wait list 120
deceased donation 124
transplant 125
donor-recipient matching 127
outcomes 128
pediatric transplant 130
Medicare data 134
transplant center maps 137

OPTN/SRTR 2012 Annual Data Report: heart

ABSTRACT The number of heart transplants performed annually continues to increase gradually, and the number of adult candidates on the waiting list increased by 25% from 2004 to 2012. The heart transplant rate among active adult candidates peaked at 149 per 100 wait-list years in 2007 and has been declining since; in 2012, the rate was 93 heart transplants per 100 active wait-list years. Increased waiting times do not appear to be correlated with an overall increase in wait-list mortality. Since 2007, the proportion of patients on life support before transplant increased from 48.6% to 62.7% in 2012. Medical urgency categories have become less distinct, with most patients listed in higher urgency categories. Approximately 500 pediatric candidates are added to the waiting list each year; the number of transplants performed each year increased from 274 in 1998 to 372 in 2012. Graft survival in pediatric recipients continues to improve; 5-year graft survival for transplants performed in 2007 was 78.5%. Medicare paid for some or all of the care for nearly 40% of heart transplant recipients in 2010. Heart transplant appears to be more expensive than ventricular assist devices for managing end-stage heart failure, but is more effective and likely more cost-effective.

KEY WORDS End-stage heart failure, heart transplant, transplant outcomes, ventricular assist device.

The following message was handwritten by the young son of the recipient of my son's heart on November 8, 1994. "To heart donor, I would like to say thank you for donating a heart for my dad. I can't say thank you enough because he couldn't do hardly anything with his bad heart. My heart goes out to you for your lost loved one."

Bonnie, donor mother

Introduction

Heart transplant outcomes continue to improve due to sustained improvements in perioperative management, patient selection, and wait-list management. Mechanical circulatory support, particularly advances in implantable devices, has revolutionized the way end-stage heart failure patients are managed and has affected heart transplant trends in multiple ways.

The number of heart transplants performed annually continues to increase gradually. From 1998 to 2004, the number of heart transplants decreased by 14.2%. Since then, the number of heart transplants performed annually has increased by 17.1%; this increase may reflect, at least in part, the broader sharing policy begun in 2006. The most recent revision of the Organ Procurement and Transplantation Network (OPTN) heart allocation policy involved a temporary change in 1A status for patients with a total artificial heart. Although this policy has expired, OPTN heart allocation policies continue to be reviewed to address changing trends in heart failure management and outcomes. The current policy, based on three medical urgency statuses, does not stratify medical urgency with sufficient granularity. It is anticipated that future revisions of the policy will provide a greater degree of stratification to respond the changing clinical profile of the advanced heart failure patient. A second challenge is wide regional variation in heart donation rates, waiting times, and, thereby, access to heart transplant. These variations are multifactorial and influenced not only by donor availability but also by center-specific practices. Nevertheless, identifying and seeking to understand these challenges to fair allocation practices will contribute to the development of better policies.

Adult Heart Transplant Waiting List Trends

New Listings, Time to Transplant, and Wait-List Mortality

From 1998 to 2004, the number of listings for heart transplant declined. Since then, however, the number of new active adult (aged 18 years or older at listing) candidates on the waiting list has increased by 25% (Figure 1.1). From 2008 through 2012, 14,524 new candidates were added to the waiting list. The distribution of candidates waiting in the most urgent category has shifted, with more status 1A and status 1B candidates and fewer status 2 and inactive candidates since 2006 (Figure 1.2). This shift may reflect the increase in ventricular assist device (VAD) implants and subsequent listing as status 1B. Also, recognizing that undergoing transplant as status 2 is unlikely, many centers are deferring listing candidates as status 2 until they qualify for a more urgent status, which may contribute to the decline in candidates listed as status 2.

The heart transplant rate among active candidates peaked at 149 per 100 wait-list years in 2007 and has been declining since; in 2012, the rate was 93 heart transplants per 100 active wait-list years (Figure 1.4). The rate appears to be increasing in women, as suggested by trends over the past 2 years, but this increase bears further observation. Of note, the 2012 transplant rate among status 2 candidates was 13 per 100 wait-list years, one-third the rate observed in 2007.

Among patients listed for transplant in 2009, 55.9% underwent transplant within 12 months of listing, 27.5% were still waiting at 12 months, and 8.7% had died. By 36 months, 66.7% had undergone transplant, 10.9% had died, and 13.9% were removed from the list for other reasons. Fewer than 10% were waiting by the end of the third year (Figure 1.7). Median time to transplant appeared to have reached a nadir for all medical urgency categories in 2006-2007 and has been gradually increasing since then. Median time to transplant is longest for status 2 candidates, at almost 20 months; median time to transplant for status 1A and status 1B candidates was 2.4 months and 6.9 months, respectively, in 2012. Considering the past decade as a whole, the median waiting time for status 1A candidates has not changed appreciably, although it has increased for status 1B and status 2 candidates. The median time to transplant among candidates with VADs at listing also reached a nadir of 3 months in 2006-2007 and has increased since then; in 2012, the median waiting time for candidates with VADs at listing was 8.7 months, the same as for candidates without VADs (Figure 1.8).

Pretransplant mortality rates include candidates who died while on the waiting list as well as those removed for being too ill, who subsequently died. In general, pretransplant mortality declined from 15.8 deaths per 100 wait-list years in 2002 to 12.4 in 2012 (Figure 1.10). There have been some notable trends among

subgroups. Although pretransplant mortality has typically been lowest for candidates aged 35 to 49 years, in 2012 it was lowest for candidates aged 50 to 64 years: 11.8 per 100 wait-list years. Pretransplant mortality was similar for all ethnic groups, ranging from 11 to 15 deaths per 100 wait-list years (Figure 1.10). Among candidates with coronary artery disease and cardiomyopathy, pretransplant mortality has declined, while it has fluctuated over time among candidates with congenital heart disease and valvular heart disease. Among candidates with VADs at time of listing, pretransplant mortality has declined substantially, from 95.7 per 100 wait-list years in 2002 and 44.7 per 100 wait-list years in 2007 to 13.25 per 100 wait-list years in 2012. Before 2010, pretransplant mortality among candidates with VADs was substantially higher than among candidates without VADs, but since 2010, pretransplant mortality has been essentially the same for candidates with and those without VADs at listing. As expected, the mortality rate was highest for candidates listed as status 1A. Pretransplant mortality among candidates listed as status 1A has declined dramatically over the past decade, from 141.8 per 100 wait-list years to 40.23. Similarly, wait-list mortality for candidates listed as status 1B declined from 33.9 per 100 wait-list years to 11.72 in 2012, and mortality for those listed as status 2 declined from 11.8 per 100 wait-list years to 7.66. The pretransplant mortality rate among inactive candidates has typically been relatively low; however, since 2002, the rate has increased from 8.6 per 100 wait-list years to 12.7 (Figure 1.10). Both favorable and unfavorable changes in condition, as well as other factors, may contribute to candidates being listed as inactive.

The waiting list continues to grow because more candidates are typically added than removed in a given year. In 2012, 3007 new candidates were added to the waiting list, while 2784 were removed; 2008 of those were removed due to undergoing transplant (Figure 1.6). The number of candidates removed from the list due to undergoing transplant remained steady from 2010 to 2012. The number removed from the list due to death remains substantial, 372 patients in 2012; 117 were removed for being too ill to undergo transplant, and 142 because their condition improved. Thus, we are still faced with a major imbalance in supply and demand that is associated with substantial mortality on the list (Figure 1.6).

Candidate Characteristics

In general, the age distribution of heart transplant candidates has been stable over the past decade. The percentage of candidates aged 18 to 34 years peaked at 11.0% in 2004 and declined to 9.8% in 2012. The proportions of candidates aged 35 to 49 years and 50 to 64 years similarly declined. On the other hand, the proportion of candidates aged 65 years or older continues to increase, from 12.8% in 2002 to 19.8% in 2012. There has been an increase in candidates from ethnic minority groups, with a notable increase in black candidates from 14.6% to 21.2% since 2002. The prevalence of cardiomyopathy as a cause for transplant increased to 51.5% compared with coronary artery disease, which declined to 37.1% (Figure 1.2).

The trend in VADs at listing persists with a substantial increase, particularly over the past 5 years. In 2012, 22.6% of candidates had a VAD at listing compared with 9.7% in 2007 (Figure 1.2).

The proportion of candidates awaiting heart transplant for an extended period is decreasing. In 2012, only 9.2% of candidates spent 4 or more years on the waiting list, compared with 18.7% in 2002 (Figure 1.2). The proportion of candidates waiting less than 1 year has stabilized at approximately 50% since 2007. Because time to transplant has increased in recent years, other factors, such as listing practices, may be contributing to the decrease in candidates waiting for an extended period.

Donation

Heart donation rates remain flat; in 2012, there were 3.5 donations per 1000 deaths. The highest rates were among donors aged 15 to 34 years, who provided 17.9 hearts per 1000 deaths (Figure 2.1). Over the past 5 years, heart donation rates increased by 11% to 14% for ages 15-34, 35-44, and 45-54 years (Figure 2.1). Hispanics have had the highest heart donation rate of all ethnic categories, 4.3 per 1000 patient deaths in 2011 (Figure 2.1). Very few recovered hearts are discarded. Over the past decade, discard rates ranged from 0.5% to 1.4% of all hearts recovered for transplant. In 2012, 1.1% of hearts were discarded, a total of 28 hearts.

The most common cause of death among heart donors is head trauma (53.4%). The prevalence of head trauma as a

cause of death has declined over the past decade from 61.7%, while the prevalence of anoxia is increasing (Figure 2.3). Anoxia is the second most common cause of death among heart donors, accounting for 24.7% of heart-donor deaths in 2012. The proportion of donors with cerebrovascular disease, previously the second most common cause of death among donors, has also declined, and in 2012 was 18.6% (Figure 2.3).

Adult Heart Transplant

Trends in Heart Transplant

From 1998 to 2004, the number of heart transplants performed nationwide persistently declined. Since then, transplant volume has been increasing, with the greatest annual rise, 5.9%, seen in 2010. Between 2011 and 2012, heart transplants increased 2.5%, from 2349 to 2407 transplants. Since 2002, the number of heart transplants performed in the US increased 10.0%, from 2188 to 2407 in 2012 (Figure 3.1). Heart retransplants increased during the past decade. Although the trend has been flat for the past 5 years, there was a slight decrease from 4.0% in 2011 to 3.2% in 2012 (Figure 3.4).

