The Perceived Medical Condition Self-Management Scale can be applied to patients with chronic kidney disease

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Chronic Kidney Disease (CKD) is a major burden on patients and the health care system. Treatment of CKD requires dedicated involvement from both caretakers and patients. Self-efficacy, also known as perceived competence, contributes to successful maintenance of patient's CKD self-management behaviors such as medication adherence and dietary regulations. Despite a clear association between self-efficacy and improved CKD outcomes, there remains a lack of validated self-report measures of CKD self-efficacy. To address this gap, the Perceived Kidney/Dialysis Self-Management Scale (PKDSMS) was adapted from the previously validated Perceived Medical Condition Self-Management Scale. We then sought to validate this using data from two separate cohorts: a cross-sectional investigation of 146 patients with end-stage renal disease receiving maintenance hemodialysis and a longitudinal study of 237 patients with CKD not receiving dialysis. The PKDSMS was found to be positively and significantly correlated with self-management behaviors and medication adherence in both patient cohorts. The PKDSMS had acceptable reliability, was internally consistent, and exhibited predictive validity between baseline PKDSMS scores and self-management behaviors across multiple time points. Thus, the PKDSMS is a valid and reliable measure of CKD patient self-efficacy and supports the development of interventions enhancing perceived competence to improve CKD self-management.

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Chronic kidney disease (CKD) affects more than 13% of individuals in the United States.[1] Favorable outcomes are attainable, but are impossible without sufficient ability of patients to manage their care when away from the treatment facility.[2] Chronic disease self-management can be defined as a set of skilled behaviors performed to manage one's own illness.[3] CKD patients must be able to perform activities to manage CKD-related symptoms such as excessive thirst, sleep problems, muscle cramps, and edema.[2] They must also be able to take prescription medications;[4] care for vascular accesses if receiving dialysis;[5] and maintain diet, exercise, fluid intake, and vaccination recommendations.[6] Unfortunately, participation in these self-management behaviors by patients with kidney disease is low,[5,7,8] often due to impaired understanding of the tasks and their importance for sustained good health. Nonadherence to self-care behaviors has been associated with increased mortality risk.[9–11]

A number of psychological factors contributing to enhanced adherence and better treatment outcomes in CKD patients have been identified.[12] Self-efficacy,[13] the self-belief that one can successfully carry out a specific behavior in a specific situation, has been shown to be predictive of improved health behaviors and outcomes broadly[14–16] and in CKD specifically.[4,8] In the few studies of self-efficacy in CKD,[17–25] a broad range of scales have been used, ranging from generalized self-efficacy[19,26] to self-efficacy in restricting dietary sodium.[20] Overall, the literature supports that self-efficacy in CKD is positively associated with medication adherence, quality of life, treatment adherence, education, and self-care behaviors, and negatively associated with depression, with gender and age having been shown to be modifying factors.[21–25]

Perceived competence[15,27] is a term used to describe a more general concept of self-efficacy that similarly contributes to the belief that one can perform goal-directed behaviors across situations to ultimately achieve desired outcomes. Because Bandura's definition of self-efficacy relates to specific behaviors, measures of perceived competence can be more readily applied to chronic diseases, which require a coordination of many behaviors during the course of treatment. Guided by early measures of perceived competence,[11,28,29] the Perceived Medical-Condition Self-Management Scale

(PMCSMS) was designed as a generic template to measure perceived competence that could be modified for use with a variety of diseases.[30] Since then, condition-specific versions using the PMCSMS template have been found to be reliable and valid among persons with diabetes, HIV/AIDS, and various rheumatologic conditions.[30–32]

Despite the associations between health-related self-efficacy and positive health outcomes, there remains a lack of a brief, validated measure of *perceived health competence* as it relates to CKD. One measure, the 25-item chronic kidney disease self-efficacy (CKD-SE) instrument was validated in a population of Taiwanese patients with CKD.[19] It has been used in pilot studies and displays good psychometric qualities. However, the length of the CKD-SE measure limits its utility in clinical settings. Thus, a brief, efficient measure of CKD-specific perceived health competence is still necessary.

