

# Beyond Kidney Function: Advancing Physiotherapy in Chronic Kidney Disease Care

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## Abstract

Chronic kidney disease (CKD) is a progressive systemic condition whose impact extends beyond the declining kidney function. As the disease progresses, patients may experience reductions in physical activity, exercise capacity, muscle strength, mobility, and quality of life. These challenges become increasingly complex among patients receiving hemodialysis because of comorbidities, fatigue, deconditioning, and prolonged periods of low physical activity. The 2024 Kidney Disease: Improving Global Outcomes (KDIGO) guideline recognizes physical activity as an important component of CKD management and recommends moderate-intensity physical activity according to the patient's cardiovascular and physical tolerance. However, translating physical activity recommendations into safe, individualized, measurable, and function-oriented programs requires specific clinical expertise and knowledge. In this context, physiotherapy plays a strategic role in functional assessment, exercise prescription, monitoring of physiological responses, intradialytic rehabilitation, and management of activity limitations. Current evidence indicates that aerobic, resistance, combined, and intradialytic exercises can benefit the physical capacity and quality of life of patients undergoing dialysis. This editorial proposes a shift from a predominantly kidney-centered approach to a function-centered model of kidney care, positioning physiotherapy as an integral component of multidisciplinary kidney care. CKD care should not focus solely on survival but also on patients' ability to move, remain active, participate, maintain independence, and live meaningful lives.

*Keywords: Cardiovascular disease; Health care; Hemodialysis; Physiotherapy*

Traditionally, chronic kidney disease (CKD) has been understood through indicators of kidney function, albuminuria, cardiovascular complications, and progression toward kidney failure [1]. These perspectives are undoubtedly important, but they do not fully capture a patient's experience of living with the disease. For patients, CKD may also cause fatigue, weakness, reduced walking ability, activity intolerance, difficulty performing household tasks, and reduced social participation [2]. Therefore, the success of CKD care should not be assessed solely by how effectively kidney disease is controlled but also by how well a person's ability to live and function can be preserved.

This perspective becomes increasingly important when patients undergo kidney replacement therapy. Hemodialysis can sustain life, but patients receiving dialysis continue to experience the burden of chronic diseases, comorbidities, fatigue, reduced physical capacity, and activity limitations [3]. Reduced activity can accelerate deconditioning, whereas deconditioning can increase weakness and exercise intolerance [4]. This cycle may ultimately worsen the functional limitations and quality of life. Therefore, CKD should be viewed not only as an organ disease but also as a condition with broad functional consequences.

This paradigm shift is reflected in the contemporary clinical recommendations. The 2024 KDIGO guidelines recommend moderate-intensity physical activity targeting approximately 150 min per week or an amount compatible with the patient's cardiovascular and physical tolerance, while also encouraging a reduction in sedentary behavior [5]. These recommendations indicate that physical activity can no longer be positioned merely as general lifestyle advice; it is becoming an integral component of CKD management in patients with CKD. At the same time, however, they raise a more important clinical question: who will translate physical activity recommendations into interventions that are safe, individualized, measurable, and function-oriented?

Physiotherapy plays a strategic role in this regard. Physiotherapy does not simply provide exercise; it involves a clinical process that includes assessment, clinical interpretation, goal setting, exercise prescription, response monitoring, intervention modification, and evaluation [6]. In patients with CKD, this process may include the assessment of exercise capacity, muscle strength, mobility, balance, respiratory function, activity tolerance, and limitations in daily activities. Through this approach, physiotherapists can translate physical activity recommendations into safe, individualized, and responsive rehabilitation programs that are tailored to the patient's clinical condition.

This is important because the problems associated with CKD are multisystemic in nature. Cardiovascular disorders, anemia, metabolic changes, inflammation, muscle weakness, respiratory impairment, fatigue, and psychological factors may interact and contribute to functional decline in patients undergoing hemodialysis [7]. When physical activity decreases, physical capacity may decline further; when muscle strength decreases, mobility and independence may be compromised; and when mobility declines, sedentary behavior may increase. Therefore, CKD rehabilitation should consider the relationships among these systems rather than focusing on a single component in isolation. This multisystem approach creates broad opportunities for physiotherapy research. Assessment may extend from vascular and cardiovascular function to respiratory, muscular, functional, and psychological domains and ultimately to quality of life. This framework can be conceptualized as a continuum: vascular → cardiovascular → respiratory → muscular → functional → psychological → quality of life. This does not mean that every patient should undergo every type of assessment or intervention; rather, it emphasizes that functional decline in patients with CKD should be understood comprehensively and addressed according to their individual needs.

In patients with pre-dialysis CKD, physiotherapy can contribute to maintaining physical activity, preventing deconditioning, preserving muscle strength, and maintaining physical reserve before patients undergo kidney replacement therapy. Earlier intervention also allows for the identification

of functional limitations before they become more severe. Therefore, physiotherapy should not be introduced only when patients have already developed weakness or mobility limitations; it should be considered as part of an effort to preserve function throughout the CKD trajectory.