Multi-Organ Transplants

Heart transplants as part of multi-organ transplants have increased, due to increases in heart-liver and heart-kidney transplants. The proportion of heart transplants that are heart-lung exceeds the proportion that are heart-liver. The proportion of heart-lung transplants performed has been static, while the proportions of heart-liver and heart-kidney transplants appear to be increasing (Figure 3.3). In 2012, 130 heart transplants were performed simultaneously with other organs; 29 were heart-lung transplants, 78 heart-kidney, 22 heart-liver, and 1 heart-liver-kidney. The number of simultaneous heart-lung transplants has been static; however, a relative peak of 42 in 2010 was the highest number performed in a year in the past decade. In 2012, the most common specified reason for heart-lung transplant was congenital heart disease (24%). Forty-four percent of heart-kidney transplants were performed in patients with idiopathic dilated cardiomyopathy, and 42% in patients with coronary artery disease. The most common diagnoses in candidates for heart-liver transplant were congenital heart disease (27%) and amyloidosis (27%). A single heart-liver-kidney transplant was performed in 2012 for congenital heart disease.

Recipient Characteristics and Posttransplant Trends

Forty-two percent of heart transplant recipients are aged 50 to 64 years. The proportion of candidates aged 65 years old or older increased noticeably compared with the other age groups, for whom the trend has been static or downward. Since 2002, the proportion of recipients aged 65 years or older increased from 10.1% to 15.1%. The number of women who underwent transplant increased 22% over the past 5 years, while the number of men increased only 2%. Transplants performed in members of ethnic minority groups continue to increase gradually, although the increase was 45% for Asians over the past 5 years, compared with 10% for blacks and 4% for Hispanics.

In 2012, 54.0% percent of heart transplants were performed in patients with cardiomyopathy, 32.8% in patients with coronary artery disease (CAD), and 9.9% in patients with congenital heart disease. The proportions of recipients with CAD and valvular heart disease are decreasing; considering the 10-year trend, the number of transplants in candidates with CAD decreased 15%, the number in candidates with cardiomyopathy and congenital heart disease increased 34% and 24% respectively, and the number in candidates with valvular heart disease decreased 44% (Figure 3.2). The proportion of adult recipients who were status 1A at the time of transplant surged over the decade from 34.8% to 58.5%; the proportion who underwent transplant at status 2 fell from 26.9% to 5.0%, and the proportion at status 1B remained the same. In 2012, 41.3% of adult recipients had prior VAD compared with only 23.2% in 2002 (Figure 3.6). The proportion of adult recipients with Medicare as primary insurer increased. Most recipients over the decade have had private insurance, but the proportion with private insurance decreased from 2002 to 2012, and the proportion with Medicare increased (Figure 3.6).

Trends in Life Support

The introduction of mechanical circulatory support dramatically changed the treatment of advanced heart failure and the practice of transplant. A paradigm shift occurred regarding what constitutes the best bridging mechanism to allow patients an adequate quality of life while awaiting transplant, ensure survival to transplant, and ensure adequate physical condition and tolerance of surgery. This shift has been reflected in the distribution of circulatory support before transplant. Since 2007, the proportion of patients on life support before transplant increased from 48.6% to 62.7% in 2012. This increase appears to be primarily due to an increase in use of left ventricular assist devices (LVAD) at the time of transplant. The proportion of recipients using an LVAD increased from 22.0% in 2007 to 35.6% in 2012; the proportion using inotropes declined from 43.4% of all recipients to 36.2%. Thus, the proportion of candidates with LVADs now approximates the proportion receiving inotropes, whereas in 2007, the proportion of recipients with prior inotropes exceeded the proportion with VADs by nearly 2 fold. The proportions of recipients using intra-aortic balloon pumps, right ventricular assist devices, or ventilators before transplant declined over the past 5 years, while the proportions using extracorporeal membrane oxygenation, inhaled nitric oxide, or prostaglandin E remained unchanged and low (Figure 3.5).

Posttransplant Mortality

Overall, mortality after transplant declined over the past decade (Figure 5.2). One-year survival was 88% for patients who underwent transplant from 2005 to 2007; 3-year survival was 81%, and 5-year survival was 75%. Although early survival appears to be similar for all age categories, by the end of year 1, survival was lowest for recipients aged 18 to 34 years and appeared to decline more than for other age groups. By the end of year 3, survival was only 75% for recipients aged 18 to 34 years, compared with 80% for those aged 65 years or older and 82% for the other age groups. By the end of year 5, survival for recipients aged 18 to 34 years was only 67%, compared with approximately 75% for the other age groups. Similarly, 5-year survival was significantly worse for black compared with white recipients. Five-year survival was 72% for women compared with 76% for men, and 72% for recipients with VADs compared with 76% for recipients without VADs (Figure 5.1). Both differences reached statistical significance, although these slight variations may be clinically acceptable. Investigation into the factors associated with the poorer outcomes would be helpful. Survival also appears to be similar for the three status categories; 5-year survival was 73% for status 1A recipients, 77% for status 1B recipients, and 75% for status 2 recipients (Figure 5.3). Median survival was 11.6 years, and 12.7 years if the recipient survived the first year. This trend has been flat for the past decade (Figure 5.4). Nevertheless, the prevalence of recipients alive with a functioning heart graft continues to increase; the number was 26,291 on June 30, 2012 (Figure 5.5). The most common causes of early mortality (during the first 3 months) after transplant are infection (1.4%), a combination of cardiovascular and cerebrovascular events (1.3%), and graft failure (1.1%). By the end of the first year, infection is the most common cause, occurring in 2.3% of recipients; this is superseded by cardiovascular/cerebrovascular events at 2 years (3.0%). Cardiovascular/cerebrovascular events remain the most common cause of mortality throughout the first 10 years after heart transplant, followed by graft failure and infection (Figure 5.9).

Posttransplant Morbidity

Acute rejection remains common, occurring in 23% of heart transplant recipients by year 1 after transplant and in 45% by year 5 (Figure 5.6). The majority of heart transplant recipients, 61.1%, are hospitalized by year 4, and 36.3% during the first year (Figure 5.7). Posttransplant lymphoproliferative disorder (PTLD) is infrequent, but occurs most frequently among recipients who are Epstein-Barr virus (EBV) negative. Of note, 93% of EBV-negative recipients received a heart from EBV-positive donors (Figure 4.3).

The rate of hospital admissions for patients who underwent transplant in 2008 with Medicare as primary payer was 133.4 per 100 person-years at risk in the first year after transplant, declining to 61.9 in year 2 (Figures 7.2 and 7.3). The most common reasons for hospitalization after transplant were transplant complications followed by infection (Figure 7.4).

Geographic Variations

Geographic variations in access to organ transplant occur for a variety of reasons, including factors related to center-specific practices, the organ procurement organization (OPO), and demographics inherent to a particular region. Between 2009 and 2011, organ donation rates varied considerably between states from 0 to 1.61 per 1000 deaths. In most states, donation rates changed only minimally from 2006-2008 to 2009-2011 (Figure 2.2). In 2011, the proportion of candidates who underwent transplant within 1 year of wait-listing also varied widely among OPOs, between 22% and 100%. This variability was observed even between OPOs within the same state (Figure 1.9). Finally, heart transplant rates vary widely. In 2011 to 2012, heart transplant rates varied by OPOs from 0 per 100 patient-years on the waiting list to 661 (Figure 1.5). Although these variations are striking, determination of their impact on pretransplant mortality and on posttransplant outcomes will be useful in assessing their true significance.

Summary

The 2012 trends may be a reflection of prior allocation policy changes and of the impact of evolving management of heart failure. Waiting times continue to increase, but this trend did not appear to correlate with an overall increase in wait-list mortality. Medical urgency categories have become less distinct, with the majority of patients being listed in the higher urgency categories. Heart transplant among candidates listed as status 2 is becoming exceedingly rare. Geographic variations in waiting times, donation rates, and transplant rates persist, although the clinical impact has not yet been determined. It is anticipated that revisions to the allocation policy will better prioritize medical urgency as a first step in ensuring equitable access.

Pediatric Heart Transplant

Pediatric Waiting List Trends

The number of new pediatric patients added to the heart transplant waiting list remains at approximately 500 per year with very few added as inactive status (Figure 6.1). At year end 2012, a total of just over 300 candidates were awaiting heart transplant, with 61% listed as active. Approximately 50% of pediatric heart transplant candidates on the waiting list were aged 5 years or younger, with almost equal numbers aged younger than 1 year and 1-5 years (Figure 6.2). Almost 60% of heart transplant candidates were white, 18.9% were black, 18.3% were Hispanic, and less than 5% were Asian. In 2012, 8.3% of candidates (n = 89) on the heart transplant waiting list had undergone a previous heart transplant (Figure 6.3). Of all wait-listed candidates in 2012, 4.3% (26) of those aged less than 6 years, 15.7% (24) of those aged 6 to 10 years, and 12.6% (39) of those aged 11 to 17 years were awaiting retransplant (Figure 6.3). Almost 70% of patients newly listed in 2009 underwent transplant within 3 years, 13.9% died, 14.3% were removed from the list, and 4.5% were still waiting (Figure 6.5). The rate of deceased donor transplant among active pediatric wait-list candidates decreased from a peak of almost 300 per 100 patient-years on the waiting list to 192 in 2012 (Figure 6.6), due largely to a growing waiting list. Transplant rates varied by age, with the highest rates in candidates aged less than 1 year, 408 transplants per 100 patient-years on the waiting list. Pretransplant mortality decreased dramatically for all age groups. The pretransplant mortality rate was highest for candidates aged younger than 1 year, at 53 deaths per 100 wait-list years in 2010-2012 (Figure 6.7).

Pediatric Transplant

The number of pediatric heart transplants performed each year increased from 274 in 1998 to 372 in 2012 (Figure 6.8). In 2012, 7.1% of heart transplant recipients had a history of previous heart transplant (Figure 6.9). Less than 2% of pediatric heart transplants were part of a multi-organ transplant (Figure 6.10). Over the past decade, age and sex of pediatric heart transplant recipients changed little (Figure 6.11). Congenital defects remain the most common primary cause of disease, 43.3% of recipients in 2010-2012. The proportion of recipients with private insurance decreased and Medicaid coverage increased. The proportion of patients who underwent transplant as status 1A increased from 65.0% in 2000-2002 to 87.9% in 2010-2012. VAD use increased from only 7.2% of transplant candidates in 2000-2002 to 20.1% in 2010-2012. ABO

incompatible transplant occurred in less than 1% of recipients in the early era, compared with 3.4% in 2010-2012.