The objective of this study is to describe the psychometric properties of an 8-item CKD-specific version of the PMCSMS. The scale examined is not a new instrument, but rather an adaptation of a previously validated template designed to be tailored to specific medical conditions. Based upon previous findings using the PMCSMS, the Perceived Kidney/Dialysis Self-Management Scale (PKDSMS) is expected to be internally consistent and stable over time. To establish the construct validity of the PKDSMS in patients with kidney disease, we compared the results of this self-management self-efficacy scale with an index of self-management behaviors and with health outcomes. Specifically, we hypothesized that higher perceived competence would be related to higher health literacy, better overall health status, more kidney disease self-care behaviors, and lower blood pressure and serum phosphorus levels.

RESULTS

Data from 2 separately collected participant samples (Table 1) were used to validate the PKDSMS. The first sample is from a cross-sectional evaluation of the PKDSMS and other psychosocial measures in patients receiving hemodialysis (HD). The second sample is from a short-term, longitudinal clinical trial that investigated the efficacy of an educational intervention on medication adherence in nondialysis CKD clinic patients. The study populations differed in severity of kidney disease and demographic composition, though both studies recruited from the same geographic region.

Participant characteristics

The HD sample consisted of 51% men, with 72% self-reporting their race as non-White, with the majority reporting as Black or African American. On average, the 146 participants were 52 years old (SD: 14), received HD therapy for 4 years, completed 12.8 (SD: 3.1) years of school, and had a serum phosphorus level of 6.0 mg/dl. Approximately 26% of the sample reported a yearly income less than $10,000, while a similar percentage reported an income of more than $40,000 per year. Nearly two-thirds of the participants self-rated their health as "good to excellent" while the remaining rated it as "fair" or "poor."

Table 1 | Participant characteristics

Characteristic	Dialysis sample Median (IQR)	CKD sample Median (IQR)
Age (yr)	51 (42, 63)	59 (50, 67)
Education (yr)	12 (12, 14)	14 (12, 16)
Hemodialysis duration (yr)	3 (1, 6)	N/A
Body mass index	28.5 (23.6, 33.7)	29.5 (25.1, 35.0)
Health literacy	12 (10, 14)	14 (11, 15)
	Percent (*N*)	**Percent (*N*)**
Gender		
Male	51.4% (75)	44.7% (106)
Female	48.6% (71)	55.3% (131)
Race		
Non-White	72.0% (105)	19.8% (47)
White	25.3% (37)	83.1% (197)
Income		
< $20K per year	42.0% (61)	20.0% (48)
$20K–$39.9K	31.5% (45)	23.3% (56)
>$40K per year	25.9% (37)	56.6% (136)
Previous attendance at kidney disease education class		
Yes	34.6% (44)	28.6% (65)
No	65.4% (83)	71.4% (162)
Diabetes diagnosis		
Yes	31.5% (46)	43.0% (105)
No	67.1% (98)	57.0% (139)
Self-rated health		
Poor or fair	35.6% (52)	32.1% (76)
Good	42.5% (62)	46.4% (110)
Very good	8.2% (12)	16.5% (39)
Excellent	12.3% (18)	1.7% (4)
CKD stage		
3 (eGFR = 30–60ml/min/1.73 m^2)	N/A	46.0% (109)
4–5 (eGFR< 30ml/min/1.73 m^2)		54.0% (128)

CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate; IQR, interquartile range.

The CKD sample consisted of 55% women, 83% of whom self-identified their race as White, while 16% identified themselves as Black or African American. On average, the 237 participants were 57 years old (SD: 12), had an estimated glomerular filtration rate (eGFR) of 32.7 ml/min/1.73 m^2 (SD: 14.0), a systolic blood pressure of 137 mm Hg at baseline, and had completed 14.0 years of school (SD: 3.0). Approximately 6% of participants reported an annual income of less than $10,000 per year, while 38% reported an annual income of $60,000 or more. Approximately two-thirds of participants endorsed their health in general as "good" to "excellent" (Table 1).

