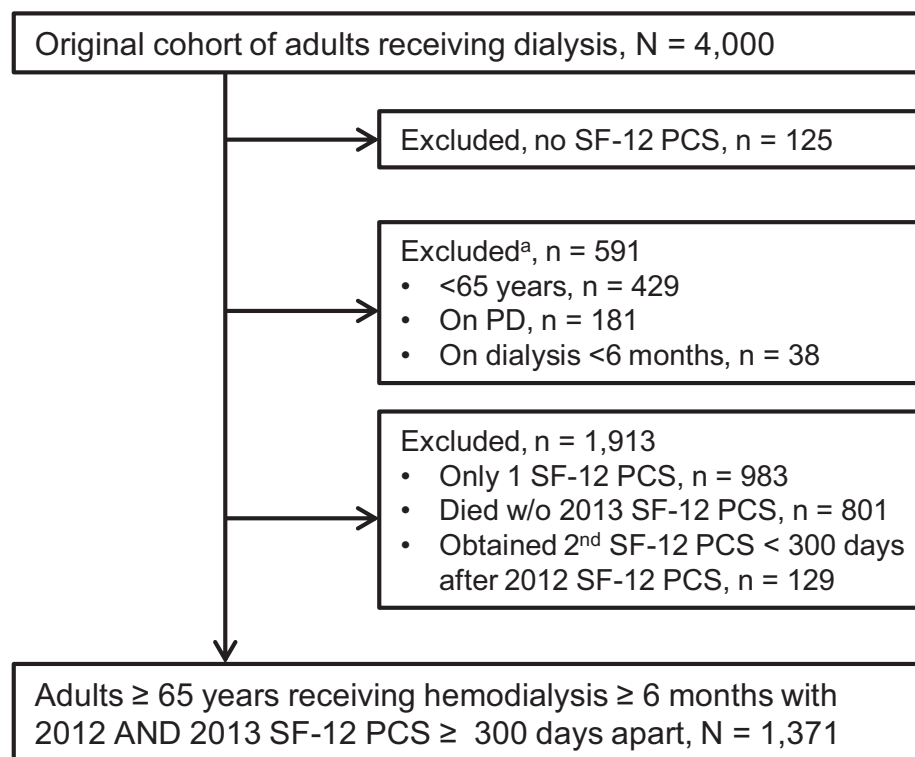

Figure 1. Flow diagram of cohort selection. Abbreviations: PD, peritoneal dialysis; SF-12 PCS, 12-Item Short Form Health Survey physical component score. [a]Not mutually exclusive.

health.[14] The secondary outcome was time to death measured from the date of the second SF-12 PCS through the event date. For this outcome, we excluded 3 patients who completed their second SF-12 PCS on the last date of observation, December 31, 2013 (no follow-up available).

Our primary exposure variables of interest included serum albumin level and hemodialysis access type (arteriovenous fistula [AVF], arteriovenous graft, or central venous catheter) on the 2012 SF-12 administration date. Additional covariates include baseline characteristics as of 2012 (age, sex, race [ie, white, African American, Hispanic, or other], dual Medicare-Medicaid eligibility, and Charlson comorbidity index score), relevant laboratory measurements obtained within a month of the 2012 KDQOL-36 administration (Kt/V and hemoglobin), time on dialysis (defined as time between each patient's first ever dialysis treatment and the date of first KDQOL-36 administration between January 1, 2012, and December 31, 2013), and hospitalizations during follow-up (between January 1, 2012, and December 31, 2013).