PTLD is a significant concern in pediatric transplant. Among pediatric heart transplant recipients from 2008 to 2012, 41.8% were EBV negative and 48.2% were positive. The highest risk for EBV infection and PTLD occurs for EBV-negative recipients of EBV-positive donor organs, 31.4% of pediatric recipients (Figure 6.12). Incidence of PTLD among EBV-negative recipients was 6.6% at 5 years after transplant, compared with 2.6% among EBV-positive recipients (Figure 6.14).

Among pediatric heart transplant recipients from 2008 to 2012, 56.1% were cytomegalovirus (CMV) negative and 40.0% were positive (Figure 6.13). The combination of a CMV-positive donor and CMV-negative recipient occurred in 29.2% of transplants.

Pediatric Immunosuppression and Outcomes

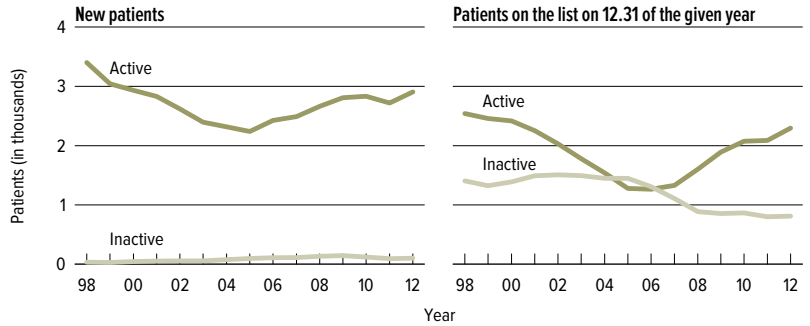
Substantial changes in maintenance immunosuppression have occurred in heart transplantation. Tacrolimus use increased from 25.2% in 1998 to 79.7% in 2012. Mycophenolate use increased from 32.8% in 1998 to 91.2% in 2012 (Figure 6.15). In 2011, mammalian target of rapamycin (mTOR) inhibitors were used in 1.6% of recipients at the time of transplant and in 9.8% at 1 year after transplant; steroids were used in 69.5% of recipients at the time of transplant and in 61.1% at 1 year. The most common induction therapy was T cell-depleting agents, used in almost half of heart transplant recipients in 2012. No induction therapy was used in 26.0% of recipients.

Graft survival after pediatric heart transplant has continued to improve. Graft survival for heart transplants in 2007 was 96.1% at 30 days, 89.5% at 1 year, 84.8% at 3 years, and 78.5% at 5 years (Figure 6.16). The rate of late graft failure is traditionally measured by the graft half-life conditional on 1-year survival, defined as the time to when half of grafts surviving at least 1 year are still functioning. For heart transplants performed in 2009-2010, the 1-year conditional graft half-life was 15.2 years (Figure 6.17). The incidence of first acute rejection increases over time after transplant with 22% of patients experiencing rejection in the first 12 months and 34% within 24 months after transplant (Figure 6.18).

Economics

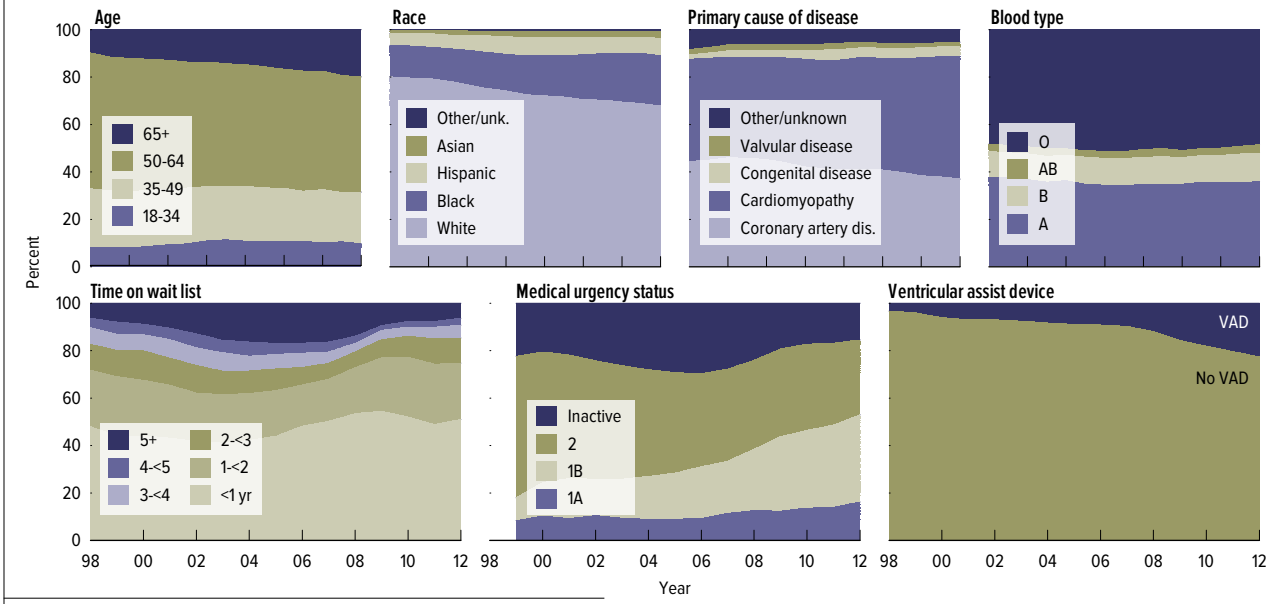
Medicare is the largest single payer for heart transplant in the United States, paying for some or all of the care for nearly 40% of recipients in 2010 (Figure 7.1). Average reimbursement for heart transplant recipients with primary Medicare coverage from transplant through 1 year after transplant was $264,994 for Part A and $33,634 for Part B (Figure 7.5), totaling $298,628. This is approximately three to four times the Medicare Part A and B expenditure for a kidney transplant recipient (Kidney Chapter, Figure 8.5), and similar to the expenditure for lung or intestine transplant recipients (Lung Chapter, Figure 7.5; Intestine Chapter, Figure 5.5). Rehospitalization is common following heart transplant; rates are relatively high in the first year after transplant (Figure 7.2) and drop by half in the second year (Figure 7.3). Primary causes of rehospitalization are dominated by transplant complications and infections in both the first and second years after transplant (Figure 7.4). Rehospitalization rates and cause patterns are remarkably similar to those for kidney transplant (Kidney Chapter, Figures 8.2, 8.3, 8.4). Annual costs after the first year are dramatically smaller; Medicare Part A and B costs average $23,671 and $14,468, respectively, during year two (Figure 7.6), totaling $38,139; cost is expected to remain stable in later years. Additional costs not accounted for here include reimbursement to hospitals for the transplant portion of the Medicare Cost Report and Medicare Part D. Including estimates for these brings average Medicare cost to approximately $375,000 in the first year after transplant and approximately $45,000 in subsequent years. Heart transplant appears to be somewhat more expensive than recent estimates of implantation of VADs for management of end-stage heart failure. However, heart transplant is considerably more effective than VADs and is likely a more cost-effective strategy. Heart transplant recipients account for 10% of all Medicare Part A and B expenditure following solid organ transplant, $412 million or $32,222 per patient in 2010 (Figure 7.7).

wait list



HR 1.1 Adult patients waiting for a heart transplant

Patients waiting for a transplant. A "new patient" is one who first joins the list during the given year, without having listed in a previous year. However, if a patient has previously been on the list, has been removed for a transplant, and has relisted since that transplant, the patient is considered a "new patient." Patients concurrently listed at multiple centers are counted only once. Those with concurrent listings and active at any program are considered active; those inactive at all programs at which they are listed are considered inactive.



HR 1.2 Distribution of adult patients waiting for a heart transplant

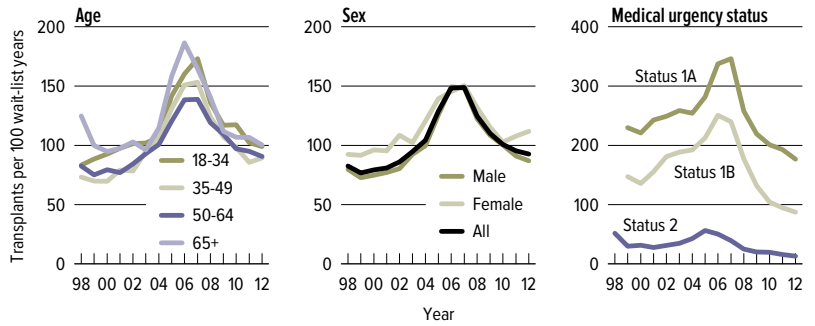
Patients waiting for a transplant any time in the given year. Age determined on the earliest of listing date or December 31 of the given year. Concurrently listed patients are counted once. Ventricular assist device information comes from the OPTN Transplant Candidate Registration form at the time of listing, and includes LVAD, RVAD, TAH, and LVAD + RVAD. Medical urgency status is the earliest available per year for each patient. Medical ugency status is the most severe recorded in the given year.

wait list

	Level	2002 N	2002 %	2012 N	2012 %
Age	18-34	301	8.5	296	9.5
	35-49	863	24.3	687	22.1
	50-64	1,950	54.9	1,532	49.3
	65+	437	12.3	593	19.1
Sex	Female	808	22.8	767	24.7
	Male	2,743	77.2	2,341	75.3
Race	White	2,739	77.1	2,126	68.4
	Black	510	14.4	674	21.7
	Hispanic	219	6.2	220	7.1
	Asian	65	1.8	65	2.1
	Other/unknown	18	0.5	23	0.7
Primary cause of disease	Cor. artery disease	1,565	44.1	1,152	37.1
	Cardiomyopathy	1,565	44.1	1,589	51.5
	Congenital disease	116	3.3	150	4.8
	Valvular disease	77	2.2	62	2.0
	Other/unknown	228	6.4	155	5.0
Transplant history	Listed/first transplant	3,466	97.6	3,001	96.6
	Listed/subseq. transplant	85	2.4	107	3.4
Blood type	A	1,153	32.5	1,004	32.3
	B	342	9.6	325	10.5
	AB	58	1.6	58	1.9
	O	1,998	56.3	1,721	55.4
Time on wait list	<1 year	1,233	34.7	1,530	49.2
	1-<2	604	17.0	644	20.7
	2-<3	467	13.2	322	10.4
	3-<4	313	8.8	209	6.7
	4-<5	272	7.7	111	3.6
	5+	662	18.6	292	9.4
Medical urgency status	1A	84	2.5	269	8.9
	1B	315	9.3	1,078	35.5
	2	1,546	45.5	895	29.5
	Inactive	1,453	42.8	793	26.1
VAD status at listing	No VAD	3,432	96.6	2,435	78.3
	VAD	119	3.4	673	21.7
Multi-organ listing	Heart-Lung	140	3.9	33	1.1
	Heart-Kidney	53	1.5	126	4.1
	Heart-Pancreas	0	0.0	1	0.0
	Heart-Liver	5	0.1	32	1.0
	Heart alone	3,353	94.4	2,916	93.8
Total		3,551	100.0	3,108	100.0

HR 1.3 Characteristics of adult patients on the heart transplant waiting list on December 31, 2002 & December 31, 2012

Patients waiting for a transplant on December 31, 2002 and December 31, 2012, regardless of first listing date; active/inactive status is on this date, and multiple listings are not counted.

