

Kidney transplant outcomes for children and young adults in the UK

Dr Alexander Hamilton¹, Dr Lucy Plumb¹, Dr Anna Casula², Dr Manish Sinha³

¹University Of Bristol, Bristol, UK, ²UK Renal Registry, Bristol, UK, ³Evelina Children's Hospital, London, UK

Background:

Multiple studies report young adulthood is associated with kidney transplant loss. However, there are few published UK graft survival data for children and young adults. To our knowledge, no studies assess initial transplant function or examine declining function.

We aimed to report graft survival for UK children and young adults and to explore the importance of donor and recipient variables on graft loss and rate of decline.

Methods:

Retrospective cohort study using UK Renal Registry and NHS Blood and Transplant data, including patients aged <30 years who underwent kidney transplantation between 1998-2016. Multivariable analyses used Cox proportional hazards to investigate variables associated with death-censored graft failure in a conditional risk-set model for multiple failure data. Age-group was time-varying. We used Efron's method for ties, stratification by graft number and clustering at participant level.

We calculated estimated glomerular filtration rate (eGFR) using the Schwartz formula if aged <18 years and the 4-variable Modification of Diet in Renal Disease formula otherwise. For participants with ≥ 4 values outside the first 6 months, individual regressions of eGFR against time were performed. We undertook multivariable linear regression to establish associations with eGFR slope gradients.

Results:

We studied 5121 individuals. Of these, 371 received a further transplant during the study period. There were 1371 graft failures and 145 deaths with a functioning graft over a 39541-year risk period. The cohort was 61% male and 80% white. Most (36%) had structural kidney problems, followed by glomerulonephritides (29%). Live donation occurred in 48%, donation after brainstem death in 46% and after circulatory death in 6%. Mean initial eGFR was 62 ml/min/1.73m².

Median graft survival was 7 years. One-year survival was 94.4% (95% confidence interval (CI) 93.7, 95.0), 5-year survival 84.0% (95% CI 82.9, 85.0), 10-year survival 71.1% (95% CI 69.6, 72.5), 15-year survival 60.2% (95% CI 58.1, 62.3) and 20-year survival 51.2% (47.6, 54.7). Survival at 15 years was 54.4% (95% CI 49.9, 58.7) in those transplanted aged 15-19 years compared to 71.7% (95% CI 63.4, 78.5) in those transplanted aged 0-4 years.

Figure 1 displays hazard ratios for graft loss. Protective associations were male gender (p=0.04), living donation (p=0.02) and higher initial eGFR (p<0.0001). Risk associations included adverse human leucocyte mismatches (p=0.001), black ethnicity (p=0.001), young adulthood and glomerulonephritides. Risk associations for faster eGFR decline included female gender (p<0.0001), age group 15-19 years (p=0.04), higher initial eGFR (p<0.0001), additional graft (p=0.003) and transplants during 2011-2014 (p=0.03).

Conclusion:

This study reports long-term graft survival for UK children and young adults and evaluates associations with declining transplant function. It contributes 20 years of follow-up and considers initial graft function in addition to established co-variables. Graft survival was $\approx 60\%$ at 15 years. The study highlights the changing survival by age group over time. Those aged <5 years at transplant had the highest long-term graft survival relative to other age-groups. Initial transplant function is strongly associated with graft performance. Young adulthood is a high-risk period for UK patients and interventions are needed to improve outcomes during transition and young adulthood.