

Predicting Outcomes in Acute Kidney Injury Survivors: Searching for the Crystal Ball



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For patients initiating dialysis in the setting of acute kidney injury (AKI-D) and their families, the possibility of permanent dialysis dependence is a source of understandable anxiety. The ability to anticipate nonrecovery of kidney function would enable clinicians to adapt care plans to incorporate the components of end-stage kidney disease care (e.g., access optimization, modality choice). The prospect of long-term dialysis dependence may impel some to adopt a more conservative approach and opt to defer dialysis initiation. There are currently no readily applicable tools at the disposal of clinicians to estimate the probability of renal recovery. Reliable risk prediction would be an important step toward informed decision making for clinicians and patients and their families when dialysis is contemplated in patients with AKI.

In this issue of *Kidney International Reports*, Lee and colleagues¹ report the derivation of a

prediction model for renal recovery in 2214 patients with AKI-D across the Kaiser Permanente Northern California network between 2009 and 2015. Renal recovery was defined as becoming independent of renal replacement therapy within 90 days of renal replacement therapy initiation and survival for at least 4 weeks thereafter. Although not universally accepted or validated, this definition is conceivably compatible with what patients would consider to be a sustained “recovery” from severe AKI. A model consisting of 4 variables, including age, liver disease, baseline estimated glomerular filtration rate, and preadmission hemoglobin level, demonstrated a moderate ability to identify patients likely to recover kidney function (C-index: 0.64).

The Kaiser Permanente Northern California dataset permitted the study of many patients who received care in an integrated health care system, thereby ensuring complete ascertainment of outcomes. This ensured a diverse population of all-comers with AKI-D and avoids the risks inherent in volunteer bias when analyzing prospective cohorts or clinical trial participants who need to provide formal consent.

They specifically selected patients who were likely to survive during hospitalization based on the severity of their underlying illness and comorbidities. Arguably, the exclusion of patients with the most extreme forms of critical illness may be appropriate because renal recovery may be a less relevant concern when mortality appears extremely likely. Despite an attempt to exclude individuals with an excessive risk of in-hospital mortality, a large proportion of patients in the non-recovered group died while still being dependent on renal replacement therapy. This further highlights the inherent challenge of predicting survival in acutely ill patients with AKI-D, a problem that may have been further exacerbated in this study due to the lack of consideration of variables that characterized the severity of the patients' acute illness and physiology.

The modest discriminative performance of the final model is reminiscent of previous efforts to develop mortality prediction models in patients with AKI in which the discriminative performance was either low to begin with or declined substantially when applied to an external cohort.^{2,3} The inability to generate an adequate model to predict kidney recovery suggests that readily available information about comorbidities, baseline characteristics, laboratory values, and current illness provide an incomplete understanding of an individual patient's likelihood of renal recovery after AKI-D. Kaiser Permanente Northern California databases may have lacked sufficient nuance about the severity of comorbidities and illness severity to permit robust outcome prediction in patients with complex illnesses further complicated by

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AKI-D. Most notably, variables reflective of the acute component of the patients' illnesses were not considered during model derivation. Although building a predictive model using only data available at or before the time of dialysis initiation has many practical advantages; the day of dialysis initiation is usually a tenuous time for patients. Information available at this time point may be inadequate to predict patient outcomes up to 90 days in the future. The integration of knowledge on the general trajectory of an acutely ill patient in the days that follow dialysis initiation may enhance our ability to predict recovery at a more distant time point.

It should be emphasized that for AKI survivors, the notion of "recovery" likely extends well beyond survival and dialysis independence. Although these objective events are usually more feasible to ascertain from a clinical database, information about functional status, quality of life, and socioeconomic status following an episode of AKI are of critical importance when evaluating the global impact of AKI-D on the surviving patient. The poor quality of life reported by survivors of AKI-D needs to be recognized and the root causes evaluated and addressed.⁴ Recent work has shown that researchers and patients may prioritize different research outcomes.^{5,6} Consequently, future research should integrate patient-centered outcomes into the study of AKI survivors (Figure 1).

The important contribution by Lee *et al.*¹ highlights that optimal outcome prognostication remains an important challenge in patients with severe AKI. Although the study did not leave us with a prognostic strategy that is ready for clinical use, we nonetheless

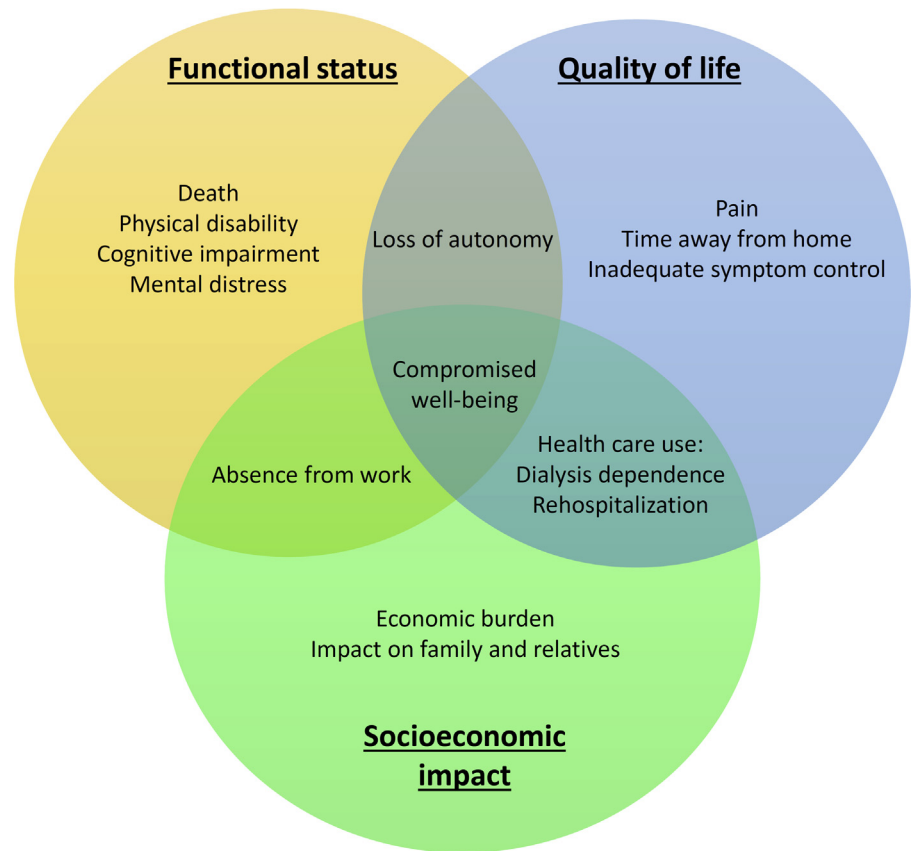


Figure 1. Patient-centered outcomes in patients with acute kidney injury.

hope that investigators will not forsake this area of investigation, as its clinical implications are likely to have an impact on patient care and shared decision making. The integration of longitudinal clinical information during hospitalization, markers of acute illness severity, and possibly novel AKI biomarkers will hopefully make the crystal ball of post-AKI prognostication less opaque.

DISCLOSURE

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