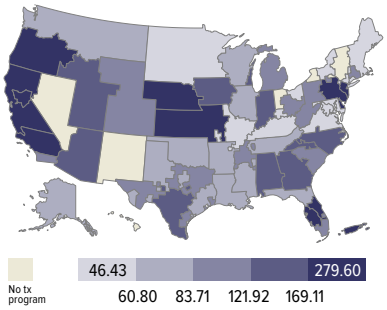


HR 1.4 Heart transplant rates among active adult waiting list candidates, by age

Transplant rates are computed as the number of deceased donor transplants per 100 patient-years of active waiting time in a given year. Age is calculated on the first active listing date in a given year. Medical urgency status is the most severe recorded in the given year. Candidates with old Status 1 in 1998 and 1999 are excluded.

data behind the figures can be downloaded from our website, at srtr.transplant.hrsa.gov

wait list



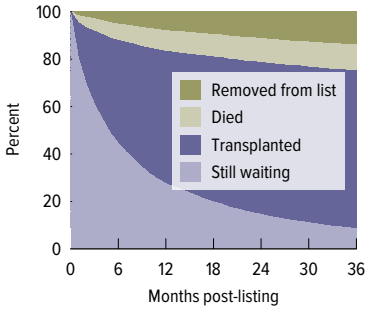
HR 1.5 Deceased donor heart transplant rates per 100 patient years on the waiting list among active adult candidates, by DSA, 2011–2012

Transplant rates by DSA of the listing center, limited to those with active time on the waiting list in 2011 and 2012; deceased donor transplants only. Maximum time per listing is two years. Patients with concurrent listings in a single DSA are counted once in that DSA, and those listed in multiple DSAs are counted separately per DSA.

	2010	2011	2012
Patients at start of year	2,737	2,932	2,883
Patients added during year	2,956	2,810	3,007
Patients removed during year	2,754	2,855	2,784
Patients at end of year	2,939	2,887	3,106
Removal reason			
Deceased donor transplant	1,993	1,948	2,008
Patient died	410	441	372
Patient refused transplant	12	16	20
Improved, tx not needed	157	164	142
Too sick to transplant	69	99	117
Other	113	187	125

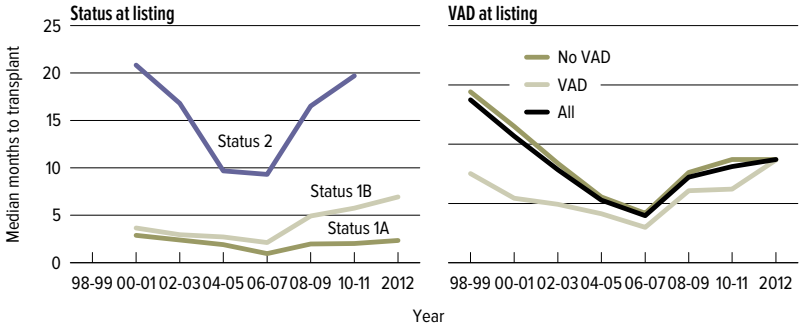
HR 1.6 Heart transplant waiting list activity among adult patients

Patients with concurrent listings at more than one center are counted once, from the time of earliest listing to the time of latest removal. Patients listed, transplanted, and re-listed are counted more than once. Patients are not considered "on the list" on the day they are removed. Thus, patient counts on January 1 may be different from patient counts on December 31 of the prior year. Patients listed for multi-organ transplants are included. Known deaths following removal for being too ill are counted as deaths.



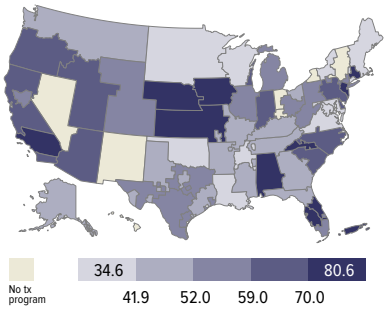
HR 1.7 Three-year outcomes for adult patients waiting for a heart transplant among new listings in 2009

Adult patients waiting for any heart transplant and first listed in 2009. Patients with concurrent listings at more than one center are counted once, from the time of the earliest listing to the time of latest removal.



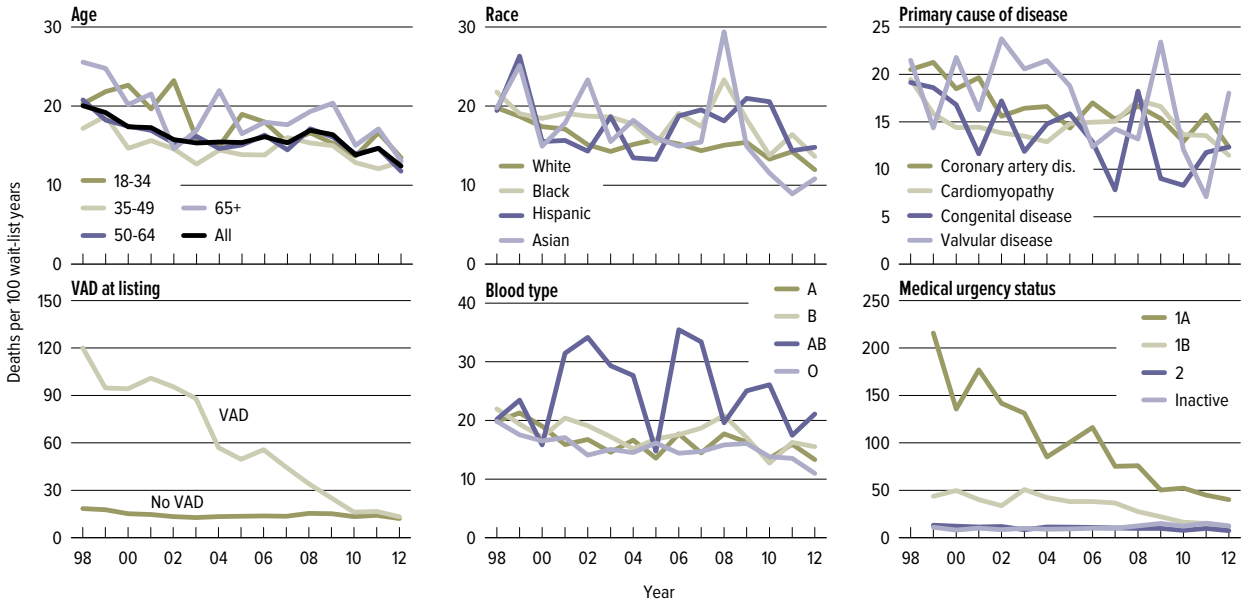
HR 1.8 Median months to heart transplant for wait-listed adult patients

Patients waiting for a transplant, with observations censored at December 31, 2012; Kaplan-Meier methods used to estimate time to transplant. If an estimate is not plotted, 50% of the cohort listed in that year had not been transplanted at the censoring date. Only the first transplant is counted.



HR 1.9 Percent of adult wait-listed patients, 2011, who received a deceased donor heart transplant within one year, by DSA

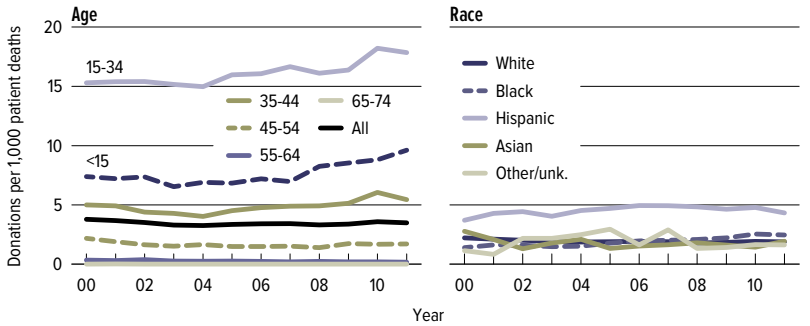
Patients with concurrent listings in a single DSA are counted once in that DSA, and those listed in multiple DSAs are counted separately per DSA.



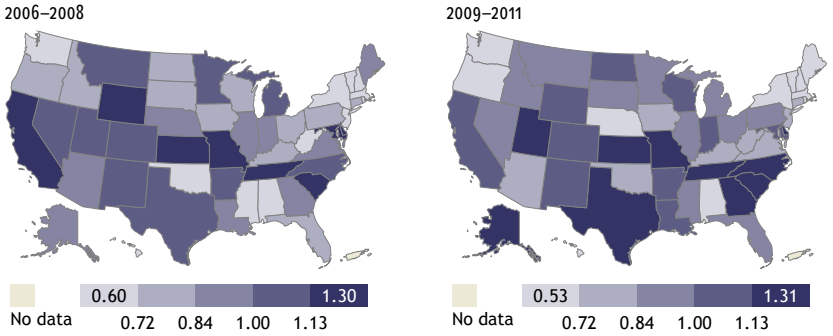
HR 1.10 Pre-transplant mortality rates among adult patients wait-listed for a heart transplant

Patients waiting for a transplant. Mortality rates are computed as the number of deaths per 100 patient-years of waiting time in the given year. For rates shown by different characteristics, waiting time is calculated as the total waiting time in the year for patients in that group. Deaths occuring after removal are counted. Age is calculated on the latest of listing date or January 1st of the given year. Other patient characteristics come from the OPTN Transplant Candidate Registration form. Ventricular assist device information comes from the time of listing. Medical urgency status is the earliest known status in the given year.

