Assessment of Physical Activity in Patients' with Chronic Kidney Disease and Renal Replacement Therapy

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Introduction

Chronic kidney disease (CKD) is associated with cardiovascular morbidity and mortality that places a considerable strain on global health care resources (1).Cardiovascular disease (CVD) is the leading cause of death within the CKD population (2). There is now irrefutable evidence supporting the role of physical activity in the prevention and management of CVD. Physical activity regulates chronic inflammation, oxidative stress, and endothelial dysfunction within the cardiovascular system and has shown significant health benefits within various chronic conditions. (3) Previous literature reported that physical inactivity is prevalent within the CKD population and end stage renal disease (ESRD) patients on renal replacement therapy (RRT) (4). To date, the most reliable questionnaire was found to be the Human Activity Profile (HAP) consisting of 94-items that correlated with patient activity levels (5). A potential weakness, however, with this in depth questionnaire is the time taken to complete the analysis. Therefore the development of a new, concise and reliable questionnaire is needed.

Aims

This cross sectional study aims to create a unique 20-item questionnaire. We aim to describe where the optimal activity level may lie and where the greatest amount of activity may be lost within the renal population. Furthermore, we aim to create an easy assessment tool that can be used to identify patients at risk of associated CVD within the CKD population, encouraging health care professionals to 'prescribe exercise'.

Methods

100 patients, approximately 20 patients from the following groups: CKD stages 3-5 not on any form of RRT, home-haemodialysis (HHD), hospital-haemodialysis (ICHD), peritoneal-dialysis (PD) and transplant (TX) patients were asked to fill out the questionnaire. Two published questionnaires were combined to produce one physical activity questionnaire (6,7). The two activity questionnaires were the 'General Practice Physical Activity Questionnaire' (GPPAQ) and the 'Human Activity Profile' (HAP) questionnaire. This self-created questionnaire produced two scores for analysis:

1. The total number of activities that the patient is able to perform – Total Activity Score (TAS)
2. The total number of activities that the patient has now stopped performing since their diagnosis with CKD (for the CKD not on RRT) or since starting RRT- Activity Loss Score

Patient's notes and the renal IT data base (DiProton©) were accessed, with their permission, to gather a range of bio-chemical markers for correlation purposes. Both scores were analysed and compared to a healthy control group of 50.

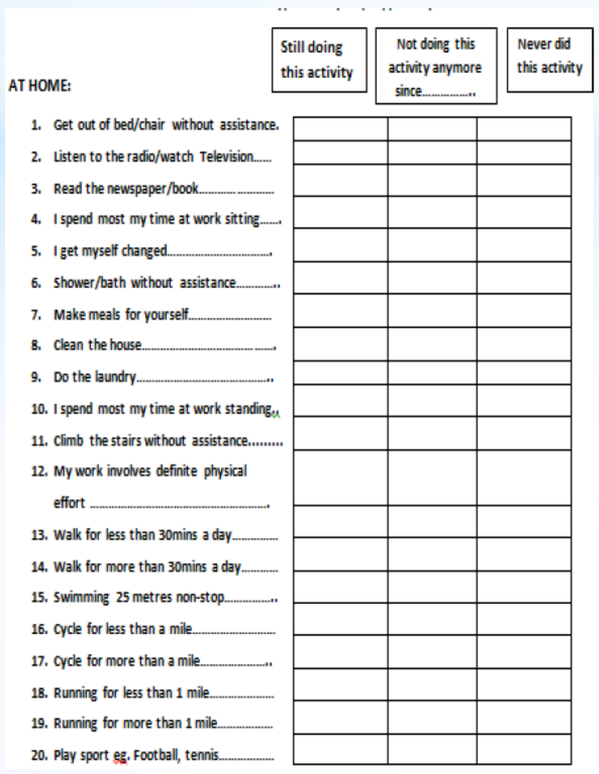
Statistical Analysis

Data was analysed using the StatsDirect© programme. Kruskal-Wallis test and Mann-Whitney tests were used to analyse the median scoring differences between the renal cohort and the healthy control. Kruskal Wallis was also used to analyse the median differences between the 5 kidney disease sub-groups (CKD, HHD, ICHD, PD, TX). Spearman's Rank Correlation was used to assess the effect of blood biochemistry and co-morbidities on activity levels.

