Current Status of Kidney Transplant Outcomes: Dying to Survive

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Kidney transplantation is associated with improved survival compared with maintenance dialysis. In the United States, post-transplant outcomes have steadily improved over the last several decades, with current 1-year allograft and patient survival rates well over 90%. Although short-term outcomes are similar to those in the international community, long-term outcomes appear to be inferior to those reported by other countries. Differences in recipient case mix, allocation polices, and health care coverage contribute to the long-term outcome disparity. This review presents the current status of kidney transplant outcomes in the United States and compares them with the most recent outcomes from Australia and New Zealand, Europe, and Canada. In addition, early trends after implementation of the new kidney allocation system in the United States and its potential impact on post-transplant outcomes are discussed.

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INTRODUCTION

ESRD is common in the United States and is associated with significant morbidity and mortality. Kidney transplantation is the treatment of choice for suitable candidates with ESRD. Since the advent of kidney transplantation in 1954, allograft and patient survival in the United States have markedly improved because of advances in surgical techniques and immunosuppression. Few studies have compared kidney transplant outcomes between the United States and other countries. Because of varying allocation policies, cultural differences influencing preferences for living vs deceased donation, and government-funded health care in some countries, it is possible that post-transplant outcomes are vastly different in other countries. The aim of this review was to describe the current status of kidney allograft and patient survival in the United States based on data from the 2014 Scientific Registry of Transplant Recipients (SRTR) Annual Data Report. These outcomes are compared with those from Australia and New Zealand (ANZ), Europe, and Canada, using the most recent published registry data. Finally, we comment on the early impact of the new deceased donation kidney allocation system (KAS) implemented in the United States in December 2014 on transplant outcomes.

This study used data from the SRTR. The SRTR data system includes data on all donors, waitlisted candidates, and transplant recipients in the United States, submitted by the members of the Organ Procurement and Transplantation Network (OPTN). The Health Resources and Services Administration, US Department of Health and Human Services, provides oversight of the activities of the OPTN and SRTR contractors.

KIDNEY TRANSPLANT OUTCOMES: UNITED STATES

Allograft Survival

A total of 17,814 adult kidney transplants were performed in the United States in 2014.[1] Of these, 12,279 were from deceased donors and 5535 were from living donors. Deceased donor allograft survival rates have improved over time. The most recent SRTR annual report showed long-term outcome data on recipients who underwent transplant from 1991 to 2014. From 2010 to 2014, the unadjusted 1-year allograft survival rate for recipients of a first deceased donor kidney transplant was 93.4% (Fig 1). For second or subsequent deceased donor transplants, the 1-year unadjusted allograft survival rate was comparable at 92.5%. Five-year unadjusted allograft survival rates for a primary deceased donor transplant and for retransplant were 72.4% and 71.6%, respectively, among transplant recipients from 2005 to 2009.

It is well established that living donor kidney transplants are associated with superior post-transplant outcomes compared with deceased donor transplants, and this was reflected in the SRTR data. In recipients undergoing a primary living donor kidney transplant, the 1-year unadjusted allograft survival rate was 97.2%. In those undergoing retransplant from a living donor (first transplant from deceased or living donor), 1-year allograft survival was similar at 97.3%. Five-year unadjusted allograft survival rates for a first living donor kidney transplant and a second or subsequent transplant were 84.6% and 81.4%, respectively. Despite better outcomes, numbers of living donor transplants in the United States have decreased over the past 10 years; the largest decrease was in living-related donor kidney transplants, from 4340 in 2004 to 2693 in 2014.[1] This underscores the ongoing need to encourage and support living donation.

Potential explanations for the decline in living kidney donation include an aging US population such that potential donors are older, often have more comorbidity, and

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may not be medically suitable, financial disincentives, changes in organ allocation and donor selection criteria, and inadequate public awareness about the benefits of living organ donation.[2,3] In particular, financial burdens have been identified as a major barrier. Although the recipient's health insurance covers the donor's donation-related medical expenses, it does not reimburse for other expenses (eg, travel to the transplant center for pre-donation testing and surgery, lodging, lost wages during the post-surgery recovery period, especially for self-employed or part-time workers, and higher premiums for health or life insurance or, difficulty obtaining it, after donation).[2,3] The average out-of-pocket cost incurred by patients after living donation is reported to be $5000.[4] In June 2014, the transplant community convened a Consensus Conference on Best Practices in Live Kidney Donation and issued several recommendations with the goal of making living donation financially neutral. Progress is being made as the Living Donor Protection Act was introduced in Congress in February 2016. This bill would prohibit life, disability, and long-term care insurance carriers from charging higher premiums or denying coverage to individuals based on previous kidney donation. Additionally, the legislation clarifies that donors are covered under the Family and Medical Leave Act and directs the Department of Health and Human Services to continue efforts to educate Americans about organ donation.

