

Review

A “Nephrological “ Approach to Physical Activity

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Key Words

Chronic kidney disease • Counseling • End stage renal disease • Physical activity • Physical function

Abstract

Despite consensus among nephrologists that exercise is important and probably beneficial for their patients, assessment of physical function or encouragement of physical activity is not a part of the routine management of patients with CKD. In order to plan an useful strategy for exercise training we need to clearly define some questions. First of all, nephrologists need to be aware of physical exercise benefits; lack of motivation and increased perceived risk by health care professionals have been identified as contributing factors to physical inactivity. Moreover, the main elements necessary for sustaining exercise programs in this population have to take in account, such as the requirement of exercise professionals, equipment and space, individual prescription, adequate commitment from dialysis and medical staff. When PA may not be implemented, a comprehensive, individualized occupational therapy program may improve functional independence and activity of daily living. Finally, physical function has to be carefully monitored and assessed by medical staff.

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Rethinking physical activity in renal disease

It is well known that the human body has evolved in such a way that most of its systems (eg, skeletal, muscle, metabolic, and cardiovascular) do not develop and function in an optimum way unless stimulated by frequent physical activity [1]. Unfortunately, nowadays a third of adults and four-fifths of adolescents do not reach public health guidelines for recommended levels of physical activity [2]; moreover, inactivity rises with age, is higher in women than in men, and is increased in high-income countries. Whatever the patients and the diseases they are treating, physicians need to keep in mind that walking is a common,

Table 1.

Benefits of regular exercise in CKD/ESRD patients
<ul style="list-style-type: none"> • Give more energy and make feel stronger • Improve mood and quality of life • Reduce stress and help sleep and digestion • Prevent excessive weight gain • Help control blood pressure and reduce blood sugar • Reduce cholesterol levels and chance of developing heart disease • Strengthen heart and bones • Improve the efficiency of dialysis if this is relevant • Overall, make feel good

accessible, inexpensive form of physical activity and is an important component of total physical activity in adult populations [3]. It is aerobic and necessitates use of large skeletal muscles, and confers the multifarious health benefits of physical activity with few adverse effects. Interventions have been implemented to increase population levels of walking and have proven this activity's effectiveness [4]. Participation in vigorous-intensity physical activity is another key indicator of physical activity levels. It has well established health benefits [5] which were recognised in the 2010 WHO global recommendations on physical activity for health [2]. Vigorous-intensity activity has higher reliability and validity than does moderate-intensity activity with standardised self-report instruments.

Recent guidelines specifically state that elderly individuals and patients with chronic diseases should also be encouraged to meet the same PA targets, as long as the intensity is adjusted so that it is of moderate intensity for the individual [6]. In fact, patients with a range of chronic medical conditions other than CKD also suffer from poor physical performance and muscle wasting, and there is mounting evidence of beneficial effects of exercise in these conditions [7]. Such conditions include congestive heart failure and coronary artery disease, cerebrovascular disease, peripheral vascular disease, chronic obstructive pulmonary disease, asthma and cancer. In patients with renal diseases, both affected by chronic kidney disease (CKD) or undergoing renal replacement therapy (RRT), three main factors affecting physical activity have been identified: a) kidney failure itself (with its associated malaise); b) side effects of the RRT, and c) worsening co-morbidity combine to discourage physical activity. Inactivity is therefore regarded as a major factor leading to impaired physical condition, reduced exercise capacity and ultimately muscle wasting [8]. Despite consensus among nephrologists that exercise is important and probably beneficial for their patients, assessment of physical function or encouragement of physical activity is not a part of the routine management of patients with CKD. However, it is nowadays quite clear that prevention of the functional decline associated with a sedentary lifestyle and relief from severe deconditioning attributable to low mobility is of paramount importance in CKD patients. Nephrologists need to be aware and have to explain their patients that regular exercise may improve quality of life, as reported in Table 1.

Many kidney patients believe they cannot exercise, but most can exercise. PA will help them to feel better, stronger and more in control of their health. Obviously, physicians have to tailor the exercise to each patient and circumstances. PA will help patients to return to work, do daily household activities, or manage own health care.