Statistical Analysis

We summarized baseline characteristics and performed χ^2 test for categorical variables and t test for continuous variables to identify differences in the cohort by access type. Given there has not been a formal study to define a minimal clinically important difference in SF-12 PCS in this population, improvement or decline by 3 or more points was considered clinically relevant, as described in a larger dialysis cohort study.[15] We conducted a multivariable linear regression to model SF-12 PCS change adjusting for age, sex, race, dual eligibility status, time on dialysis, Charlson comorbidity index score, access type, albumin level, Kt/V, hemoglobin level, hospitalization, and days between PCSs (centered around 365 days). We performed test of effect modification of age by time on dialysis and access type by time on dialysis. Of note, we identified a possible nonlinear relationship between time on dialysis and SF-12 PCS change. Because the hypothesis that spline coefficients for time on dialysis equaled zero was not significant, we did not include a nonlinear expression of time on dialysis in the model.

We also conducted several exploratory post hoc analyses. First, we computed the probability that the adjusted outcome, SF-12 PCS change, had a decline of at least 10 points at various serum albumin levels and the 3 hemodialysis access types (primary exposure variables). A 10-point decline in SF-12 PCS has been associated with increased hazards of mortality.[15] Probability estimation was a 4-step calculation: (1) specify a value in the model for a key predictor for all observations (ie, all access = AVF), holding all other covariates fixed at their observed values; (2) compute a z score for the predicted outcomes [$z = $ (predicted $y − $ actual SF-12 PCS decline $\geq$ 10 points])/ model root mean square error]; (3) assuming Gaussian errors, determine the probability of predicted SF-12 PCS

decline of at least 10 points; and (4) average these probabilities over the study cohort.[16]

Second, we conducted Cox proportional hazards regression models to measure the association of SF-12 PCS change with time to death adjusting for age, sex, race, time on dialysis in one model, and further adjusting for second SF-12 PCS in a second model. Individuals were censored at the date of the event or end of the observation period, December 31, 2013. All analyses were performed using Stata, version SE 15 (StataCorp).

RESULTS

Cohort Characteristics

Of the 3,284 in the cohort who were 65 years or older receiving hemodialysis for 6 or more months, 24.4% (n = 801) died within the next year and 33.9% (n = 1,112) did not have a second SF-12 PCS at least 300 days apart, resulting in an analytic cohort of 1,371 (Fig 1). Compared with those who were excluded for death, members of the analytic cohort had fewer central venous catheters (7.8% vs 11.6%) and hospitalizations (54.9% vs 86.1%) and higher mean baseline SF-12 PCSs (35.4 [SD = 9.7] vs 32.6 [SD = 9.6]; Tables 1 and S1). Table 1 shows baseline characteristics of the cohort stratified by hemodialysis access type. Most (67.2%; n = 922) cohort members had an AVF. Compared with those with an arteriovenous graft or central venous catheter, those with AVFs were more likely to be men, have lower Charlson comorbidity index scores, not have dual Medicare-Medicaid eligibility, and have a shorter time on dialysis (Table 1).

SF-12 PCS Change

Table S1 shows baseline cohort characteristics stratified by SF-12 PCS change. On average, the analytic cohort had a minimal SF-12 PCS change of −0.9 (SD = 9.6) points over 399 (SD = 74) days. However, there was substantial variability, with 39.3% (n = 539) and 32.2% (n = 442) having clinically relevant (SF-12 PCS change ≥ 3 points) SF-12 PCS decline and improvement, respectively. Severe SF-12 PCS decline of at least 10 points occurred in 16.0% (n = 219), while 12.2% (n = 167) had SF-12 PCS improvement of at least 10 points.

There was no visual trend in SF-12 PCS change by age (Fig 2). When cohort members were grouped by time on dialysis (<5, 5-9, 10-14, and ≥15 years; Fig 3), minimal SF-12 PCS change (absence of SF-12 decline or improvement of at least 10 points) occurred in the majority (70%-74%).

