**Mortality and Morbidity following Renal Rehabilitation in patients with CKD: The effect of programme completion and change in exercise capacity**

**Background:** Twelve weeks of renal rehabilitation (RR) (twice-weekly supervised aerobic training, resistance training and education) has been shown to improve exercise capacity, functional ability, depression and anxiety in patients with chronic kidney disease (CKD) at all stages of the CKD trajectory. Survival following RR has not previously been examined. Our aims were to compare the long-term risk of a combined mortality and morbidity event in two cohorts of patients referred for RR; those who successfully completed the programme (completers), and those patients who either did not complete RR or did not start the program (non-completers). In those participants who completed the programme, we also aimed to examine time to combined event between those people who were able to achieve a clinically meaningful improvement in exercise capacity following RR (responders) with those who were not (non-responders).

**Methods:** A retrospective longitudinal analysis of clinical service outcomes was conducted. We analysed the value of programme completion and exercise capacity, characterised as change in incremental shuttle walk test (ISWT), for predicting the risk of a combined event including death, cerebrovascular accident (confirmed stroke) and hospitalisation for chronic heart failure (excluding myocardial infarction and cardiac arrest) in a cohort of patients with CKD. In completers (participants who completed >50% of planned sessions and had post-rehab outcome data), time to combined event was examined between responders (those achieving (≥50 m increase in ISWT distance) and non responders (<50 m increase) . Kaplan-Meier survival analyses were performed. Differences in time to combined event were investigated with Cox proportional hazards models independent of baseline estimated glomerular filtration rate (eGFR), weight, diabetes status, age, gender, ethnicity, baseline ISWT and smoking status.

**Results:** 770 patients (male 54%) from across the CKD trajectory (242 haemodialysis patients, 221 kidney transplant recipients, 43 peritoneal dialysis patients, 251 non-dialysis CKD patients) were referred for RR over a 12-year period from 2005 to 2017. There were 173 events, including 136 deaths during the follow-up period (median follow-up of 34 months). 53% of those referred were classified as completers. Survival time was significantly greater in “completers” compared to “non-completers” of RR (p=0.009). RR success) was also associated with improved survival (p=0.02). with Kaplan Meier analyses On multivariate analysis, completing a RR programme contributed significantly to the minimal explanatory model relating clinical variables to mortality and morbidity (overall χ2 49.0, *p*<0.001). Patients who did not complete the RR programme had a 34% (Hazard ratio = 0.66; confidence interval: 0.44 to 0.99) independent lower risk of a combined event (*p*=0.04). Change in ISWT of >50m contributed significantly to the minimal explanatory model relating clinical variables to mortality and morbidity (overall χ2 50.5, *p*<0.001). Non-responders had a 1.8-fold (Hazard Ratio = 1.8; 95% confidence interval: 1.1 to 3.1) independent greater risk of a combined event (*p*=0.03).

**Relevance and conclusion**: There is an association between completion of a RR programme and a lower risk of a combined mortality and cardiovascular morbidity event in this observational cohort study. In addition, RR responders (>50 m increase in ISWT distance) was associated with a lower risk of a combined event. Renal Rehabilitation interventions to improve exercise capacity in patients with CKD may reduce the risk of morbidity and mortality and a pragmatic intervention trial is warranted.