Performance on the PKDSMS

For the 146 participants in the HD sample, the mean item scores for the PKDSMS ranged from 2 to 5 (on a scale of 1 to 5), with a grand item mean of 3.84. For the 237 participants in the CKD sample, the average item scores on the PKDSMS ranged from 1.71 to 5, with a grand item mean of 3.85 (Table 2). Therefore, on average, participants in both studies somewhat agreed that they could self-manage their kidney

Table 2 | Item wording and descriptive statistics for the Perceived Kidney Disease Self-Management Scale (PKDSMS)

PKDSMS item wording	Dialysis item mean (SD) (N = 146)	Kidney disease item mean (SD) (N = 237)
It is difficult for me to find effective solutions for problems that occur with managing my kidney disease (dialysis).[a]	3.67 (1.22)	3.84 (1.12)
I find efforts to change things I don't like about my kidney disease (dialysis) are ineffective.[a]	3.44 (1.35)	3.68 (1.22)
I handle myself well with respect to my kidney disease (dialysis).	4.13 (1.16)	3.93 (1.07)
I am able to manage things related to my kidney disease (dialysis) as well as most other people.	4.16 (1.11)	4.04 (1.00)
I succeed in the projects I undertake to manage my kidney disease (dialysis).	3.85 (1.11)	3.77 (1.06)
Typically, my plans for managing my kidney disease (dialysis) don't work out well.[a]	3.85 (1.22)	3.95 (1.14)
No matter how hard I try, managing my kidney disease (dialysis) doesn't turn out the way I would like.[a]	3.74 (1.39)	3.79 (1.21)
I'm generally able to accomplish my goals with respect to managing my kidney disease (dialysis).	3.95 (1.21)	3.78 (1.10)
Total score	30.75 (5.96)	30.77 (6.08)
Average item score	3.84 (0.75)	3.85 (0.76)
Cronbach's α	0.76	0.83

[a]Item reverse-scored.

disease. Individual item responses ranged from 1 to 5 for every item, indicating that the full range of responses was utilized by participants. Patients in the CKD sample with stage 3 CKD (eGFR: 30–60 ml/min/1.73 m^2), had a virtually identical mean score on the PKDSMS ($\mu = 0.012$, $P = 0.99$) to those with stage 4 or 5 CKD (eGFR: <30 ml/min/1.73 m^2). This suggests that severity of disease did not significantly impact responses on the PKDSMS.

Internal consistency and test-retest reliability of the PKDSMS

Item analyses of the PKDSMS revealed a Cronbach's alpha of 0.76 in the HD sample based on an average inter-item correlation of 0.29, and an alpha of 0.83 based on an average inter-item correlation of 0.39 in the CKD sample. The item analyses also revealed that Cronbach's alpha would not be meaningfully improved if any 1 item were to be deleted from the 8-item scale, thus all 8 items were retained (Table 2).

Test-retest reliability analysis using data from the longitudinal CKD sample found that the PKDSMS was stable over multiple administrations. When analyzed in the pilot trial's control group participants, the correlation between the baseline and 3-month administration of the PKDSMS was moderate: $r = 0.47$, 95% CI (0.30–0.61), $P < 0.0001$. This moderate correlation held even when baseline and 6-month administrations were compared: $r = 0.47$, 95% CI (0.31–0.61), $P < 0.0001$.

Validity of the PKDSMS

Table 3 shows the correlations between PKDSMS scores and measures of self-management behaviors and health outcomes. The strongest relationship (CKD sample: $r = 0.29$, 95% CI [0.17–0.40]; HD sample: $r = 0.27$, 95% CI [0.11–0.42]) was with the summary score for the Kidney Disease Behavior Inventory (KDBI). Also as shown in Table 3, the PKDSMS correlated significantly in the HD sample, with 7 of the 16 self-management behaviors that constituted the KDBI and with 9 of the 14 self-management behaviors in the CKD sample.