Characteristics Associated With Any SF-12 PCS Change

Albumin level and access type, our primary exposure variables, were not associated with SF-12 PCS change after adjustment (Table 2). Kt/V had a statistically significant, though not clinically relevant, association with SF-12 PCS change (β = −1.03; 95% confidence interval [CI], −1.95

Table 1. Cohort Characteristics by Hemodialysis Access Type

Characteristic	Total (N = 1,371)	AVF (N = 922)	AVG (N = 342)	CVC (N = 107)	P
Age, y	79.9 (4.5)	79.85 (4.43)	79.84 (4.48)	80.76 (4.59)	0.13
Sex					<0.001
Female	694 (50.6%)	403 (43.7%)	215 (62.9%)	76 (71.0%)	
Male	677 (49.4%)	519 (56.3%)	127 (37.1%)	31 (29.0%)	
Race[a]					<0.001
White	675 (49.3%)	493 (53.5%)	131 (38.3%)	51 (48.1%)	
African American	419 (30.6%)	237 (25.7%)	144 (42.1%)	38 (35.8%)	
Hispanic	178 (13.0%)	127 (13.8%)	41 (12.0%)	10 (9.4%)	
Other	98 (7.2%)	65 (7.0%)	26 (7.6%)	7 (6.6%)	
Charlson comorbidity index score	7.2 (1.3)	7.19 (1.32)	7.28 (1.39)	7.56 (1.17)	0.02
Medicare coverage	1,350 (98.5%)	907 (98.4%)	337 (98.5%)	106 (99.1%)	0.9
Dual-eligible coverage	293 (21.4%)	180 (19.5%)	82 (24.0%)	31 (29.0%)	0.03
Kt/V (n = 1,365)[b]	1.70 (0.29)	1.70 (0.28)	1.75 (0.30)	1.61 (0.33)	<0.001
Hemoglobin, g/dL (n = 1,370)	10.9 (1.0)	10.9 (1.0)	10.9 (1.0)	11.0 (1.0)	0.3
Albumin, g/dL (n = 1,370)	3.9 (0.3)	4.0 (0.3)	3.9 (0.3)	3.9 (0.4)	0.007
Time on dialysis, y	6.1 (3.1)	5.9 (2.9)	6.5 (3.2)	6.4 (3.6)	0.002
Days between SF-12 PCSs[c]	398.6 (74.4)	398.4 (74.5)	402.3 (76.5)	388.4 (66.5)	0.2
First SF-12 PCS	35.4 (9.7)	35.5 (9.7)	35.7 (9.5)	33.6 (10.6)	0.1
Second SF-12 PCS	34.5 (9.8)	34.6 (9.9)	34.0 (9.4)	34.6 (10.2)	0.6
SF-12 PCS change	−0.9 (9.6)	−0.9 (9.7)	−1.7 (9.3)	1.0 (9.7)	0.05
SF-12 PCS change					0.4
Decline ≥ 3 points	539 (39.3%)	366 (39.7%)	139 (40.6%)	34 (31.8%)	
Any change < 3 points[d]	390 (28.4%)	253 (27.4%)	100 (29.2%)	37 (34.6%)	
Improvement ≥ 3 points	442 (32.2%)	303 (32.9%)	103 (30.1%)	36 (33.6%)	
Any hospital admission[e]	753 (54.9%)	495 (53.7%)	195 (57.0%)	63 (58.9%)	0.4
Mortality					0.0
Alive as of 12/31/2013	1,259 (91.8%)	855 (92.7%)	311 (90.9%)	93 (86.9%)	
Died on or before 12/31/2013	112 (8.2%)	67 (7.3%)	31 (9.1%)	14 (13.1%)	

Note: Data expressed as number (percent) or mean (standard deviation) based on a total of 1,371 participants, unless otherwise specified.
Abbreviations: AVF, arteriovenous fistula; AVG, arteriovenous graft; CVC, central venous catheter; SF-12 PCS, 12-Item Short Form Health Survey physical component score.
[a]Missing race in analytic cohort (n = 1).
[b]Kt/V expressed with 2 significant figures to show difference between comparison groups.
[c]Days between PCSs is defined as number of days since first SF-12 PCS since January 1, 2012, and first PCS 300 or more days later.
[d]Either decline or improvement of less than 3 points in SF-12 PCS.
[e]Any hospital admission defined as presence of at least 1 hospitalization between 2012 and 2013.