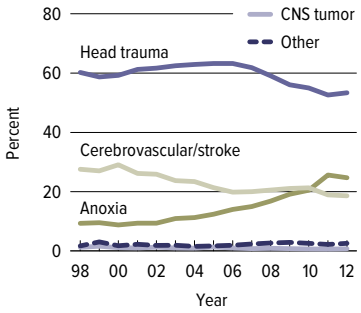
deceased donation



HR 2.1 Deceased donor heart donation rates
Numerator: Deceased donors age less than 75 whose heart was recovered for transplant. Denominator: US deaths per year, age less than 75. (Death data available at http://www.cdc.gov/nchs/products/nvsr.htm.) Death data were available only through 2011.

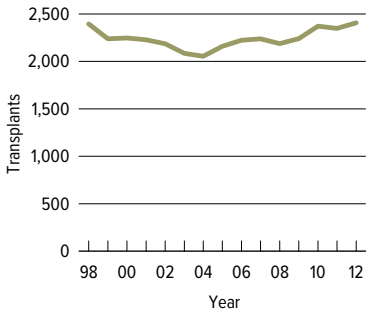


HR 2.2 Deceased donor heart donation rates (per 1,000 deaths), by state
Numerator: Deceased donors residing in the 50 states whose heart was recovered for transplant in the given year range. Denominator: US deaths by state during the given year range (death data available at http://www.cdc.gov/nchs/products/nvsr.htm). Rates are calculated within ranges of years for more stable estimates.

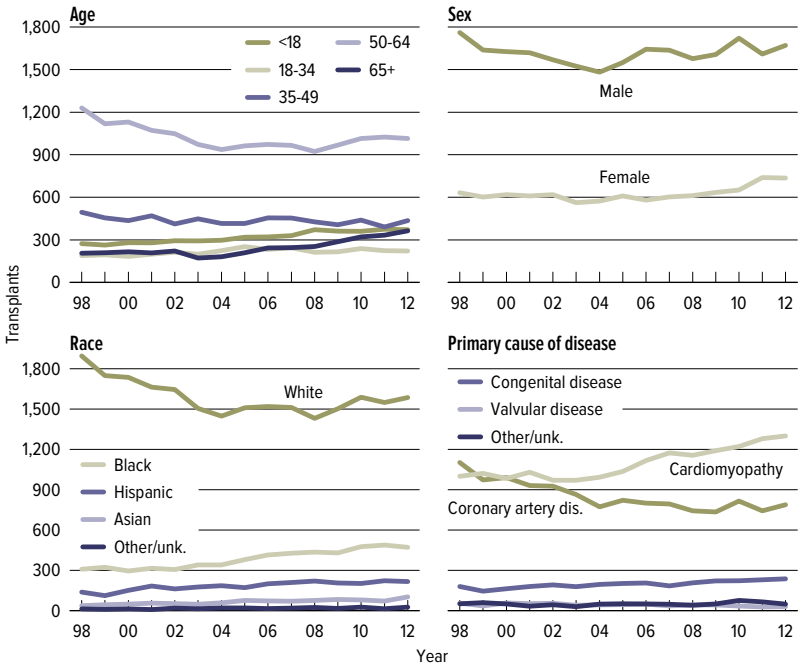


HR 2.3 Cause of death among deceased heart donors
Deceased donors whose heart was transplanted. CNS = central nervous system.

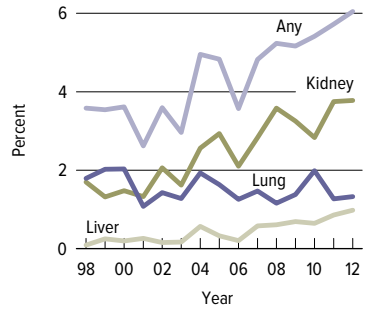
transplant



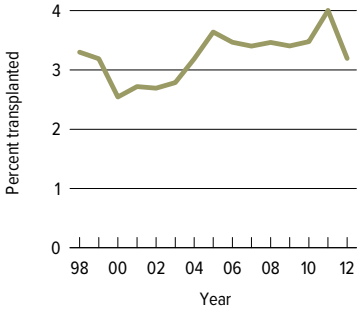
HR 3.1 Total heart transplants
Patients receiving a transplant, including multi-organ transplants and pediatric patients. Retransplants are counted.



HR 3.2 Heart transplants
Patients receiving a transplant, including multi-organ transplants and pediatric patients. Retransplants are counted.



HR 3.3 Heart transplants that were part of a multi-organ transplant
All adult patients receiving a deceased donor heart transplant with at least one additional organ. A multi-organ transplant may include more than two different organs in total; if so, each non-heart organ will be considered separately. Kidney transplants include living donor transplants.



HR 3.4 Retransplants among adult heart transplant recipients
Patients receiving a heart retransplant in the given year.

	2007		2012	
	N	%	N	%
Any life support	929	48.6	1276	62.7
Intravenous Inotropes	829	43.4	736	36.2
Left ventricular assist device	421	22.0	724	35.6
Intra aortic balloon pump	136	7.1	120	5.9
Right ventricular assist device	88	4.6	53	2.6
Ventilator	49	2.6	20	1.0
Extra corporeal membrane oxygenation	15	0.8	18	0.9
Inhaled NO	7	0.4	5	0.2
Prostaglandins	1	0.1	1	0.0

HR 3.5 Adult heart recipients on circulatory support prior to transplant
Patients may have more than one type of circulatory support.

data behind the figures can be downloaded from our website, at srtr.transplant.hrsa.gov

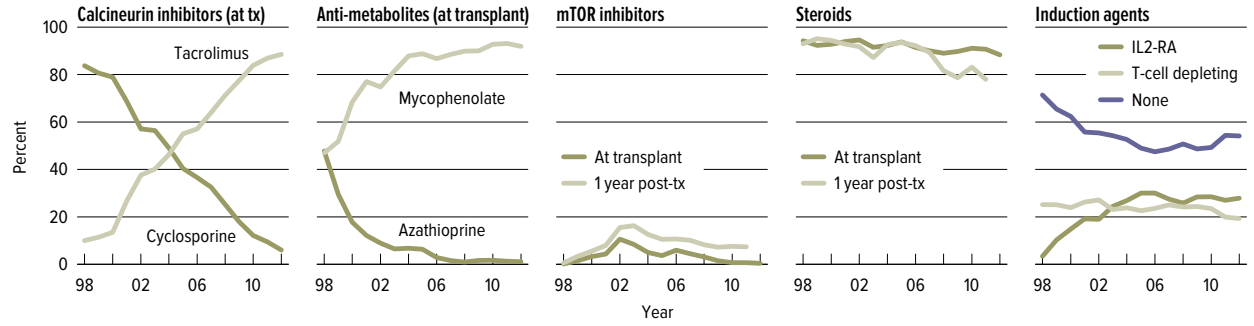
transplant

	Level	2002 N	2002 %	2012 N	2012 %
Age	18-34	213	11.2	221	10.9
	35-49	412	21.8	436	21.4
	50-64	1,048	55.3	1,015	49.9
	65+	221	11.7	363	17.8
Sex	Female	480	25.3	563	27.7
	Male	1,414	74.7	1,472	72.3
Race	White	1,462	77.2	1,370	67.3
	Black	264	13.9	400	19.7
	Hispanic	115	6.1	160	7.9
	Asian	39	2.1	87	4.3
	Other/unk.	14	0.7	18	0.9
Primary cause of disease	Coronary artery dis.	924	48.8	784	38.5
	Cardiomyopathy	820	43.3	1,106	54.3
	Congenital disease	58	3.1	74	3.6
	Valvular disease	54	2.9	30	1.5
	Other/unknown	38	2.0	41	2.0
Transplant history	First	1,843	97.3	1,970	96.8
	Subsequent	51	2.7	65	3.2
Blood type	A	840	44.4	858	42.2
	B	246	13.0	295	14.5
	AB	76	4.0	128	6.3
	O	732	38.6	754	37.1

	Level	2002 N	2002 %	2012 N	2012 %
Primary payor	Private	1,120	59.1	1,020	50.1
	Medicaid	216	11.4	250	12.3
	Medicare	484	25.6	671	33.0
	Other government	57	3.0	48	2.4
	Other/unknown	17	0.9	46	2.3
Time on wait list	<30 days	470	24.8	591	29.0
	31-60 days	267	14.1	252	12.4
	61-90 days	172	9.1	177	8.7
	3-<6 months	314	16.6	351	17.2
	6-<12 months	280	14.8	292	14.3
	1-<2 years	205	10.8	226	11.1
	2-<3 years	88	4.6	97	4.8
	3+ years	98	5.2	49	2.4
Medical urgency status	1A	660	34.8	1,190	58.5
	1B	723	38.2	743	36.5
	2	509	26.9	102	5.0
VAD status	No VAD	1,454	76.8	1,194	58.7
	VAD	440	23.2	841	41.3
Total		1,894	100.0	2,035	100.0

HR 3.6 Characteristics of adult heart transplant recipients, 2002 & 2012

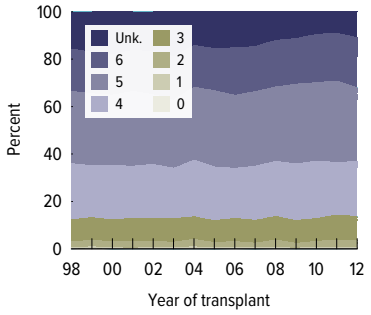
Patients receiving a transplant. Retransplants are counted. Ventricular assist device information comes from the OPTN Transplant Recipient Registration form and includes LVAD, RVAD, TAH, and LVAD + RVAD.



HR 3.7 Immunosuppression use in adult heart transplant recipients

One-year post-transplant data limited to patients alive with graft function one year post-transplant. Mycophenolate group includes mycophenolate mofetil and mycophenolate sodium.

donor-recipient matching



HR 4.1 Total HLA mismatches among adult heart transplant recipients

Donor and recipient antigen matching is based on the OPTN's antigen values and split equivalences policy as of 2012.