In both samples, the relationship between the PKDSMS scores and measures of self-reported health status (CKD sample: $r = 0.26$, 95% CI [0.13–0.37]; HD sample: $r = 0.30$, 95% CI [0.15–0.44]) and health literacy (CKD sample: $r = 0.14$, 95% CI [0.01–0.27]; HD sample: $r = 0.26$, 95% CI [0.10–0.40]) were positive and significant. PKDSMS scores were not significantly related to any of the selected demographic or background variables: age, gender, race, years of education, number of years receiving dialysis, family income, or having taken a renal replacement therapy education class. The PKDSMS was negatively associated with serum phosphorus ($r = -0.20$, 95% CI [–0.35,–0.04], $P < 0.05$) in the HD sample, and for the CKD sample with 3-month ($r = -0.24$, 95% CI [–0.38,–0.09], $P < 0.01$) and 6-month ($r = -0.22$, 95% CI [–0.34,–0.08], $P < 0.01$) systolic blood pressure. Regression analyses adjusting for age, gender, education, and eGFR found that higher PKDSMS scores remained associated with systolic blood pressure at 3 months (β [95% CI]: –0.69 [–1.38 to –0.01]; $P = 0.048$) and 6 months (–0.55 [–1.11 to 0.02]; $P = 0.057$), although no longer statistically significant. PKDSMS scores were not significantly associated with baseline systolic blood pressure in this sample.

Relationship of PKDSMS scores to follow-up self-care behaviors in non-dialysis CKD

The PKDSMS for the 113 participants in the usual care arm of the CKD sample were used to predict self-care behaviors at the study's 3- and 6-month time points. Results from this sample showed that participants' scores on the baseline PKDSMS were significantly, positively correlated with the KDBI at the 3-month ($r = 0.20$, 95% CI [0.00–0.38], $P = 0.05$) and 6-month ($r = 0.27$, 95% CI [0.09–0.44], $P < 0.01$) time points. Regression models adjusting for age, gender, education and eGFR showed similar findings (β [95% CI]: 0.32 [0.15–0.47]; $P < 0.001$).

Table 3 | Item wording and item means of the Kidney Disease Behavior Inventory (KDBI)

Item wording	Dialysis sample item mean (SD) ($N = 119$)	Correlation with PKDSMS	CKD sample item mean (SD) ($N = 213$)	Correlation with PKDSMS
Checked your blood sugar levels	1.17 (1.30)	*NS*	2.12 (1.02)	*NS*
Checked your blood pressure at home	1.38 (1.21)	0.18[a]	1.50 (1.03)	0.13[a]
Checked your weight between dialysis	1.48 (1.20)	0.25[b]	N/A	N/A
Kept track of laboratory results related to your kidney disease	2.00 (1.04)	*NS*	2.00 (1.10)	0.21[b]
Kept track of symptoms related to your kidney disease	2.02 (0.99)	*NS*	1.83 (1.08)	0.15[a]
Kept track of thoughts and feelings about your health	1.65 (1.03)	*NS*	1.92 (0.96)	0.14[a]
Taken medications as prescribed	2.67 (0.69)	0.21[a]	2.71 (0.48)	0.22[b]
Taken a medication in different ways than prescribed	2.76 (0.65)	*NS*	2.86 (0.45)	*NS*
Not taken a prescribed medication	2.55 (0.86)	–0.19[a]	2.74 (0.68)	*NS*
Taken herbs, non-prescribed vitamins, or other natural remedies	2.65 (0.81)	*NS*	2.50 (0.92)	*NS*
Followed your kidney diet plan	2.01 (0.92)	0.41[b]	1.70 (0.99)	0.16[a]
Chosen healthier food to eat	2.07 (0.89)	0.27[b]	2.01 (0.68)	0.27[b]
Exercised or stretched for 20 minutes or more	1.24 (1.09)	*NS*	1.52 (1.09)	0.20[b]
Taken time to unwind and feel better	2.03 (0.98)	0.19[a]	1.75 (0.84)	0.24[b]
Missed dialysis treatments	2.70 (0.65)	*NS*	N/A	N/A
Missed visits with your doctor	2.71 (0.65)	*NS*	2.83 (0.45)	*NS*
Total Score	32.47 (7.15)	0.27[b]	28.33 (5.80)	0.29[b]
Average Item Score	2.07 (0.56)		2.14 (0.48)	
Cronbach's α	0.74		0.69	

NS = $P > 0.05$.
[a]$P < 0.05$.
[b]$P < 0.01$.