Baseline Characteristics

Patients ages ranged from 18-85 years old (mean age 60.82 ± 14.10) with varying primary diagnoses. 39 patients were female and 61 male. Patients with CKD had been known to the renal service for an average of 51 ± 37.48 months and patients on renal replacement therapy for an average of 49.54 ± 48.73 months. Within the study population there were 45 patients on EPO therapy and 55 patients not on EPO therapy. Results were compared to a healthy control group, ranging from 21-88 years old (mean age 59.34± 22.54 years old) with 24 females and 26 males within the sample.

Figure 1: Physical Activity Questionnaire
The unique 20 item questionnaire patients' filled out to produce a Total activity score and Activity loss score



AT HOME:	Still doing this activity	Not doing this activity anymore since……	Never did this activity
1. Get out of bed/chair without assistance.			
2. Listen to the radio/watch Television……			
3. Read the newspaper/book……			
4. I spend most my time at work sitting……			
5. I get myself changed……			
6. Shower/bath without assistance……			
7. Make meals for yourself……			
8. Clean the house……			
9. Do the laundry……			
10. I spend most my time at work standing…			
11. Climb the stairs without assistance……			
12. My work involves definite physical effort ……			
13. Walk for less than 30mins a day……			
14. Walk for more than 30mins a day……			
15. Swimming 25 metres non-stop……			
16. Cycle for less than a mile……			
17. Cycle for more than a mile……			
18. Running for less than 1 mile……			
19. Running for more than 1 mile……			
20. Play sport eg. Football, tennis……			

References

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Results- Activity Scores

Figure 2. The Mean Total Activity Score within each group
Chart showing the mean total activity scores between the five sub-groups compared to the control

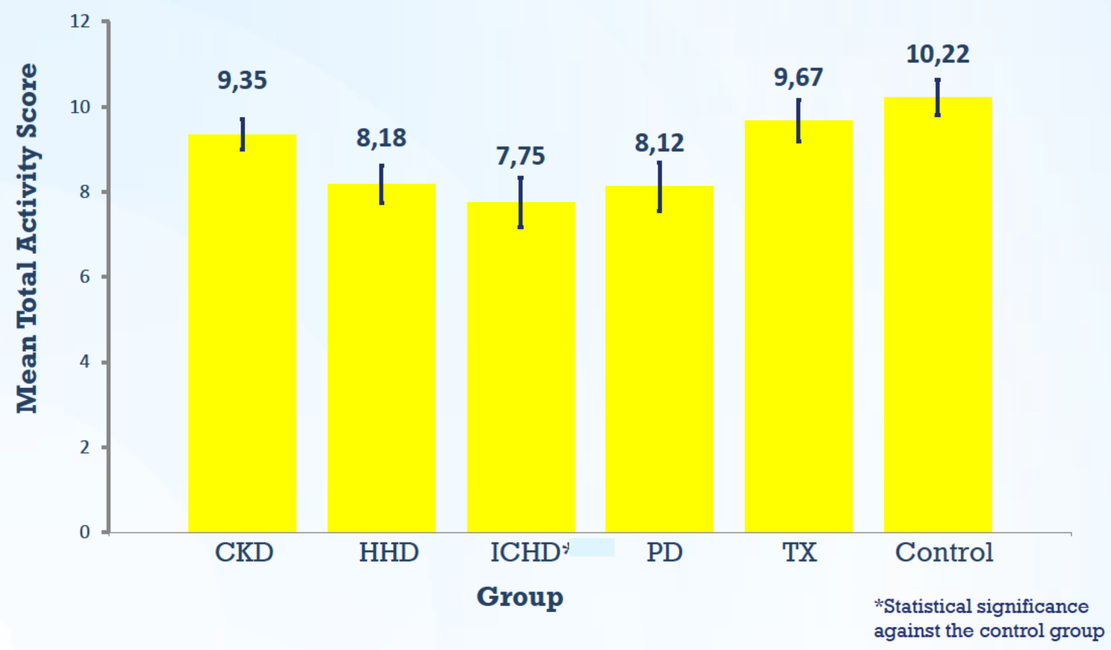

Figure 3. The Mean Activity Loss within each group.
Chart showing the mean number of activities lost since their diagnosis/intervention