to −0.11; Table S2). Tests for interaction of age by time on dialysis and access by time on dialysis were not significant. Post hoc analyses determined that the marginal probability of continuous adjusted PCS change met or exceeded the clinical cutoff for severe decline (at least 10 points). The adjusted probability of SF-12 PCS decline of at least 10 points was 17%, 19%, and 13% for AVF, arteriovenous graft, and central venous catheter access types, respectively. The adjusted probability of SF-12 PCS decline of at least 10 points varied minimally, from 17% to 18%, at 0.10 increments of albumin level from 2.6 to 4.8 g/dL (cohort range).

SF-12 PCS Change and Mortality

During a median follow-up of 151 days, there were 112 (8.2%) deaths among the 1,368 cohort members with time available for observation for death (ie, 3 cohort members experienced their second PCS assessment on December 31, 2013). In unadjusted and adjusted analyses,

there was no association between SF-12 PCS change and mortality (hazard ratio [HR], 0.98, 95% CI, 0.96-1.00). There was no association between second SF-12 PCS and mortality (HR, 0.99; 95% CI, 0.96-1.01; Table 3).

DISCUSSION

Using SF-12 PCS as a functional status measure in a survivor cohort of older hemodialysis patients, we found tremendous heterogeneity in functional status change; nearly 40% of patients had a clinically relevant SF-12 PCS decline and 30% had improvement over approximately 1 year. We were unable to assess functional status change in one-fourth of the cohort who were excluded for death before the second SF-12 PCS. This high annual mortality rate in a cohort of older adults receiving hemodialysis highlights that interim functional status changes preceding death could not be captured because SF-12 PCS was administered annually. Among those who survived to have a second SF-12 PCS, SF-12 PCS change, as well as most
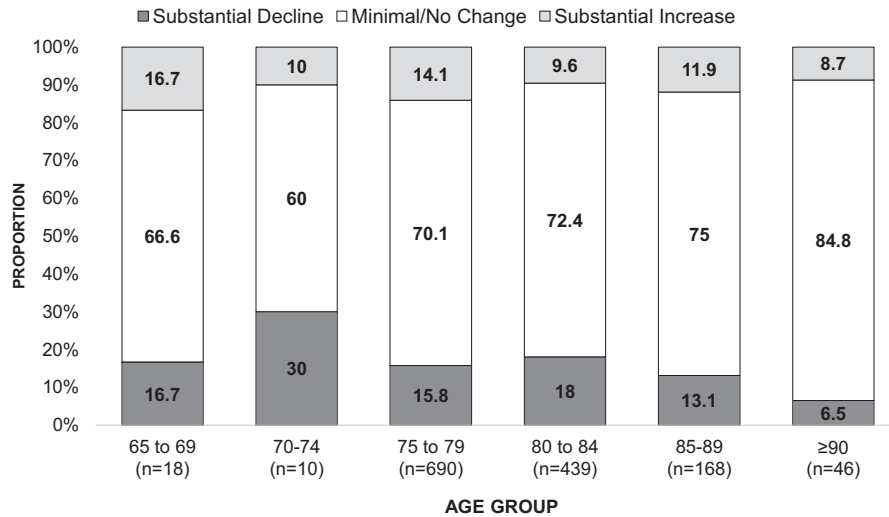
Figure 2. The 12-Item Short Form Health Survey (SF-12) physical component score (PCS) change in older hemodialysis patients by age group. Within each age group, each bar delineates the proportion with substantial SF-12 PCS improvement or decline (SF-12 PCS change by ≥10 points) or minimal SF-12 PCS change. The size of each age group is shown in the axis label.

recent SF-12 PCS, was not associated with mortality. Further, traditional risk factors for adverse events in this population, both potentially modifiable risk factors (albumin level and access type) and nonmodifiable (age, race, and time on dialysis) were not associated with SF-12 PCS change in this time frame.

