

Survival outcome of haemodialysis and peritoneal dialysis

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End-stage renal disease (ESRD) is a challenging and growing health issue, with number of patients increasing globally. The use of dialysis has greatly improved the survival and life expectancy of ESRD patients. Haemodialysis (HD) and peritoneal dialysis (PD) are 2 broad dialysis modalities used for ESRD. Despite the advancement and proliferation of both modalities over past decades, controversy remains in the comparison of their survival outcomes.¹ Numerous observational studies done have yielded heterogeneous results.² Multiple studies, including those from the US, Canada, Northern Europe, Australia and New Zealand, showed that PD conferred a slight survival advantage over HD during the initial years of dialysis.³ Some postulate that the initial survival advantage of PD is due to better preservation of residual kidney function in the initial phase after dialysis commencement.⁴ However, a large Korean study found that mortality among patients aged 55 years and above was higher in PD as compared to HD.³ Other studies, such as those from Taiwan and Finland, showed similar survival outcomes between the 2 dialysis modalities.⁴ However, there is still a paucity of such studies in Southeast Asia.

To address this gap in knowledge, in this issue of the *Annals*, Khoo and colleagues⁵ evaluated the mortality and cardiovascular outcomes of HD and PD patients in Singapore. They performed a large retrospective study of approximately 5,000 ESRD patients who started dialysis in Singapore between 2007 and 2012. The authors reported comorbidities and mortality rates of ESRD patients. They identified older age (over 60 years), history of diabetes mellitus, cerebrovascular event, ischaemic heart disease and peripheral vascular disease as risk factors for mortality and acute myocardial infarction in dialysis patients.

They also found a higher mortality rate in the PD group compared to those who received HD, which differed from the findings of many Western studies that showed a superior survival outcome in PD initially. The authors suggested that the differences in their findings may be contributed by the relatively high prevalence of

diabetes mellitus (DM) in the Singaporean population (prevalence of DM was 68.5%). The PD solution, which contained glucose, could worsen diabetes control and it is possible that DM patients may be more prone to infections resulting in complications of PD, such as PD peritonitis. Indeed, a recent systematic review showed that the majority of studies, which compared outcomes of diabetic patients on HD and PD, showed a poorer survival with the use of PD.⁶ However, the authors of the systematic review noted a high risk of bias as there was significant variability across the studies in terms of DM management, dialysis protocols and patient background. These confounding variables made it difficult to draw definitive conclusions on the superior dialysis modality for DM patients.

It is important to take into account the limitations of observational studies and comparison of the outcomes of dialysis modalities, when interpreting their findings.

Firstly, the nature of observational studies prevents the establishment of causality between the dialysis modality and survival outcome. While randomised controlled trials (RCT) are more appropriate to establish causality, past RCTs have generally been unsuccessful as most ESRD patients valued autonomy in their choice of dialysis modality.³ As such, comparison between HD and PD have been generally restricted to observational studies.

Secondly, selection bias is an important confounder as the choice of dialysis modality for a patient is often linked to a myriad of factors, including patient lifestyle, medical comorbidities, socio-economic background, resource access and physician inclination. Furthermore, these factors are dynamic and may evolve longitudinally over the course of a patient's disease. Several approaches have been adopted by observational studies to better account for these factors and to reduce selection bias. Selection and streamlining of study cohort is important to improve comparability of the dialysis modalities. For example, a retrospective cohort study by Wong et al. showed that the improved survival outcomes for ESRD patients on PD disappeared when the authors

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restricted the study only to patients deemed eligible for both HD and PD.⁷ Statistical models such as propensity score, competing risk and marginal structural models may also be used to study confounding factors of mortality in ESRD patients.⁴

Studies on survival outcomes of dialysis modalities have shown inconsistencies and neither PD nor HD has demonstrated a significant survival outcome advantage over the other. Survival outcomes alone are thus insufficient to guide decision-making on the optimal dialysis treatment for an ESRD patient. Besides emphasis on survival outcomes, it is also important to consider the patient-reported outcomes and quality-of-life measures of each dialysis modality as ESRD patients face significant disease burden.⁸ As such, there has been increasing interest in comparing the qualitative outcomes of dialysis modalities. A recent systematic review showed that ESRD patients on PD showed a better health-related quality of life, as compared to patients on HD, based on measurement tools such as Short Form 36 Health Survey Questionnaire (SF-36), EuroQol-5 Dimension (EQ-5D) and Kidney Disease and Quality of Life (KDQOL).⁹ Many of the studies included were however limited by the presence of confounders and biases similar to the ones noted in observational studies on survival outcomes. Future large-scale longitudinal prospective studies across different populations to investigate the interactions between the qualitative outcomes (such as quality of social interaction, emotional state and function) and

quantitative outcomes (such as mortality, hospitalisation rate and residual renal function) will facilitate a more holistic approach to better identify the optimal dialysis modality for each ESRD patient.

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