In patients undergoing hemodialysis, intradialytic rehabilitation is one of the most tangible opportunities. Hemodialysis sessions last several hours, and patients generally remain in a seated or recumbent position for prolonged periods of time. This period may provide an opportunity to deliver structured exercise interventions to patients who have undergone appropriate screenings and assessments. Exercise modalities that have been studied include aerobic exercise, resistance exercise, combined aerobic-resistance exercise, respiratory muscle training, and other modalities [8]. Recent systematic reviews and meta-analyses have investigated various forms of intradialytic exercise in patients undergoing hemodialysis, although the relative effectiveness of each modality and its implementation in clinical practice still require individualized consideration.

However, intradialytic exercise should not be considered a protocol that can be uniformly applied to all patients. Hemodynamic stability, cardiovascular status, vascular access, fatigue, comorbidities, blood pressure response, symptoms during dialysis, and baseline physical capacity should be considered before and during the intervention [9]. Therefore, the value of physiotherapy lies not only in selecting an exercise modality but also in applying *clinical reasoning* to determine whether a patient is suitable for exercise, which type of exercise is appropriate, the optimal dose and progression, how the patient should be monitored, and when the exercise should be modified or discontinued. Evidence regarding the benefits of exercise is also shifting attention from physiological capacity alone to outcomes that are meaningful to patients. A 2025 meta-analysis including 25 randomized controlled trials in patients with CKD receiving dialysis found improvements in both physical and mental components of quality of life among exercise groups compared with usual care [10]. These benefits were observed with both aerobic and resistance exercises, and with exercise delivered in both intradialytic and interdialytic settings. This finding is important because the ultimate goal of rehabilitation is not simply to enable patients to exercise for longer periods but to help them do more, participate more fully, and experience a better quality of life.

In this context, the success of physiotherapy should not be limited to improvements in the *six-minute walk test*, handgrip strength, or exercise capacity parameters [9]. These outcomes are important clinical indicators, but their significance increases when improvements translate into the ability to stand, walk, perform daily activities, return to work, interact with family, or maintain independence. In other words, improving physical capacity is a means, whereas function and participation are the goals of rehabilitation.

The contribution of physiotherapy should be positioned within a multidisciplinary kidney care framework [5]. Nephrologists manage kidney disease and its complications, nurses provide continuous monitoring and education, dietitians contribute to nutritional management, pharmacists support medication safety and optimization, and other professionals contribute according to patient needs. Within this team, physiotherapy provides a perspective specifically oriented toward function.

The physiotherapist asks not only, “What is the patient's disease status?” but also, “How does this condition affect the patient's ability to move and perform daily activities?”. This difference in perspective supports a shift from a predominantly kidney-centered model of care to function-centered kidney care. Such a model can begin with screening and functional assessment, followed by risk stratification, exercise prescription or rehabilitation intervention, response monitoring, outcome evaluation and program progression [6]. Rehabilitation should not be episodic but continuous, adapting to changes in the patient's condition and stage of the disease.

However, integrating physiotherapy into CKD care faces several challenges. The availability of physiotherapists within dialysis services is not yet uniform, exercise protocols vary across studies, and the need for safety screening and clinical monitoring requires adequate competence and resources [6,11]. Furthermore, evidence from countries with different healthcare systems and resources cannot always be directly applied to Indonesia. Therefore, the development of physiotherapy models for CKD should consider the characteristics of Indonesian patients, the structure of hemodialysis services, workforce availability, facilities, financing, and intervention sustainability.

These challenges open up a broader research agenda. Physiotherapy research in CKD should move beyond the simple question of whether exercise is effective. The next questions are which patients benefit the most, which types of exercise are most appropriate, when exercise should be delivered, how dose and progression should be determined, and which outcomes are most meaningful to patients. Future research should also evaluate models for integrating physiotherapy into hemodialysis units, cost-effectiveness, program sustainability, and the potential of technology and telerehabilitation. Recent evidence from 2026 has begun to explore the influence of exercise therapy duration on different domains of quality of life in patients undergoing hemodialysis [12].

Thus, the future direction of physiotherapy in CKD should not simply be toward “more exercise,” but toward rehabilitation that is more integrated, individualized, measurable, and function-oriented, as described above. Physiotherapy should be positioned as a part of preventive, restorative, and maintenance care throughout the CKD trajectory. Involvement of physiotherapists from the pre-dialysis phase through hemodialysis can help identify functional decline earlier, design appropriate interventions, and sustain rehabilitation benefits in daily life.

Ultimately, CKD care needs to broaden the definition of success. Survival remains a primary goal, but a longer life does not necessarily mean a more functional one. Patients also need the ability to stand, walk, work, care for themselves, interact with their families, and participate in social life. Therefore, the question in kidney care needs to expand from “How do we manage kidney disease?” to “How do we manage kidney disease while preserving a person's ability to live their life?”

Physiotherapy is well-positioned to address this issue. Integrating physiotherapy into multidisciplinary kidney care is not merely an addition of exercise services; it represents a paradigm shift toward care that views the patient as a whole person—with renal, physical, functional, psychological, and social needs. Kidney care should not only aim to prolong life but also preserve the ability to live that life.

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