DISCUSSION

The results of this study indicate that the PKDSMS, a kidney disease-specific scale modified from the PMCSMS template, is a reliable and valid assessment of self-efficacy or perceived competence in performing self-management behaviors related to kidney disease care. The PMCSMS had been previously validated for use when tailored to address other chronic illnesses (e.g., diabetes[30] and HIV[32]) and can be confidently applied in patients with kidney disease. Further, the similar performance of the HD and CKD samples, as well as the lack of difference between patients with stage 3 and stage 4 or 5 CKD, indicates that the PKDSMS can be used across the range of kidney disease severity. These findings add to previously published CKD research supporting the relationship between self-efficacy and self-management behavior,[4,17,19,33] and are consistent with Bandura's social cognitive theory[34] which would posit that patients' perceived ability to perform goal-oriented tasks is significantly related to their self-report of self-management activities. The finding that PKDSMS scores were not significantly related to any of the selected demographic variables demonstrates discriminant validity for the PKDSMS. The significant correlations found between the PKDSMS and self-care behaviors, while modest, are consistent with other studies describing factors contributing to self-care behaviors and clinical outcomes,[4,17,19,35,36] and still account for significant portions of the observed variance.

The PKDSMS benefits from being a measure of self-efficacy as it relates specifically to CKD. Perhaps in part due to construct validation concerns,[37] generalized self-efficacy has not been the construct of choice for most studies investigating self-efficacy in health care settings.[38] It should also be noted that there have been studies,[39] particularly from earlier self-efficacy research, that have used health locus of control measures to make claims about self-efficacy in patients with CKD and ESRD. However, it has been extensively noted in the literature that it is a misconception to infer health-related self-efficacy from health locus of control measures.[15,27,40] An internal health locus of control orientation merely signifies an individual believes in the relationship between their behavior and health outcomes, and does not necessarily mean that the individual feels capable of carrying out the behavior.[15] Instruments such as the PKDSMS, based on an easily modifiable template, are preferred as a measure of health self-efficacy than are measures of health locus of control beliefs.[40]

Based on the initial relationships with health outcomes examined in this study, interventions to increase CKD patients' self-management self-efficacy could be a target for future research. The correlations between the PKDSMS and both serum phosphorus and blood pressure are encouraging. Both phosphorus and blood pressure control are vital clinical assessments in the management of dialysis and CKD, respectively, and both are highly reliant on the patient's adherence to medications and treatment more generally. The opportunity to quickly screen patients with CKD or receiving dialysis to identify individuals with low perceived competence will be a valuable target for interventions to these behaviors and related health outcomes. Interventions such as integrative health coaching[41,42] and health literacy and numeracy-sensitive education[43] have been effectively applied in diabetes and other chronic diseases, and should be considered for CKD-specific perceived competence interventions.

Self-report of participating in self-management activities was relatively common in these CKD samples. Despite these

high scores, there was sufficient variability within the 2 samples for the correlations with CKD perceived competence of self-management to be statistically significant. This also indicates that although the scores are high, there is still room for improvement. The test-retest correlations among the 3 Kidney Disease Behaviors Index administrations in the CKD sample indicate that it too is a highly reliable instrument that can be another valuable tool for evaluating self-management in the context of kidney disease.

Though our sample of patients with CKD is relatively large and representative, the majority of those receiving dialysis consisted of non-White, Black, or African American participants. The demographic characteristics of the dialysis sample are, however, comparable to the demographic characteristics of individuals in the US diagnosed with ESRD.[44] Further testing with more diverse groups is needed to bolster the case for the measure's external validity and generalizability in dialysis more broadly. No measure of social desirability bias was included in this study, so we cannot rule out the influence of such a bias in the self-report of these behaviors. Moreover, self-care behaviors were measured by self-report, and these behaviors were not objectively verified. In the future, observation by professional medical personnel or additional clinical and behavioral measurements could further validate the frequency with which CKD patients actually perform self-care activities. However, self-report of behaviors, such as medication adherence, are widely accepted in both research and clinical quality improvement programs. Finally, although the temporal stability of other variants of the PKDSMS have been established previously, the measurement of consistency of the PKDSMS in the CKD sample over the course of a 3-month interval was longer than desirable for test-retest evaluation.