This suggests that a wide range of older dialysis patients are potentially at risk for functional decline that was not seen to be attributable to those risk factors and potentially not identified by annual SF-12 PCS. These findings suggest that annual SF-12 PCS change, as a measure of functional status change, may not consistently identify high-risk

patients. Further research is needed to identify the best tool(s) and appropriate frequency for assessing functional status changes in older adults receiving dialysis.

Our study contributes to the growing body of evidence that older adults receiving dialysis are a particularly vulnerable population at high risk for both death and functional decline. It is notable that nearly one-fourth of our initial cohort died before the next year's SF-12. Although trajectory of functional decline in end-stage kidney disease survivors has been previously characterized as progressive and interspersed with periods of significant decline often due to hospitalizations,[17] few studies
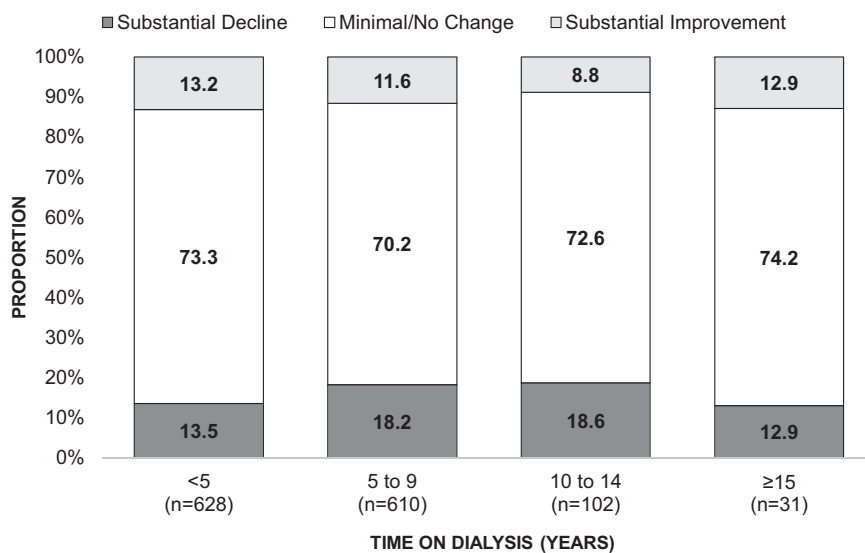

Figure 3. The 12-Item Short Form Health Survey (SF-12) physical component score (PCS) change in older hemodialysis patients by time on dialysis. Within each time on dialysis subgroup, each bar delineates the proportion with substantial SF-12 PCS improvement or decline (SF-12 PCS change by ≥10 points) or minimal SF-12 PCS change. The size of each group is shown in the axis label.

Table 2. Unadjusted and Adjusted Associations Between Patient Characteristics and SF-12 PSC Change

	Unadjusted β (95% CI)	Adjusted β (95% CI)
Albumin, per g/dL	−0.07 (−1.73 to 1.58)	0.02 (−1.67 to 1.71)
Access type		
AVF (reference)	—	—
Catheter	2.04 (0.12 to 3.97)	1.84 (−0.14 to 3.82)
AVG	−0.72 (−1.90 to 0.47)	−0.62 (−1.85 to 0.60)

Note: Analyses conducted on complete cases, n = 1,363, and were adjusted for age, Charlson comorbidity index score, albumin level, Kt/V, hemoglobin level, time on dialysis, days between SF-12 PCSs, sex, race, dual-eligible insurance coverage, and hospitalization during follow-up. See Table S2 for effect estimates of covariates.
Abbreviations: AVF, arteriovenous fistula. AVG, arteriovenous graft; CI, confidence interval; SF-12 PSC, 12-Item Short Form Health Survey physical component score.

explore longitudinal changes in self-reported measures of functional status.