In order to plan an useful strategy for exercise training in CKD/ESRD patients we need to clearly define some questions:

- a) Are nephrologists aware of physical exercise benefits ?
- b) Which elements are necessary for sustaining exercise programs in this population?

- c) Which role for a restorative physical and occupational therapy ?
- d) How can we assess and monitor physical function for people with CKD?

Are nephrologists aware of physical exercise benefits ?

Lack of motivation and increased perceived risk by health care professionals have been identified as contributing factors to physical inactivity among haemodialysis patients [9]. Levels of physical activity are not routinely assessed and patients are not counseled to exercise more. The DOPPS study confirmed these results and clearly indicated that factors other than patient case mix are likely to contribute to levels of physical activity and suggest the possibility that facility practices can affect exercise frequency [10]. In fact, a great variability was observed in the percentage of regular exercisers across facilities; moreover, while in some dialysis patients there may be no potential for improvement in physical functioning, in many others it is likely that poor physical performance is due in part to deconditioning and could be modified. The higher prevalence of regular exercisers at facilities offering exercise programmes indicates that these interventions may be beneficial, with lessons to be learned by providers worldwide [10]. A recent paper by Delgado et al. performed a cross-sectional survey of nephrologists to ascertain the current rate of PA counseling among practicing nephrologists and to compare current rates of counseling with prior data to determine the extent to which the publication of the Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines has affected practices and opinions regarding exercise counseling [11]. Authors clearly showed that despite the general view that guidelines would be likely to change practice, current nephrologists were not asking and counseling more than nephrologists asked the same questions in 2001 before the publication of the guidelines. Despite increased knowledge of the benefits of PA that resulted in the publication of this KDOQI guideline and a 2001 study highlighting counseling deficits, practice patterns have not changed. As research in nephrology continues to produce an enlarging body of evidence that has the potential to enhance clinical practice, information delivery is of crucial importance. In fact, given the strong association of low PA with poor outcomes and the robust evidence supporting regular exercise training and counseling, there is an urgent need for research to identify optimal strategies to implement measurements of physical function and to provide encouragement for PA into the routine care of these patients.

Sustaining a Hemodialysis Exercise Program

Sustaining exercise and activity in the CKD/ESRD setting may be an hard challenge mainly because its concept has not been clearly defined in the literature [12].

Its nowadays clear that sustaining an exercise program and inclusion in routine care is vital to increase dialysis patient exercise rates and improve physical and psychological side effects of CKD/ESRD patients. A recent literature review [12] identified the main elements of care that may contribute to a sustained exercise program in this setting:

- A sustainable program requires exercise professionals
- Intradialytic exercise
- Commitment from dialysis and medical staff
- Adequate physical requirements of equipment and space
- Exercise programs need to be interesting and stimulating
- The cost implications of the exercise program need to be addressed
- Exercise is not for everyone and requires individual prescription
- Age is no barrier to exercise on hemodialysis.

Table 2.

Safety' rules of physical exercise in CKD/ESRD setting
1. Prescribed by physician
2. Designed by a qualified physiotherapist or exercise physiologist
3. Administered by a physiotherapist or exercise physiologist or nurse
4. Individualized dosage
5. Regular follow-up
6. Adaptation to the patient's current situation

First of all, it seems crucial engage experts in physical therapy or exercise physiology: this strategy has different advantages, such as the greater patients' agreement, removing pressure by the nurse staff and, last but not least, an individually prescribed exercise regimen. Exercise professionals can coach and encourage dialysis staff to embrace exercise as a part of the patients' prescription which may contribute to increased confidence of the dialysis staff with exercise [13, 14].

The second relevant point is "when" to perform PA. As recently showed by Konstantinidou et al. [15] in a comparison of three different exercise regimes, the interdialytic program had greater adherence. Although there are specific barriers to this exercise timing, in a great majority of cases it may be the first choice. On the other hand, a combination of encouraging strategies for behavioral change from the healthcare providers focused on nutrition and exercise, with some coaching from staff was suggested with the aims to develop an individualized exercise program to be performed during the hemodialysis sessions, while encouraging increased participation in activities of daily living [16].

