

Functional Status in CKD: What Measures to Use?

Sarah J. Schrauben^{1,2} and Alex R. Chang^{3,4}

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CKD is increasingly prevalent and is often called a model of “accelerated aging”; even early stages of CKD add ≥ 5 years to the aging process, increasing the likelihood of experiencing physical dysfunction and cognitive decline (1). CKD has sequelae beyond ESKD and cardiovascular disease, including functional limitations and disability, which occur at higher rates in patients with CKD than age-matched controls, even after accounting for comorbidities, such as cardiovascular disease and diabetes. Functional status has long been recognized as an important outcome in chronic disease and geriatric populations and is also an important determinant for kidney transplantation selection and for adequate disease self-management. The impairment of functional status is important to consider because of its widespread prevalence and link to decreased quality of life; increased risk of disability, falls, fractures, and depression; and increased health-care costs. However, much of the prior literature on functional decline has focused on individuals with ESKD or community-dwelling, older individuals. Less has been described about the functional status and burden of disability in patients with earlier-stage CKD. To prevent or mitigate functional limitations and disability, and to improve health outcomes in the CKD population, it is important to identify those at high risk of functional decline.

In the process of trying to prevent functional decline, the first step is to effectively assess functional status and establish whether measures of functional status are associated with adverse outcomes among people with earlier stages of CKD. Then, interventions can be designed and tested in patients with poor functional status who may benefit from preventative interventions to prevent adverse outcomes. Researchers in gerontology have developed standardized, performance-based tests to assess physical function that are inexpensive, easy to use, reproducible, and have low patient burden, such as the Short Physical Performance Battery (SPPB), or tasks encountered in daily life, such as the Lawton Instrumental Activities of Daily Living (IADL). Tests of physical function are highly predictive of healthcare utilization in older individuals (2). However, to date, performance-based tests are not routinely used in the

care of patients with CKD, and few data are available on the utility of performance-based tests in this population.

In this issue of *Kidney360*, in a prospective, observational, outpatient cohort study of 350 participants with stage 2–5 CKD from Baltimore, Maryland, Belkin *et al.* investigate the concordance of three performance-based functional assessments, and the relationship of these assessments—individually and as a summary measure—with death and CKD progression (50% decline in eGFR and/or ESKD) to understand their potential predictive value for adverse clinical outcomes. The authors specifically assessed two domains of functional status (physical and cognitive status) and a domain further downstream from impaired poor functional status—functional independence (or absence of disability). The authors analyzed data from 350 participants who completed the SPPB to measure physical function, the Modified Mini-Mental Status Exam (M3SE) to measure cognitive function, and the Lawton IADL to measure functional independence.

Research is growing for the importance of these measures of function to link to important clinical and patient-reported outcomes, but cut points for low and adequate levels of functioning or what constitutes meaningful change of these measures in the CKD population has not been established. Due to this lack of evidence and the non-normal distribution of these scores, the authors chose to dichotomize the measures on the basis of the median scores of each measure, classifying participants as “high” or “low” performers. High performers of each of the tests were younger and had better education than low performers. Over a median follow-up of 3.5 years, the authors report associations of the functional measures in relation to death, ESKD only, ESKD or 50% decline in GFR, or a composite of all three. The authors observed that a low SPPB performer had higher risk of death (adjusted hazard ratio, 2.43; 95% CI, 1.36 to 4.34) and the composite outcome of death, ESKD, and 50% eGFR decline (aHR, 1.96; 95% CI, 1.28 to 2.99), compared with high SPPB performers. However, SPPB was not associated with ESKD only or ESKD or 50% decline in eGFR, so the association of SPPB with the composite outcome was largely driven by death. These results

¹Department of Medicine, Center for Clinical Epidemiology and Biostatistics, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania

²Department of Biostatistics, Epidemiology, and Informatics, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania

³Kidney Health Research Institute, Geisinger, Danville, Pennsylvania

⁴Department of Population Health Sciences, Geisinger, Danville, Pennsylvania

Correspondence: Dr. Alex R. Chang, Kidney Health Research Institute, Geisinger Health, 100 N Academy Avenue, Danville, PA 17822. Email: achang@geisinger.edu

confirm the relationship of performance measures with mortality in CKD (3).

There have only been limited reports of a relationship between lower levels of eGFR and lower SPPB scores (4), and, therefore, cutoff scores or meaningful changes in SPPB scores have not yet been established. Among older adult populations, clinically meaningful changes and cutoff scores have been determined (5). The authors missed an opportunity to further contribute to the evidence base of functional status measures among the CKD population by not providing more details on the distribution of the SPPB, M3SE, and IADL scores. Further, these measures were only assessed at baseline. Future research is needed to assess how these scores change over time, and whether this could allow for tracking of changes in mobility that may lead to eventual disability.

No significant associations were observed between the M3SE measure with death, CKD progression, or the composite outcome, which reinforce prior findings that M3SE does not have a direct relationship to CKD progression (6). Before this study, IADL research had not focused on its relationship with CKD progression. Low IADL performers tended to have a lower risk of ESKD or 50% decline in eGFR compared with high IADL performers in this study, which was not explained, but may have been due to the higher proportion of participants who dropped out of the study in the low IADL category compared with the high IADL category (11% versus 4%). It also seems plausible that participants with a low IADL score may be more likely to receive conservative care. Future research is needed to further explore how the development of disability and cognitive decline relate to death and CKD progression.

The authors also found there was low-to-fair concordance among the three performance-based functional assessments, which could be expected because each measure focused on different aspects of functional status, and the results further support the use of the three different functional measures for measuring different domains. Overall, the results of this study suggest that the SPPB battery, a simple objective measure of physical function, may be useful for mortality risk stratification of individuals with stage 2–5 CKD. Incorporating the SPPB measure into routine nephrology care could help identify patients at high risk for functional decline and disability, and those at risk may benefit the most from preventive, individually tailored therapeutic interventions.

Unfortunately, to date, no studies targeting the CKD population have evaluated the effectiveness of exercise programs in reducing the risk of mobility disability. However, in a multicenter, randomized controlled trial of a physical activity intervention for older community-dwelling participants ($N=1635$ with low SPPB scores of four to nine and a sedentary lifestyle; mean age, 79 years), the intervention was associated with a 28% reduction in risk for persistent mobility disability compared with health education only (7). Recent meta-analyses have also demonstrated benefits of short-term exercise on fitness, sarcopenia, physical performance, and self-reported physical function among participants with advanced CKD, including dialysis-dependent populations, which may protect against functional decline and disability over time (8–10).

Future studies are needed to determine the reliability, prognostic utility, and what constitutes a meaningful change

in these performance-based measures of functional status in non-dialysis-dependent CKD. In addition, there is a need to explore potential mechanisms leading to adverse outcomes, which may inform the development of tailored interventions to prevent or mitigate functional decline.

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Author Contributions

A.R. Chang and S.J. Schrauben conceptualized the study and reviewed and edited the manuscript; and S.J. Schrauben wrote the original draft.

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