	DONOR			
RECIPIENT	Negative	Positive	Unknown	Total
Negative	14.2	23.1	0.1	37.4
Positive	21.8	36.1	0.1	58.0
Unknown	1.7	2.9	0.0	4.6
Total	37.7	62.1	0.2	100

HR 4.2 Adult heart donor-recipient cytomegalovirus (CMV) serology matching, 2008–2012

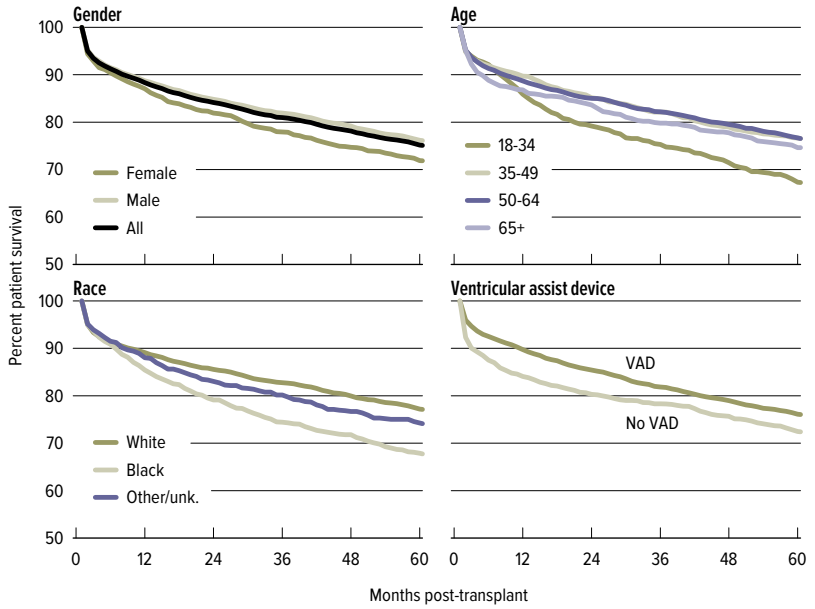
Adult transplant cohort from 2008–2012. Donor serology is reported on the OPTN donor registration forms; recipient serology is reported on the OPTN recipient registration forms. Any evidence for a positive serology is taken to indicate that the person is positive for the given serology; if all fields are unknown, not done, or pending, the person is considered to be "unknown" for that serology; otherwise, serology is assumed negative.

	DONOR			
RECIPIENT	Negative	Positive	Unknown	Total
Negative	0.8	12.4	0.0	13.3
Positive	3.8	65.4	0.3	69.4
Unknown	0.8	16.5	0.1	17.3
Total	5.4	94.2	0.4	100

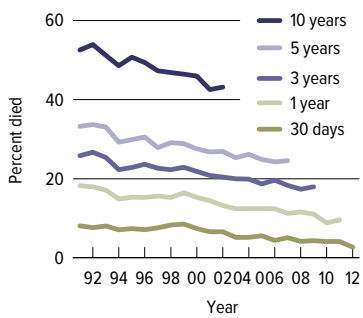
HR 4.3 Adult heart donor-recipient Epstein-Barr virus (EBV) serology matching, 2008–2012

Adult transplant cohort from 2008–2012. Donor serology is reported on the OPTN donor registration forms; recipient serology is reported on the OPTN recipient registration forms. Any evidence for a positive serology is taken to indicate that the person is positive for the given serology; if all fields are unknown, not done, or pending, the person is considered to be "unknown" for that serology; otherwise, serology is assumed negative.

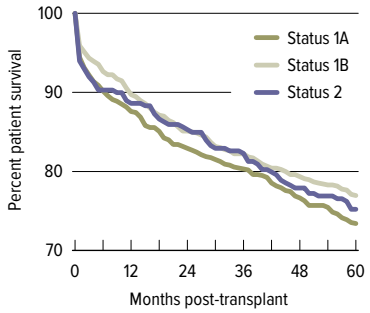
outcomes



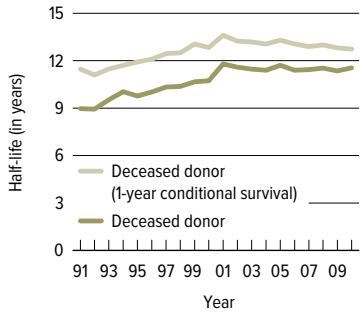
HR 5.1 Patient survival among adult heart transplant recipients, 2005–2007
Percent patient survival using unadjusted Kaplan-Meier methods. For patients with more than one transplant during the period, only their first transplant is considered. VAD status for each patient comes from time of transplant.



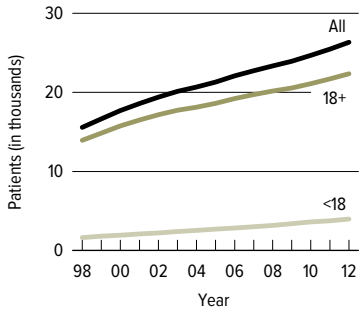
HR 5.2 Patient deaths among adult heart transplant recipients
Cox proportional hazards models reporting probability, adjusting for age, sex, and race.



HR 5.3 Patient survival among adult heart transplant recipients transplanted in 2007
Recipient survival estimated using unadjusted Kaplan-Meier methods.

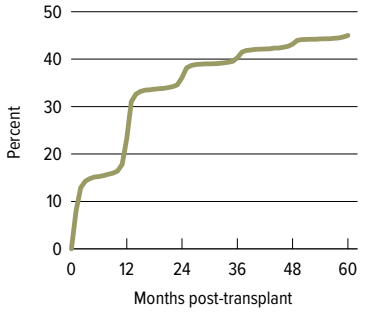


HR 5.4 Half-lives for adult heart transplant recipients
The half-life for a transplant cohort (e.g. 2009 heart transplants) is the time point in follow-up at which 50% of the transplanted grafts have failed. A conditional half-life for a transplant cohort is the same calculation but limited to those who survive with function at least 1 year post-transplant.



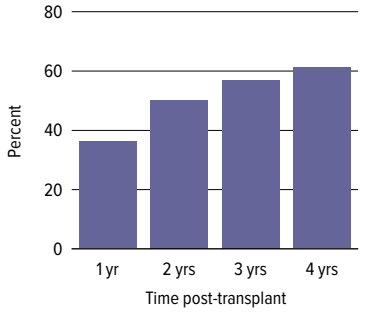
HR 5.5 Recipients alive & with a functioning heart transplant on June 30 of the year
Transplants before June 30 of the year that are still functioning. Patients are assumed alive with function unless a death or graft failure is recorded. A recipient can experience a graft failure and drop from the cohort, then be retransplanted and re-enter the cohort. Age cut is based on age at transplant.

outcomes



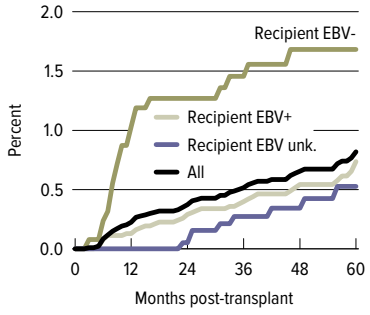
HR 5.6 Incidence of first acute rejection among adult patients receiving a heart transplant in 2006–2010

Acute rejection defined as a record of acute or hyperacute rejection, or a record of an anti-rejection drug being administered on either the Transplant Recipient Registration form or the Transplant Recipient Follow-up form. Only the first rejection event is counted. Cumulative incidence, defined as the probability of acute rejection at any time prior to the given time, is estimated using Kaplan-Meier competing risk methods.



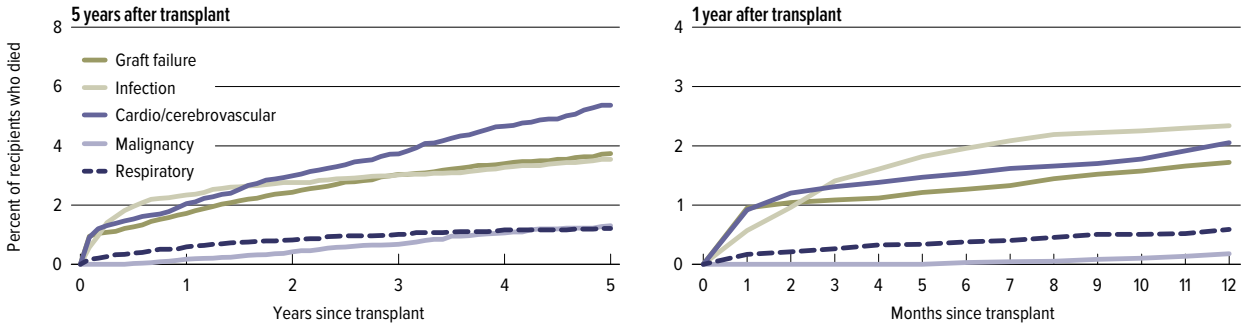
HR 5.7 Reported cumulative incidence of rehospitalizations among adult patients receiving a heart transplant in 2007–2012

Cumulative rate of rehospitalization; hospitalization identified from follow-up form. Patients required to be alive with graft function at each time period, so denominators reduce over time.



HR 5.8 Incidence of PTLD among adult patients receiving a heart transplant in 2006–2010, by recipient Epstein-Barr virus (EBV) status at transplant

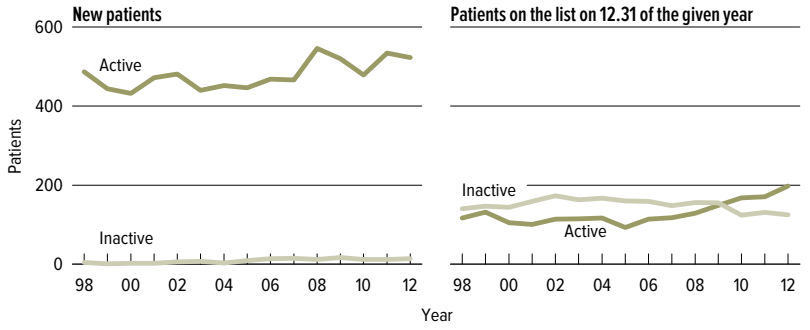
The cumulative incidence is estimated using Kaplan-Meier competing risks methods. PTLD is identified as either a reported complication or cause of death on the Transplant Recipient Follow-up form or on the Post-transplant Malignancy form as polymorphic PTLD, monomorphic PTLD, or Hodgkin's Disease. Only the earliest date of PTLD diagnosis is considered.