The PKDSMS is both an efficient and comprehensive measure, and future research can firmly establish its use to inform directed self-management interventions in place of generic self-management tools.[45] Future work will benefit from longitudinal designs that can elucidate causal relationships that may exist among self-efficacy, affect, optimism, and mood, and as a result further refine intervention targets to improve health behaviors and related health outcomes. Future work will also benefit from exploring any differences that may exist in these relationships across CKD disease severity. The PKDSMS, by demonstrating reliability and validity as a brief, usable measure of perceived competence, shows excellent promise as a tool for exploring these relationships and identifying avenues for interventions to improve CKD patient health outcomes and quality of life. The results of the present study illustrate the utility of the PKDSMS in research and its promise for potential future use in clinical practice.

METHODS

Participants and procedures

Cross-sectional evaluation of the PKDSMS in ESRD patients on hemodialysis. Participants in the hemodialysis sample were recruited from 4 outpatient dialysis units in the Nashville, TN, area, including 2 affiliated with Vanderbilt University Medical Center. Two hundred twenty-eight eligible patients were approached, of which 66 potential participants declined participation and 12 withdrew after giving written consent. The remaining 150 patients (66% of those eligible) were all English-speaking adults older than 18 years of age, receiving chronic HD for at least 1 month, with adequate vision and cognitive function. Four of these participants did not complete the PKDSMS and were therefore not used in analysis. After obtaining written informed consent, participants were administered self-report measures by trained research personnel and key laboratory values such as serum phosphorus were collected from medical record review. Most participants selected to complete the assessments just prior to or just after initiating the dialysis procedure.

Longitudinal evaluation of the PKDSMS in the cohort of CKD patients. Participants in the CKD sample were drawn from within a pilot randomized, controlled trial that recruited participants from a single general nephrology clinic at an academic medical center. The results of this trial have not yet been published. Four hundred twenty-one patients who met eligibility criteria of an eGFR less than 60 ml/min/1.73 m^2, no diagnosis of end-stage renal disease, no significant cognitive impairment, and who were English-speaking were approached. Of those patients, 148 declined participation and 12 withdrew after giving informed consent. The remaining 261 enrolled participants (62% of those approached) completed baseline surveys, with 125 randomized to the control condition and 136 completing an educational intervention with their physician. After giving written informed consent, participants completed surveys in the waiting room before meeting with their physician, after their visit, and again at 3 months and 6 months after enrollment. Clinical outcomes were collected at each time point, including blood pressure and eGFR. Eleven participants did not complete the PKDSMS at baseline and were not included in analysis. The final sample used in these analyses consisted of the 237 participants (113 control and 124 intervention) who completed the PKDSMS at baseline and at least 1 follow-up time point.

Each study was approved by the Vanderbilt University Institutional Review Board, and all participants gave written informed consent prior to research activities. A trained research assistant in each study performed data collection.

Measures

The measures described below were used in both groups of participants. Additionally, demographic information, clinical information abstracted from the electronic medical record, and a single self-report item assessing perceived health status (rated on a 5-point response scale from poor [0] to excellent [4]) were collected from participants.

Perceived Kidney/Dialysis Self-Management Scale (PKDSMS). The PKDSMS is an 8-item scale modified for use with CKD and dialysis patients by replacing "condition" in each item of the Perceived Medical Condition Self-Management Scale (PMCSMS) with the phrase "kidney disease" or "dialysis." The PMCSMS template was developed from 2 previous self-efficacy measures, the Personal Competence Scale (PCS)[28] and the Perceived Health Competence Scale (PHCS)[11], and was designed to be adapted to specific health conditions. It had been previously validated in diabetes[30] and HIV[32] and has been found to not significantly correlate with measures of social desirability bias.[31]

