

The BASES Expert Statement on Exercise Therapy for People with Chronic Kidney Disease

Produced on behalf of the British Association of Sport and Exercise Sciences by Dr Pelagia Koufaki, Sharlene Greenwood, Dr Patricia Painter and Prof Tom Mercer FBASES.

Introduction

Chronic kidney disease (CKD) is a long-term metabolic condition, characterised by gradual loss of the kidneys' regulatory and excretory functions. It is categorised into 5 stages (CKD 1-5) based on the kidneys' estimated glomerular filtration rate (GFR). Stage 5 (eGFR < 15 ml/min/1.73²) marks the introduction of renal replacement therapy (RRT), such as dialysis or transplantation, to sustain life. The Health Survey for England (2009) estimates that about ~4-6% (2.7 million) of the adult population have CKD 3-5 (GFR < 60 ml/min/1.73²), with worldwide prevalence estimated around 8-16%. The incidence of new CKD 5 patients in the UK has almost doubled in the last 10 years, with ~55,000 people currently receiving RRT. This may reflect the rising prevalence of diabetes, obesity, hypertension, and dyslipidaemia, which accelerate loss of kidney function and multi-system dysfunction. Suboptimal physical activity levels and an aging demographic, further contribute to muscle loss and weakness, low cardiovascular reserve capacity, frailty and disability, severely compromised quality of life and premature mortality in CKD (Jha *et al.*, 2013). Worryingly, and despite being increasingly highlighted in national and international CKD clinical practice guidelines, physical inactivity is not yet routinely addressed by renal multidisciplinary care teams (RMDT), despite meriting early intervention for optimum disease prevention and management.

Non-Health Care Professions Council registered professionals, such as clinical exercise physiologists and clinical exercise scientists/specialists, often have a key research role in RMDT promoting exercise. A compelling case has also been made for appropriately trained and qualified exercise professionals to be included as central pillars of the RMDT to ensure the delivery of effective exercise training interventions/services and to support the sustainability of physical activity behaviour change (Bennett *et al.*, 2010), across the range of in-centre outpatient as well as community and home-based settings. It is thus the purpose of this statement to outline the clinical importance of exercise therapy for the benefit of patients and raise awareness among exercise and renal health care professionals on implementation and sustainability requirements.

Background and evidence

Epidemiological reports indicate that physical inactivity is an independent risk factor for the development and progression of CKD and associated complications. Even when prevalent comorbidities (diabetes, hypertension, CVD) are controlled for, people with low physical activity levels are 10 times more likely to develop CKD. Higher physical activity levels are also associated with up to 37% reduction in the rate of kidney function loss in people older than 65 years with CKD 2-3. People with CKD 2-5 have substantially reduced physical activity and function levels. The clinical importance of doing 'some' physical activity compared to 'none', confers an independent all cause and cardiovascular mortality risk reduction of up to 50%. People with CKD 3-5 with better scores in objectively measured physiological fitness (VO_{2peak}, muscle strength), functional capacity (gait speed, sit-to-stand performance) and also patient-reported outcomes (activities

of daily living), are characterised by longer, event-free survival, better mental health, less frequent hospitalisations, less functional limitations and better overall quality of life. Illustratively, VO_{2peak} > 17.5 ml/kg/min was associated with better survival rates over 3.5 years in patients on haemodialysis. Gait speed > 1.3 m/sec was associated with 18-26% reduced risk of rapid kidney function decline in CKD 2-4. Patient reported physical function composite score (PCS), from the SF-36 questionnaire, indicated that a one point increase corresponded to 2% reduction in mortality rate and a total PCS < 25 was associated with 93% increased risk of death and 56% increased risk of hospitalisation in patients on dialysis (Painter & Roshnrahan 2013, Koufaki *et al.*, 2013). Interestingly, a long term observational report on dialysis related practices and outcomes based on 20,920 patients in 12 countries (the DOPPS study), reported that 'simply' the provision of exercise in a dialysis unit was associated with 38% higher odds of patients taking up exercise, and a reduced overall mortality risk for units with more exercisers (Tentori *et al.*, 2010).