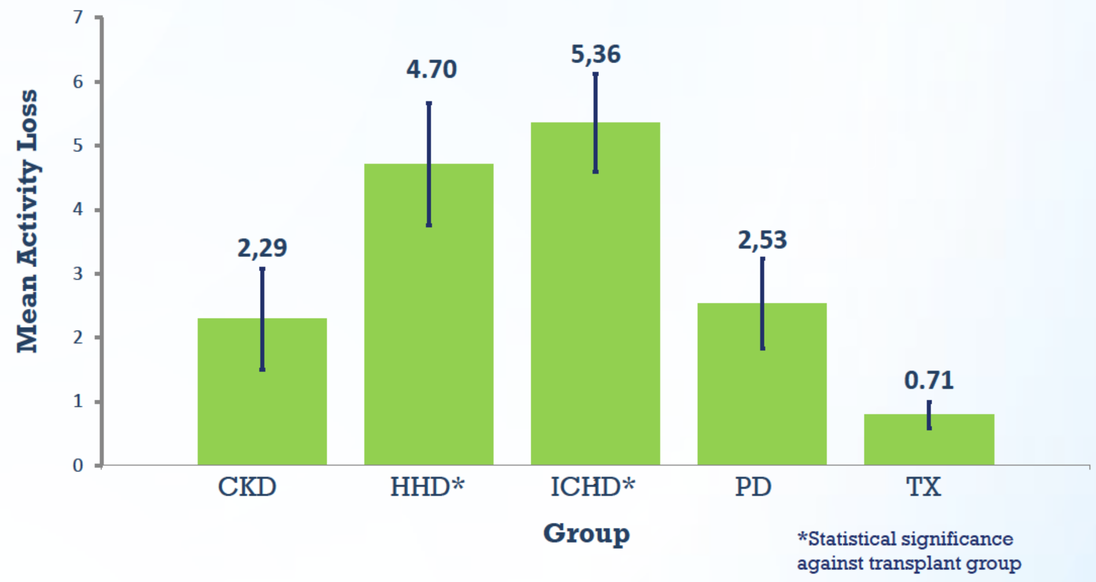

Table 1.Total Activity Score and Activity Loss Score for EPO vs no EPO therapy

Group	Median TAS (IQR)	Mean TAS (SD)	p-value
EPO Therapy	8 (7-10)	7.84 (2.25)	0.013
No EPO therapy	9 (7-11)	9.15 (2.45)	
Group	**Median Activity Loss (IQR)**	**Mean Activity Loss (SD)**	**p-value**
EPO Therapy	4 (1-7)	4.42 (3.88)	0.0024
No EPO therapy	1 (0-3)	2.33 (3.24)	

Results- correlation

No significant correlation was seen between calcium, phosphate or parathyroid hormone and the TAS of a patient. There was also no correlation with these parameters and the activity loss within the renal cohort. However significant positive correlation (r=0.58, p=0.0061) was seen between haemoglobin levels and TAS within the transplant group, illustrating that as the haemoglobin levels increased, so did their total activity levels. Mean arterial pressure (MAP) showed significant positive correlation (r=0.54, p=0.026) with the TAS in the PD group. Surprisingly, there was no correlation seen between the number of co-morbidities a patient may have and their TAS or activity loss.

Conclusion

Our unique assessment tool identified ICHD patients as the most physically inactive sub-group within the CKD and RRT population. We found no significant difference between the CKD, HHD, TX and PD patients against the control. This favours home therapy over ICHD with regards the patient retaining their previous physical activity.

A significant loss in activity was seen in both the HHD and ICHD patients when compared to patients having undergone renal transplant. Patients on EPO therapy were significantly less active than those not on therapy, thought to be due to their significantly lower mean haemoglobin levels.

Further research is needed to validate this quick, reliable tool and establish its use to assess physical activity. We recommend doctors encourage physical activity and prescribe tailor made rehabilitation programmes to all CKD and RRT patients, with a particular emphasis on the high-risk physically inactive sub-groups identified within this study.

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