Similar to the Perceived HIV Self-Management Scale[32] and the Perceived Diabetes Self-Management Scale,[30] the PKDSMS was created to assess a patient's perceived ability to self-manage their CKD. Likert response options range from 1 = "strongly disagree" to

5 = "strongly agree" (Table 2). The instructions that preceded the measure oriented participants to assess it as it related directly to their kidney disease or dialysis. Following the precedent set by the previous iterations of the PMCSMS, the PKDSMS is treated as a unidimensional scale by reverse scoring the 4 negatively worded items (items 1, 2, 6, and 7) that signify low perceived competence or self-efficacy. Total scores could range from 8 to 40; the higher the score, the greater the perceived ability to self-manage their kidney condition. The PKDSMS takes approximately 2 to 3 minutes to administer and in the CKD sample was given prior to the educational intervention.

Brief Health Literacy Scale (BHLS). The BHLS is a 3-item measure of health literacy.[46] Questions address an individual's belief that they are capable of understanding and using written information presented to them in health contexts. Each item is scored on a 5-point response scale, with the first item being reverse-scored. The total score ranges from 3 to 15, with higher scores reflecting higher perceived health literacy. The scale has been validated for use in both research settings and routine clinical practice, as well as in patients receiving dialysis.[47,48]

Kidney Disease Behaviors Inventory (KDBI). The KDBI is a novel 16-item scale based on the Summary of Diabetes Self-Care Activities,[49] intended to measure an individual's self-reported completion of specific self-care activities required for kidney disease management. Self-care activities include keeping track of symptoms and laboratory results, attending scheduled appointments, maintaining exercise, diet, and stress reduction regimens, and medication adherence (Table 3). The participant is asked to report how often they perform these activities over the past month, and the 4-point response options range from 0 = "very slightly or not at all" to 3 = "quite a bit." Scores were summed over the 16 items for a range of scores from 0 to 48, with higher scores indicating a greater engagement in self-management behaviors. The total scores are analyzed as continuous data, while each individual behavior can also be evaluated as an ordinal variable. In the CKD sample, participants received a 14-item version of the scale which excluded 2 dialysis-specific behaviors related to missing dialysis treatments and managing fluids between dialysis visits.

Analysis of the 16-item KDBI for patients receiving dialysis showed a Cronbach's alpha of 0.74, based on an average inter-item correlation of 0.15, and for patients with CKD, a Cronbach's alpha of 0.69 with an average inter-item correlation of 0.15. For both versions, the internal consistency of the scale was not meaningfully improved by deleting any of the items. The range of responses on individual items was from 0 to 3 for every item, indicating that the full range of responses was utilized by respondents. The test-retest reliability of the KDBI among participants with CKD was found to be high between baseline and both the 3 month (r [204] = 0.67, 95% CI [0.58–0.74], $P < 0.0001$) and 6 month (r [234] = 0.66, 95% CI [0.58–0.73], $P < 0.0001$) time points.

Data analysis

Cronbach's alpha was calculated to assess the internal consistency reliability of the PKDSMS and the KDBI. Pearson product-moment correlations and matched-paired t-tests were used to examine relationships between PKDSMS scores and selected demographic and background variables, such as age, gender, race, education, income, having attended a renal replacement therapy options class, and self-rated health. Pearson product-moment correlations were also used to examine relationships between the PKDSMS with self-care behaviors. Significance was established at the 0.05 level (2-tailed). Test-retest reliability was examined using Pearson correlations on the data from the repeated administrations of the PKDSMS and KDBI to participants in the CKD sample. Data from this CKD sample control group was also used to investigate whether baseline perceived competence scores predicted later self-management behaviors and blood pressure. Regression analyses were performed adjusting for age, gender, education, and eGFR. All analyses were performed using IBM SPSS software (PASW Statistics 18.0) and R 3.3.0 using the psych package.[50] Before calculating scale scores for the PKDSMS, missing data were replaced with individual subject mean scores as long as 75% of the item responses were completed. Missing data were present in 6% of the dialysis sample and 2% of the CKD sample.

DISCLOSURE

All the authors declared no competing interests.

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