CLINICAL SUMMARY

- Short-term kidney transplant outcomes in the United States are similar to those in other countries.
- Long-term kidney allograft and patient survival are worse in the United States than in Australia and New Zealand, Europe, and Canada.
- Differences in post-transplant insurance coverage, deceased donor allocation policy, and recipient comorbidity probably contribute to inferior long-term US outcomes.

Patient Survival

Recipients of living donor kidney transplants enjoy high survival rates, with little difference in outcomes for primary transplant and retransplant. The unadjusted 1-year patient survival rate was 97.0% for primary deceased donor transplant recipients from 2010 to 2014 and 97.2% for retransplant recipients. Patient survival at 5 years was 86.1% for first-transplant recipients and 88.9% for retransplant recipients who underwent deceased donor transplant from 2005 to 2009. For living donor transplant recipients, patient survival at 1 year and 5 years was 98.7% and 93.1% (primary transplant) and 99.0% and 92.9% (retransplant), respectively.

Although one might anticipate that retransplant would be associated with worse post-transplant outcomes since retransplant recipients are often highly sensitized and at higher risk for rejection, worse outcomes were not observed. This likely reflects selection bias during the evaluation for retransplant, when patients who were nonadherent (perhaps leading to allograft failure) or who have substantial comorbidity are usually not deemed candidates for retransplant.

Preemptive Transplant

Kidney transplant before dialysis initiation is associated with better post-transplant outcomes than transplant after dialysis initiation. Meier-Kriesche and colleagues[5] reported that less than 6 months of pretransplant dialysis was associated with a 17% higher risk of death-censored allograft loss compared with preemptive transplant. The risk of allograft loss increased with longer pretransplant dialysis time, although the relative increase after 3 years of dialysis was minimal. Similarly, these authors showed that 6 months or longer of dialysis pretransplant was linked to a higher risk of death post-transplant compared with preemptive transplant. Other advantages of preemptive transplant include lower rates of delayed graft function and lower overall ESRD treatment costs compared with maintenance dialysis.[6,7]

In 2014, 17.1% of US adult transplant recipients underwent a preemptive transplant.[1] As would be expected, preemptive transplant accounted for a smaller fraction of all deceased donor (10.6%) than of living donor (31.6%) transplants.[1] Although the proportion of preemptive living donor transplants increased from 23% in 1995 to 32% in 2014, growth has been stagnant since 2004 despite recognition of the benefits and new paradigms, such as the Kidney First Initiative.[1,7] Future research should focused on understanding reasons for this.

High Kidney Donor Profile Index Kidneys

Previously, deceased donor kidneys were classified as standard criteria donor (SCD) or expanded criteria donor (ECD). ECD kidneys were from donors aged 60 years or older or 50 to 59 years with 2 of the following: serum creatinine more than 1.5 mg/dL, history of hypertension, or death from a stroke.[8] ECD kidneys are associated with a 1.7 times higher risk for allograft failure compared with SCD kidneys.[9] Under the new KAS, the ECD and SCD classifications were supplanted by the kidney donor profile index (KDPI), which is computed using donor age; height; weight; race; and hypertension, diabetes, cause of death, serum creatinine, hepatitis C, and donation after circulatory death (DCD) status.[10] High KDPI kidneys are anticipated to have shorter allograft survival than lower KDPI kidneys. For US recipients who underwent transplant in 2009, unadjusted 1- and 5-year allograft survival was 84.4% and 60.0%, respectively, for a KDPI >85% kidney and 94.3% and 81.3% for a KDPI 20% or lower kidney.[1]

Transplant candidates may opt for KDPI >85% kidney offers, similar to opting for ECD kidneys under the previous allocation system. Given the shortage of donor kidneys and the high annual mortality on dialysis, some patients may benefit from accepting a high KDPI kidney rather than remaining on dialysis. Massie and others[11] demonstrated that after 19.8 months, even patients who accepted the "lowest quality" KDPI 91%-100% kidneys had higher cumulative survival than patients who stayed