One US study demonstrated that almost equal proportions of patients had an improvement and a worsening in frailty score annually,[18] similar to the pattern of SF-12 PCS change found in this study. A larger international cohort study with an average age of 62 years showed a mean annual SF-12 PCS change of −0.4 (SD = 8.8) points,[15] a smaller decline than seen in our cohort. Perl et al[15] showed that SF-12 PCS change had an association with mortality that was attenuated when accounting for the most recent SF-12 PCS.

In contrast, our study focuses on an older US cohort and found no association of SF-12 PCS change or most recent

Table 3. Adjusted Association of SF-12 PCS Change and Mortality

	Model 1 HR (95% CI)	Model 2[a] HR (95% CI)
SF-12 PCS change, per point	0.98 (0.96 to 1.00)	0.98 (0.96 to 1.01)
Age, per y	1.06 (1.02 to 1.10)	1.06 (1.02 to 1.10)
Sex		
Female (reference)	—	—
Male	1.05 (0.72 to 1.53)	1.1 (0.75 to 1.61)
Race		
White (reference)	—	—
African American	0.39 (0.23 to 0.68)	0.41 (0.24 to 0.70)
Hispanic	0.62 (0.33 to 1.16)	0.65 (0.35 to 1.21)
Other	0.62 (0.27 to 1.43)	0.64 (0.28 to 1.48)
Time on dialysis, per y		
Second SF-12 PCS, per point	—	0.99 (0.96 to 1.01)

Note: Analyses conducted on complete cases, n = 1,367, and were adjusted for all covariates shown in the table.
Abbreviation: CI, confidence interval; HR, hazard ratio; SF-12 PCS score, 12-Item Short Form Health Survey physical component score.
[a]Model 2 adjusts for second SF-12 PCS.

SF-12 PCS with mortality. Our report contributes to the literature through its emphasis on SF-12 PCS changes in older adults, demonstrating that although similar proportions of older adults who survived at least 6 months of dialysis had either minimal changes or improvement in SF-12 PCSs in a year, the largest proportion, 39%, had a clinically relevant decline in SF-12 PCSs. This is likely an underestimate of the true proportion who experienced decline because the 29% of survivors with missing SF-12 PCSs were more likely to be missing due to illness or major change in status (eg, initiation of hospice) associated with functional decline. Functional decline also likely occurred in a proportion of the 8% who subsequently died after completing the second SF-12 PCS.

Although SF-12 PCS is a reasonable measure of functional status, we did not identify meaningful clinical characteristics associated with SF-12 PCS change. The likelihood of experiencing a significant decline in SF-12 PCSs was similar in patients with varying hemodialysis access types and albumin levels. Because nearly one-fourth were excluded for death, this finding may be representative of the analytic cohort and not true absence of association. However, that so many died before the second SF-12 PCS hints that annual assessment is not frequent enough for this population. For those who died before the next annual assessment, more frequent assessment may have allowed for measures preceding death that may signify functional decline. For those who survived to a second SF-12 PCS, comparisons of annual SF-12 PCSs may not fully represent functional status changes over the prior 12 months. This explanation is plausible because the SF-12 PCS items ask patients to recall their physical health in the prior 4 weeks. Once a frail older adult is limited in daily activities or even nonambulatory, there is a floor effect in response to SF-12 PCS items such that further declines in functional status could not be detected.[19] Overall, recognition of functional status decline and associated clinical characteristics would likely be enhanced by serial assessments of ADLs as described in existing tools for assessing functional decline.[20]

Although the SF-12 PCS predicts mortality,[7,15] we did not find an association between SF-12 PCS change (or most recent SF-12 PCS) and mortality. While this finding may be due to insufficient power, it could also be partially explained by the unique subset of dialysis patients represented in our analytic cohort, older adults who started dialysis at an advanced age and have survived with dialysis for at least 3 years. This analytic cohort had on average lower Charlson comorbidity index scores, higher SF-12 PCSs, and fewer hospitalizations than those excluded for death (Table S1). Although it may appear to be a survival advantage, they remain representative of patients in US dialysis units who commonly experience new functional decline characterized by ADL difficulty that is not identified by the SF-12 PCS.[21]