Clinical effectiveness of exercise therapy in CKD

Based on reported research evidence, the clinical effectiveness of exercise therapy in CKD can be summarised as follows:

1. Despite the high-risk status of patients with CKD, no fatal or serious exercise-related adverse events have been reported (Heiwe & Jacobson, 2011). This may reflect the strict selection criteria that studies have applied and/or the individualised and supervised interventions employed. Expected and minor adverse events include post-exercise hypotensive episodes, fatigue and increased muscle soreness.
2. In CKD 5, short term (2-6 months) structured and supervised moderate intensity aerobic training programmes (mainly cycling), induce a systematic and large improvement in cardiorespiratory fitness (VO_{2peak}) by 17 to 50%, with an overall mean difference between treatment and control groups of 5.22 ml/kg/min (Segura-Orti, 2010; Smart & Steele, 2011). Such improvement exceeds the clinically important criterion of 1 MET (3.5 ml/kg/min). Larger average improvements in cardiovascular fitness were associated with interventions delivering regular and progressive increases in exercise volume, lasting at least 6 months, performed on non-dialysis days and including an additional resistance-training component.
3. In CKD 2-4, short to medium term (12 weeks to 78 weeks), low to moderate intensity aerobic training in supervised or self-managed settings, produced a small systematic improvement in VO_{2peak} (~ 9% or ~ 2 ml/kg/min). Although this amount of improvement is substantially smaller than seen in CKD 5 training studies, it may be clinically important, as it equates to the per year natural decline in VO_{2peak}, observed in pre-dialysis patients. Accordingly, early exercise intervention may be enough to slow the decline in cardiovascular reserve capacity in CKD 2-4 (Koufaki & Greenwood, 2013).



Left: Cycling during haemodialysis is a feasible, effective and safe modality of exercise based rehabilitation for patients with CKD 5
 Courtesy Dr Pelly Koufaki

4. In CKD 2-5, overall quality of life indices were improved with exercise training. Improved scores in the self-report physical function sub-scores of the questionnaires used, appeared to be the main drivers for the overall improvement. Other elements of quality of life such as vitality, social function, general health did not show a systematic change (Heiwe & Jacobson, 2011).
5. Well designed and progressive resistance-only training programmes, delivered in outpatient settings, have the potential to produce large improvements in muscle strength and muscle cross sectional area in all stages of CKD (Heiwe & Jacobson, 2011).
6. Inconsistent improvements were noted for objectively measured functional capacity indices (walking speed/distance, Sit-to-Stand performance). There is limited and inconsistent data on the efficacy of exercise interventions to favourably modify other cardiovascular, metabolic risk factors and residual kidney function. These observations may reflect the small number of trials (patients), the large variability in individual responses and exercise dose.

Conclusions and recommendations

The benefits of regular physical activity in cardiovascular disease and diabetes are well established and although the evidence base in CKD needs to be strengthened, existing data indicates similar benefits. We therefore suggest that every stable patient with CKD, irrespective of age, gender, comorbidities or prior exercise experience, should be provided with specific written advice on how to safely and effectively increase physical activity to: (i) enhance confidence and self-efficacy in performing physical activities; (ii) attenuate deterioration of physical function and associated limitations in activities of daily living; (iii) increase physiological reserve; (iv) reduce comorbid events; and (v) enhance quality of life.

The challenge is to engage and educate all stakeholders in developing a renal exercise-rehabilitation service that is safe, feasible, sustainable and resourced to facilitate its incorporation into the integrated care of CKD patients across the entire disease trajectory. This will require the recommendation for routine monitoring and documentation, within electronic medical records and in national registries, of the physical function and activity levels of patients, in addition to the effects of any exercise participation. This should precipitate the consensus generation of core outcomes for the screening, assessment, monitoring, as well as evaluation of exercise training effectiveness, for people with CKD (Koufaki & Kouidi, 2010). Renal rehabilitation services should include (clinical) exercise scientists alongside physiotherapists to support the development and evaluation of individualised, effective and sustainable physical activity and exercise plans. The role of these individuals and their activities, will be central to the managed transition of rehabilitation services towards community based pre-dialysis (stages 2-4) and post-transplantation services (akin to Phase IV cardiac rehabilitation) involving, where appropriate, self-managed physical activity plans to support sustained participation. ■



Dr Pelagia Koufaki

Pelagia is Research Fellow in Clinical Exercise Physiology in School of Health Sciences, Queen Margaret University, Edinburgh.



Sharlene Greenwood

Sharlene is Lead Renal Physiotherapist at King's College Hospital NHS Foundation Trust.



Dr Patricia Painter

Patricia is Research Associate Professor in Physical Therapy, University of Utah.



Prof Tom Mercer FBASES

Tom is Professor in Clinical Exercise Physiology and Rehabilitation at Queen Margaret University, Edinburgh.

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