

**TABLE 337-1 DEFINITION OF AN EXPANDED CRITERIA DONOR AND A NON-HEART-BEATING DONOR (DONATION AFTER CARDIAC DEATH)**

Expanded Criteria Donor (ECD)	
Deceased donor >60 years	
Deceased donor >50 years and hypertension and creatinine >1.5 mg/dL	
Deceased donor >50 years and hypertension and death caused by cerebrovascular accident (CVA)	
Deceased donor >50 years and death caused by CVA and creatinine >1.5 mg/dL	
Donation after Cardiac Death <sup>a</sup> (DCD)	
I: Brought in dead	
II: Unsuccessful resuscitation	
III: Awaiting cardiac arrest	
IV: Cardiac arrest after brainstem death	
V: Cardiac arrest in a hospital patient	

<sup>a</sup>Kidneys can be used for transplantation from categories II–V but are commonly only used from categories III and IV. The survival of these kidneys has not been shown to be inferior to that of deceased-donor kidneys.

**Note:** Kidneys can be both ECD and DCD. ECD kidneys have been shown to have a poorer survival, and there is a separate shorter waiting list for ECD kidneys. They are generally used for patients for whom the benefits of being transplanted earlier outweigh the associated risks of using an ECD kidney.

transplants rose progressively. Currently, deceased-donor grafts have a 92% 1-year survival and living-donor grafts have a 96% 1-year survival. Although there has been improvement in long-term survival, it has not been as impressive as the short-term survival, and currently the “average” ( $t_{1/2}$ ) life expectancy of a living-donor graft is around 20 years and that of a deceased-donor graft is close to 14 years.

Mortality rates after transplantation are highest in the first year and are age-related: 2% for ages 18–34 years, 3% for ages 35–49 years, and 6.8% for ages ≥50–60 years. These rates compare favorably with those in the chronic dialysis population even after risk adjustments for age, diabetes, and cardiovascular status. Although the loss of kidney transplant due to acute rejection is currently rare, most allografts succumb at varying rates to a chronic process consisting of interstitial fibrosis, tubular atrophy, vasculopathy, and glomerulopathy, the pathogenesis of which is incompletely understood. Overall, transplantation returns most patients to an improved lifestyle and an improved life expectancy compared with patients on dialysis.

### RECENT ACTIVITY AND RESULTS

In 2011, there were more than 11,835 deceased-donor kidney transplants and 5772 living-donor transplants in the United States, with the ratio of deceased to living donors remaining stable over the last few years. The backlog of patients with end-stage renal disease (ESRD) has been increasing every year, and it always lags behind the number of available donors. As the number of patients with end-stage kidney disease increases, the demand for kidney transplants continues to increase. In 2011, there were 55,371 active adult candidates on the waiting list, and less than 18,000 patients were transplanted. This imbalance is set to worsen over the coming years with the predicted increased rates of obesity and diabetes worldwide. In an attempt to increase utilization of deceased-donor kidneys and reduce discard rates of organs, criteria for the use of so-called expanded criteria donor (ECD) kidneys and kidneys from donors after cardiac death (DCD) have been developed (**Table 337-1**). ECD

kidneys are usually used for older patients who are expected to fare less well on dialysis.

The overall results of transplantation are presented in **Table 337-2** as the survival of grafts and of patients. At the 1-year mark, graft survival is higher for living-donor recipients, most likely because those grafts are not subject to as much ischemic injury. The more effective drugs now in use for immunosuppression have almost equalized the risk of graft rejection in all patients for the first year. At 5 and 10 years, however, there has been a steeper decline in survival of those with deceased-donor kidneys.

### RECIPIENT SELECTION

There are few absolute contraindications to renal transplantation. The transplant procedure is relatively noninvasive, as the organ is placed in the inguinal fossa without entering the peritoneal cavity. Recipients without perioperative complications often can be discharged from the hospital in excellent condition within 5 days of the operation.

Virtually all patients with ESRD who receive a transplant have a higher life expectancy than do risk-matched patients who remain on dialysis. Even though diabetic patients and older candidates have a higher mortality rate than other transplant recipients, their survival is improved with transplantation compared with those remaining on dialysis. This global benefit of transplantation as a treatment modality poses substantial ethical issues for policy makers, as the number of deceased kidneys available is far from sufficient to meet the current needs of the candidates. The current standard of care is that the candidate should have a life expectancy of >5 years to be put on a deceased organ wait list. Even for living donation, the candidate should have >5 years of life expectancy. This standard has been established because the benefits of kidney transplantation over dialysis are realized only after a perioperative period in which the mortality rate is higher in transplanted patients than in dialysis patients with comparable risk profiles.

All candidates must have a thorough risk-versus-benefit evaluation before being approved for transplantation. In particular, an aggressive approach to diagnosis of correctable coronary artery disease, presence of latent or indolent infection (HIV, hepatitis B or C, tuberculosis), and neoplasm should be a routine part of the candidate workup. Most transplant centers consider overt AIDS and active hepatitis absolute contraindications to transplantation because of the high risk of opportunistic infection. Some centers are now transplanting individuals with hepatitis and even HIV infection under strict protocols to determine whether the risks and benefits favor transplantation over dialysis.

Among the few absolute “immunologic” contraindications to transplantation is the presence of antibodies against the donor kidney at the time of the anticipated transplant that can cause hyperacute rejection. Those harmful antibodies include natural antibodies against the ABO blood group antigens and antibodies against human leukocyte antigen (HLA) class I (A, B, C) or class II (DR) antigens. These antibodies are routinely excluded by proper screening of the candidate’s ABO compatibility and direct cytotoxic cross-matching of candidate serum with lymphocytes of the donor.

### TISSUE TYPING AND CLINICAL IMMUNOGENETICS

Matching for antigens of the HLA major histocompatibility gene complex (**Chap. 373e**) is an important criterion for selection of donors for renal allografts. Each mammalian species has a single chromosomal

**TABLE 337-2 MEAN RATES OF GRAFT AND PATIENT SURVIVAL FOR KIDNEYS TRANSPLANTED IN THE UNITED STATES FROM 1998 TO 2008<sup>a</sup>**

	1-Year Follow-Up		5-Year Follow-Up		10-Year Follow-Up	
	Grafts, %	Patients, %	Grafts, %	Patients, %	Grafts, %	Patients, %
Deceased donor	92	96	72	84	46	64
Living donor	96	99	81	91	59	77

<sup>a</sup>All patients transplanted are included, and the follow-up unadjusted survival data from the 1-, 5-, and 10-year periods are presented to show the attrition rates over time within the two types of organ donors.

**Source:** Data from Summary Tables, 2009 Annual Reports, Scientific Registry of Transplant Recipients.