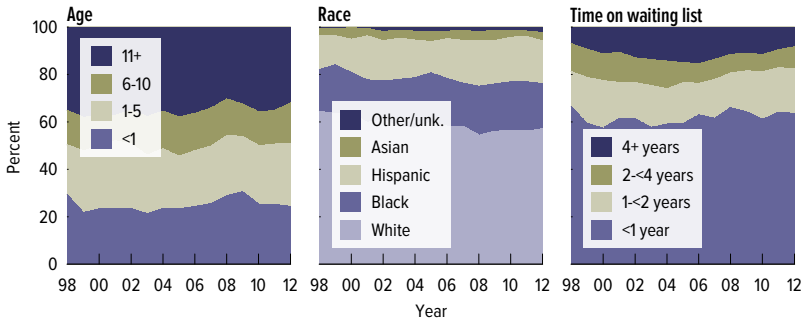
HR 5.9 Cumulative incidence of death by cause among adult heart recipients transplanted 2006–2010

Primary cause of death is as reported by the OPTN from the Transplant Follow-up form. Other causes of death include hemorrhage, trauma, non-compliance, unspecified other, unknown, etc. Cumulative incidence is estimated using Kaplan-Meier competing risk methods.

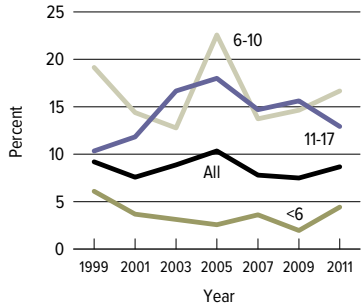
pediatric transplant



HR 6.1 Pediatric patients waiting for a heart transplant
Patients waiting for a transplant. A "new patient" is one who first joins the list during the given year, without having listed in a previous year. However, if a patient has previously been on the list, has been removed for a transplant, and has relisted since that transplant, the patient is considered a "new patient." Patients concurrently listed at multiple centers are counted only once. Those with concurrent listings and active at any program are considered active; those inactive at all programs at which they are listed are considered inactive.



HR 6.2 Distribution of pediatric patients waiting for a heart transplant
Patients waiting for a transplant any time in the given year. Age determined on the lastest of listing date or January 1 of the given year. Concurrently listed patients are counted once.



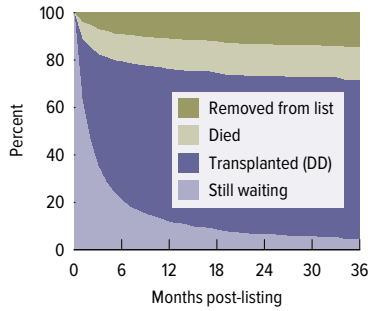
HR 6.3 Prior heart transplant in pediatric patients waiting for a heart transplant, by age
Prior transplant is obtained from the OPTN Transplant Candidate Registration form.

pediatric transplant

	2010	2011	2012
Patients at start of year	317	304	307
Patients added during year	491	546	537
Pts removed during year	503	542	514
Patients at end of year	305	308	330
Removal reason			
Received a transplant	366	386	380
Patient died	68	70	67
Patient refused transplant	2	0	0
Improved, tx not needed	43	48	44
Too sick to transplant	21	24	18
Other	3	14	5

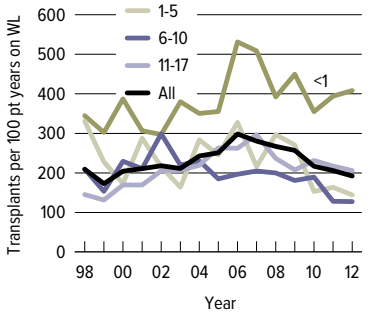
HR 6.4 Heart transplant waiting list activity among pediatric patients

Patients with concurrent listings at more than one center are counted once, from the time of earliest listing to the time of latest removal. Patients listed, transplanted, and re-listed are counted more than once. Patients are not considered "on the list" on the day they are removed. Thus, patient counts on January 1 may be different from patient counts on December 31 of the prior year. Patients listed for multi-organ transplants are included.



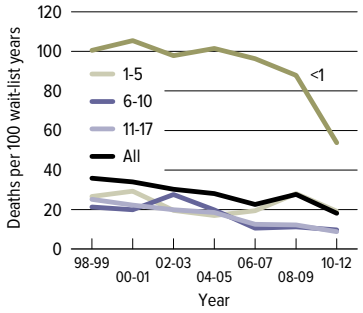
HR 6.5 Three-year outcomes for pediatric patients waiting for a heart transplant among new listings in 2009

Patients waiting for a transplant and first listed in 2009. Patients with concurrent listings at more than one center are counted once, from the time of the earliest listing to the time of latest removal.



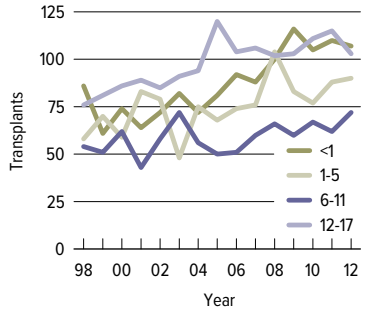
HR 6.6 Heart transplant rates among active pediatric waiting list candidates, by age

Transplant rates are computed as the number of deceased donor transplants per 100 patient-years of active waiting time in the given year. Age is calculated on the first active listing date in a given year.



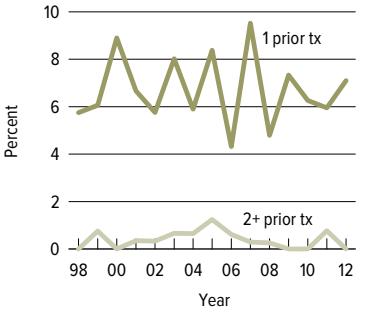
HR 6.7 Pre-transplant mortality rates among pediatric patients wait-listed for a heart transplant, by age

Patients waiting for a transplant. Mortality rates are computed as the number of deaths per 100 patient-years of waiting time in the given interval. Waiting time is calculated as the total waiting time per age group in the interval. Only deaths that occur prior to removal from the waiting list are counted. Age is calculated on the latest of listing date or January 1 of the given period.



HR 6.8 Pediatric heart transplants, by age

Patients receiving a heart or heart-lung transplant.

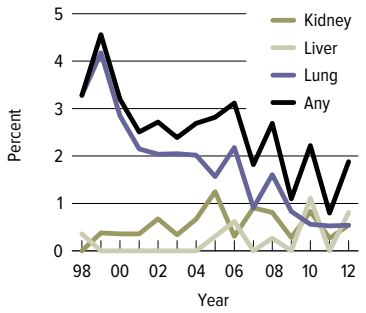


HR 6.9 Retransplants among pediatric heart transplant recipients

Includes patients transplanted after age 17, but listed at age 17 or younger. Retransplanted patients include only those with a prior transplant of the same type.

data behind the figures can be downloaded from our website, at srtr.transplant.hrsa.gov

pediatric transplant



HR 6.10 Pediatric heart transplants that were part of a multi-organ transplant

Patients receiving a deceased donor heart transplant with at least one additional organ. A multi-organ transplant may include more than two different organs in total; if so, each non-heart organ will be considered separately.

	DONOR			
RECIPIENT	Negative	Positive	Unknown	Total
Negative	9.7	31.4	0.7	41.8
Positive	11.5	36.0	0.8	48.2
Unknown	2.5	7.2	0.3	10.0
Total	23.7	74.6	1.8	100

HR 6.12 Heart donor-recipient Epstein-Barr virus (EBV) serology matching for pediatric transplant recipients, 2008–2012

Pediatric transplant cohort from 2008–2012. Donor EBV serology is reported on the OPTN donor registration forms; recipient EBV serology is reported on the OPTN recipient registration forms. Any evidence for a positive serology is taken to indicate that the person is positive for EBV; if all fields are unknown, not done, or pending, the person is considered to be "unknown" for that serology; otherwise, serology is assumed negative.

	DONOR			
RECIPIENT	Negative	Positive	Unknown	Total
Negative	26.6	29.2	0.3	56.1
Positive	17.8	21.9	0.3	40.0
Unknown	1.6	2.2	0.1	3.9
Total	46.0	53.3	0.7	100

HR 6.13 Heart donor-recipient cytomegalovirus (CMV) serology matching for pediatric transplant recipients, 2008–2012

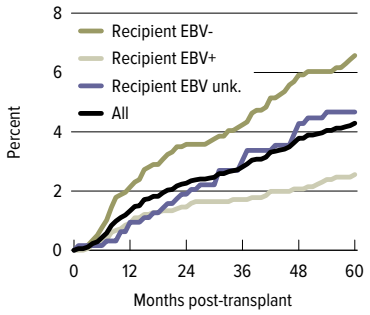
Pediatric transplant cohort from 2008–2012. Donor CMV serology is reported on the OPTN donor registration forms; recipient CMV serology is reported on the OPTN recipient registration forms. Any evidence for a positive serology is taken to indicate that the person is positive for CMV; if all fields are unknown, not done, or pending, the person is considered to be "unknown" for that serology; otherwise, serology is assumed negative.