Although the dialysis staff is in an excellent position to encourage sustained physical activity and has the opportunity to act as role model for dialysis patients, literature has also showed that inconsistent clinician beliefs and practices may decrease the sustainability of intradialytic exercise programs [17]. Because the dialysis staff may not have the skills and may not believe it is their role to provide and assist patients to intradialytically exercise [18], this underlines ones more the need of exercise professionals.

A great array of activities have been proposed to design interesting and stimulating PA. The combination of new and interesting exercise ideas coupled with a systematic documentation of progress, contributes to increasingly sustainable programs. Walking a dog, twice daily, every day of the year may be one possibility to motivate patients [19], but we can also suggest dancing, gardening, bowling, water exercises or golf.

Given the increasing age of ESRD subjects dialysis staff often view hemodialysis patients as being too old to exercise, but elderly hemodialysis patients may respond well to some form of physical activity or exercise. In fact it has been recently proposed that recommended aerobic physical activity for the older and chronically diseased individuals [20] can be applied to the hemodialysis population [21]. Whether age is not to be quoted as a relevant barrier, it is also quite clear that each patient requires individual assessment by exercise professionals to assess their capabilities and provide a formal treatment plan and specific details regarding frequency, intensity, duration, and progression are required with individualized charting and documentation of progress [18]. In Table 2 the main rules of safety are summarized.

Restorative physical and occupational therapy

In everyday clinical practice, nephrologists are aware that renal replacement therapy usually prolongs the life of a patient with CKD, but it does not necessarily have a positive impact on quality of life. In fact, the multiple comorbidities experienced by patients with CKD/ESRD usually result in various impairments and functional limitations that may manifest as difficulty in ambulation, balance deficits, joint pain/stiffness, and impaired independence in

activities of daily living (ADLs), all of which are indications for rehabilitation, which includes physical and occupational therapy [22]. Rehabilitation of ESRD subjects has been considered almost a daunting, if not impossible, task. Despite evidence that a physically active lifestyle positively influences physical function, quality of life, and longevity in both elderly

Table 3.

Rehabilitation's objectives in elderly CKD/ESRD patients	
1.	Manage the home
2.	Live at home
3.	Care for oneself
4.	Go shopping
5.	Recreation
6.	Social activities
7.	Be able to work or to go to school

and chronically ill populations, few dialysis care centers integrate rehabilitation programs into their dialysis care plan [23, 24]. But we need to be aware that, considering the physical limitations of CKD/ESRD patients, even small declines in physical function can lead to functional dependence on nursing care. Rehabilitation in these patients may have some simple but very relevant purposes, as in Table 3.

Occupational therapy may be defined as a science-driven, evidence-based profession that allows people of any age to live life to its fullest by helping them promote health, and prevent or better live with an illness, injury, or disability. Interventions are individualized and based on the impairments and functional limitations identified on the initial examination. Some of the interventions, activities, and techniques that could be used to achieve functional goals and improve overall outcomes may include modalities, neuromuscular reeducation, cognitive retraining, and therapeutic activities/exercises. However, patients selection is a critical point. Patients participating in the rehabilitation program should be hemodynamically stable and be able to tolerate the plan of care as prescribed. Unstable angina and/or cardiac status, recent cerebral vascular accident or transient ischemic attack, limited mental status, active malignancy, or certain musculoskeletal pathologies may be limiting factors for the rehabilitation program. In these patients lifestyle programs provide an alternative to center-based rehabilitation or fitness programs by helping patients to develop the behavioral skills to start and maintain an active lifestyle [24]. Simple 6-months lifestyle rehabilitation and education program in in-center hemodialysis centers, such as the so called Life Readiness Program [24], would result in improvement in self-reported physical function compared with patients treated in a standard dialysis center environment. The Life Readiness Program was probably the first prospective study showing that PA can positively influence physical function and quality of life in chronically ill subjects such as ESRD patients.

A comprehensive, individualized occupational therapy program would include interventions to (a) improve functional independence and ADLs; (b) decrease upper-extremity pain, cramping, and stiffness; and (c) improve trunk and upper-extremity strength and dexterity [22].