Our findings suggest that SF-12 PCS change is less informative in an older segment of the dialysis population,

particularly if patients have already adapted to low physical function or activity. Instead, objective physical performance measures (eg, timed up and go, gait speed, and chair stand) may more accurately assess functional decline than the SF-12 PCS because they can identify subtle changes in physical function before identified by self-report.[22] While an objective measure may have led to a different finding in this study, such measures, unlike the SF-12, are not currently part of routine care in dialysis units. Alternative subjective measures may include instruments to identify non–disease-specific problems that are common in older adults receiving dialysis (eg, cognitive impairment, polypharmacy, and falls) that may better indicate functional decline and have a greater association with mortality than SF-12 PCS change.[23]

Overall, this study highlights that clinicians and social workers in dialysis units should acknowledge that SF-12 PCS changes may not be meaningful for older dialysis patients. Practically, SF-12 PCS decline may be a useful indicator to prompt additional inquiry into a patient's level of independence. Still, additional research is warranted to confirm the appropriate approach to early recognition of functional decline in dialysis units.

An interesting finding from our analyses is that a substantial proportion (32%) of cohort members experienced a clinically relevant improvement in SF-12 PCSs in a year. Thus, older dialysis patients who survive are experiencing both an improvement and a decline in SF-12 PCS, a pattern that has been previously reported in community-dwelling older adults.[24] A study of monthly assessments of functional status revealed that it is common for older adults to experience functional disability that is followed by recovery.[24] Here, improvement in SF-12 PCS may reflect recovery after a period of disability. This suggests that there may be opportunities for interventions to prevent decline or promote functional recovery in this highly vulnerable population. A longitudinal cohort study with frequent evaluation of functional status in older dialysis patients, and their association with common geriatric syndromes, is needed to better understand functional trajectories in this population and potential intervention targets.

Our study's primary strength lies in the availability of patient-reported functional status, through the KDQOL-36, in a nationally representative cohort of prevalent older hemodialysis patients.

However, this study has limitations. First, our outcome assessment was limited to only 2 time points for assessing SF-12 PCS change in a cohort with varying time on dialysis. Thus, our findings do not represent the extent of SF-12 PCS change since dialysis initiation. Additional time points will provide more accurate representation of decline or improvement in functional status over time and how it predicts sentinel events (eg, hospitalization, institutionalization, and death).

Second, our covariates could only be assessed at baseline so our models were unable to account for changes in albumin level, hemodialysis access type, and comorbid conditions. However, these changes may be partially represented in the model by hospitalization events. Also, we did not have access to key information that could elucidate factors that contribute to functional status change (eg, social support, new chronic conditions, primary hospitalization diagnoses, and geriatric syndromes).

Finally, one-third of our cohort died before an opportunity to have a second SF-12 PCS. As a result, our findings reflect a survivor cohort with potentially better self-reported physical function over time and lower mortality risk than those who experienced death earlier in the observation period.

In conclusion, it is common for older adults who survive the first 6 months of dialysis to experience a clinically relevant decline in functional status, as measured using the SF-12 PCS, within any given year. However, the extent of SF-12 PCS change does not demonstrate an association with known risk factors of limited health status nor does it have an association with subsequent mortality. Because functional decline is an important risk factor for morbidity and mortality for older adults, additional efforts to identify the most appropriate tool for detecting functional decline in those receiving dialysis is warranted.

SUPPLEMENTARY MATERIAL

Supplementary File (PDF)

Table S1: Characteristics of Cohort Members Included (grouped by clinically relevant SF-12 PSC change) and Excluded From the Analytic Cohort

Table S2: Unadjusted and Adjusted Associations Between Clinical Characteristics and SF-12 PSC Change

ARTICLE INFORMATION

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