As for PA, also for occupational therapy some relevant barriers have been identified: lack of awareness by other health care professionals regarding the importance and potential benefits, so education focusing on the importance and specific benefits of rehabilitation is critical and should be incorporated into any educational information provided to patients and their families, but also to caregivers; moreover, CKD/ESRD patients have to address multiple medical appointments, may be fatigued, and have other obligations. On the other hand the appeal of this kind of interventions is that they can be administered safely during the dialysis sessions [25, 26].

Because physical and occupational interventions have shown improvements in impairments and functional limitations in many other patient populations with chronic diseases, rehabilitation programs should be considered as another component of the standard of care of these patient populations [24].

Measurement of Physical activity

CKD patients are characterized by reduced levels of physical function in comparison with the general population, with peak aerobic exercise capacity of approximately 65% of age-, sex-, and physical activity-matched healthy controls and a marked compromised Physical Performance, about 50% to 120% lower than non uremic reference controls [27, 28]. Although low and deteriorating physical function are increasingly recognized as a key characteristics of their assessment does not yet form part of the routine clinical monitoring of this patient group. Moreover, there is a clear evidence of a wide diversity of measures currently used for the assessment of physical functioning [29]. A correct approach advocates that physical function assessments should be performed in order to describe physiological impairment in relation to physical function via exercise tolerance testing; functional limitations of the individual; and disability. The patient's physical activity level can be estimated by administered or self-administered questionnaires or quantified by objective measurements [30].

Exercise Tolerance Assessment

The tolerance to exercise may be assessed by Peak Cardiorespiratory Fitness, Exercise Test Mode, Submaximal Exercise Tolerance and Neuromuscular Exercise Function [29]. The most commonly reported measure of integrated cardiorespiratory exercise tolerance in patients with CKD is peak VO₂. The clinical value of VO₂peak assessment for patients with CKD is supported by a recent report that showed the median VO₂peak is a stronger predictor of survival than many traditional prognostic variables [31]. Moreover, also cycle ergometers are frequently used as mode of exercise testing in patients with CKD, while muscle function-related measures have also been shown to be related to comorbidity and survival in CKD stage 4/5 patients [31].

Physical Performance Assessment

Among the great number of available test, we suggest to use those that are simple, feasible and reproducible in the different venues, with low cost and not requiring instruments, as in the Excite study [30]. The test selected should also require a limited time of execution to minimize the number of testing days and the discomfort inside the dialysis centres. So probably two tests for measuring physical functioning may be sufficient for our aims, the 6-minute walk test (6MWT) to evaluate mobility, with additional gait speed analysis at self-selected pace, and the five minutes six-to-stand test (5-STS) for measuring muscle power of lower limbs. By means of these tests the study allowed to take a picture of the physical functioning in a wide population of patients able to walk from dialysis centres [30].

Conclusions

Until now, awareness of PA clinical relevance is scarce and exercise therapy is largely underutilized in chronic diseases particularly so in CKD and in dialysis patients. Exercise programmes in CKD patients should aim at safely inducing favourable physiological adaptations. Exercise planning should be scheduled at optimal volume and intensity and be based on the patient's age and comorbidities [32]. Its nowadays clear that sustaining an exercise program and inclusion in routine care is vital to increase dialysis patient exercise rates and improve physical and psychological side effects of CKD/ESRD patients. The main elements of care that may contribute to a sustained exercise program in this setting have recently been identified and need to be taken in account [12]. The dialysis staffs must be aware of the clinical relevance of the physical capacity assessment of CKD/ESRD patients, and this practice should be an everyday part of their routine management.

Selection of physical function assessment tools is influenced by the intended goal of the assessment, the personal characteristics of the patient, and also by the prevailing information quality requirements and potential operational constraints. As exercise tolerance, functional capacity, and functional status assessments have been shown to be safe, feasible, and clinically useful, it is recommended that their implementation be incorporated within clinical management protocols for the patient with CKD.

Disclosure Statement

The authors of this work declare that they do not have any conflict of interests.

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