		2000–2002		2010–2012	
	Level	N	%	N	%
Age	<1	208	24.9	322	29.2
	1-5	219	26.3	254	23.1
	6-10	115	13.8	157	14.3
	11-17	292	35.0	368	33.4
Sex	Female	385	46.2	508	46.1
	Male	449	53.8	593	53.9
Race	White	516	61.9	615	55.9
	Black	138	16.5	230	20.9
	Hispanic	134	16.1	187	17.0
	Asian	40	4.8	45	4.1
	Other/unk.	6	0.7	24	2.2
Primary cause of disease	Congenital defect	357	42.8	477	43.3
	Dilated myopathy: idiopathic	269	32.3	316	28.7
	Restrictive myopathy: idiopathic	50	6.0	49	4.5
	Dilated myopathy: myocarditis	20	2.4	49	4.5
	All others	138	16.5	210	19.1
Transplant history	First transplant	773	92.7	1,027	93.3
	Subsequent	61	7.3	74	6.7
Blood type	A	350	42.0	413	37.5
	B	98	11.8	146	13.3
	AB	30	3.6	54	4.9
	O	356	42.7	488	44.3
Primary payer	Private	465	55.8	521	47.3
	Medicaid	295	35.4	486	44.1
	Other public	42	5.0	69	6.3
	Other	32	3.8	25	2.3
Time on wait list	<30 days	388	46.5	400	36.3
	31-60 days	144	17.3	223	20.3
	61-90 days	94	11.3	135	12.3
	3-<6 months	105	12.6	191	17.3
	6-<12 months	61	7.3	104	9.4
	1-<2 years	30	3.6	36	3.3
	2-<3 years	9	1.1	5	0.5
	3+ years	3	0.4	7	0.6
Status	1A	542	65.0	968	87.9
	1B	126	15.1	78	7.1
	2	166	19.9	55	5.0
Patient on VAD	No	774	92.8	880	79.9
	Yes	60	7.2	221	20.1
PRA	0	553	66.3	590	53.6
	1-19	97	11.6	163	14.8
	20-79	52	6.2	165	15.0
	80-100	25	3.0	57	5.2
	Missing	107	12.8	126	11.4
ABO	Identical	651	78.1	863	78.4
	Compatible	177	21.2	201	18.3
	Incompatible	6	0.7	37	3.4
All patients		834	100.0	1,101	100.0

HR 6.11 Characteristics of pediatric heart transplant patients, 2000–2002 & 2010–2012

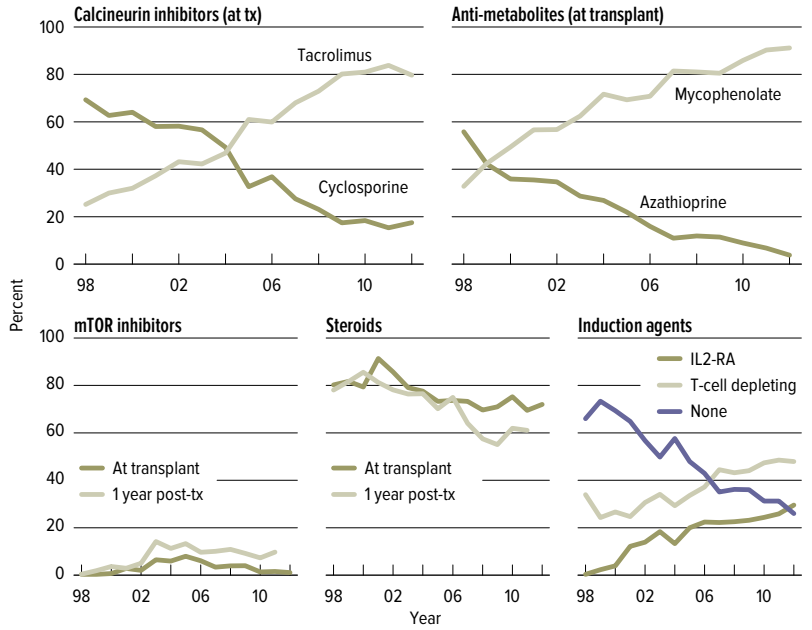
Patients receiving a transplant. Retransplants are counted.

pediatric transplant



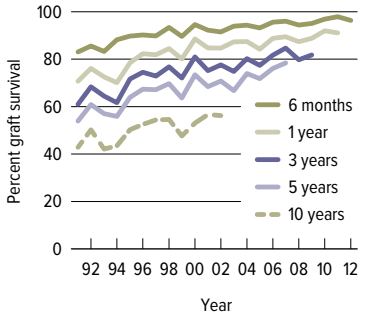
HR 6.14 Incidence of PTLD among pediatric patients receiving a heart transplant, 2000–2010, by recipient Epstein-Barr virus (EBV) status at transplant

The cumulative incidence is estimated using Kaplan-Meier competing risks methods. PTLD is identified as either a reported complication or cause of death on the Transplant Recipient Follow-up form or on the Post-transplant Malignancy form as polymorphic PTLD, monomorphic PTLD, or Hodgkin's Disease. Only the earliest date of PTLD diagnosis is considered.



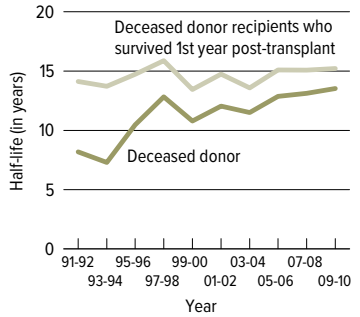
HR 6.15 Immunosuppression use among pediatric heart transplant recipients

One-year post-transplant data limited to patients alive with graft function one year post-transplant. Mycophenolate group includes mycophenolate mofetil and mycophenolate sodium.



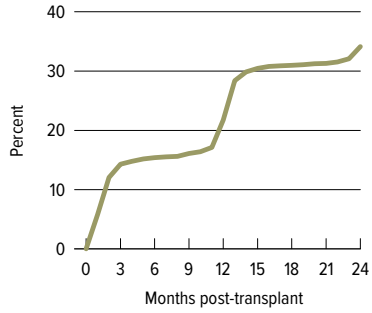
HR 6.16 Graft survival among pediatric heart transplant recipients

Estimates computed with Cox proportional hazards model, adjusted for age, sex, and race.



HR 6.17 Half-lives for pediatric heart transplant recipients

The half-life for a transplant cohort (e.g. 2009 heart transplants) is the time point at which 50% of the transplanted grafts have failed. A conditional half-life for a transplant cohort is the same calculation but limited to those who survive with function at least 1 year post-transplant.

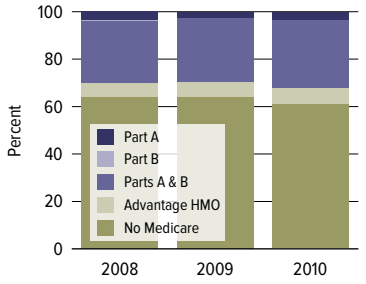


HR 6.18 Incidence of first acute rejection among pediatric patients receiving a heart transplant in 2006–2011

Acute rejection defined as a record of acute or hyperacute rejection, or a record of an anti-rejection drug being administered on either the Transplant Recipient Registration form or the Transplant Recipient Follow-up form. Only the first rejection event is counted. Cumulative incidence, defined as the probability of acute rejection at any time prior to the given time, is estimated using Kaplan-Meier competing risk methods.

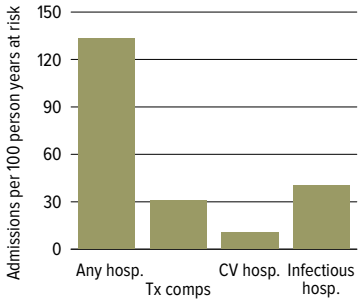
data behind the figures can be downloaded from our website, at srtr.transplant.hrsa.gov

Medicare data



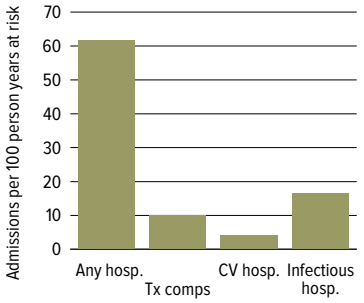
HR 7.1 Medicare coverage among heart transplant recipients

Coverage at the time of transplant as identified by the Medicre Beneficiary Annual Summary supplied by CMS.



HR 7.2 Rehospitalization rates among heart transplant recipients in the first post-transplant year

Transplant recipients, 2008, with Medicare as the primary payer at transplant. Rehospitalizations and reasons for rehospitalization determined from Medicare claims. First year rates are based on rehospitalizations occuring from initial discharge to one year later.



HR 7.3 Rehospitalization rates among heart transplant recipients in the second post-transplant year

Transplant recipients, 2008, with Medicare as the primary payer at transplant. Rehospitalizations and reasons for rehospitalization determined from Medicare claims. Second year rates are based on hospitalizations occuring from initial discharge+1 year to initial discharge+2 years.

Year 1 Cause of hospitalization	Percent of hospitalizations
Transplant complication	28.1
Other infection	16.0
Other	9.4
Respiratory infection	7.3
Genito-urinary and breast	5.0
Bacteremia, viremia and septicemia	4.4
Gastro-intestinal	4.4
Metabolic, endocrine, nutritional	3.8
Electrolyte, acid-base & volume depletion	2.5
Immune and hematologic	2.5

Year 2 Cause of hospitalization	Percent of hospitalizations
Transplant complication	21.9
Other	11.7
Other infection	10.2
Respiratory infection	9.8
Gastro-intestinal	9.8
Genito-urinary and breast	5.1
Skin and musculoskeletal	5.1
Metabolic, endocrine, nutritional	3.5
Electrolyte, acid-base & vol. depletion	3.2
Respiratory	3.2

HR 7.4 Top ten causes of rehospitalization among heart recipients transplanted in 2008 with Medicare primary coverage

Transplant recipients, 2008, with Medicare as the primary payer at transplant. Reasons for rehospitalization determined from Medicare claims, denominator for percentages includes only those re-hospitalized.

Medicare data

		# patients	Total costs Part A	Total costs Part B	PPPY costs Part A	PPPY costs Part B
	All patients	904	215,261,230	27,321,527	264,994	33,634
Age	0-11	*	*	*	*	*
	12-17	*	*	*	*	*
	18-34	45	11,615,361	1,346,347	305,734	35,438
	35-49	154	36,898,646	4,704,291	262,816	33,507
	50-64	399	95,117,399	12,197,767	261,304	33,509
	65+	304	69,941,079	9,014,496	261,052	33,646
Sex	Male	697	164,541,493	20,992,625	260,769	33,270
	Female	207	50,719,738	6,328,902	279,695	34,901
Race	White	629	149,153,877	18,866,651	261,609	33,091
	Black	180	42,688,935	5,634,648	274,360	36,214
	Hispanic	75	18,625,061	2,236,018	273,018	32,777
	Asian/Pac. Isl.	14	3,187,437	386,088	246,434	29,850
	Other/unk.	*	*	*	*	*
Primary cause of disease	Coron. artery dis.	423	101,795,695	12,706,390	268,833	33,556
	Cardiomyopathy	430	100,493,855	13,059,818	255,743	33,235
	Congenital dis.	19	5,178,333	519,682	392,542	39,394
	Valvular disease	18	3,939,561	550,376	234,766	32,798
	Other/unk.	14	3,853,786	485,261	358,560	45,149

HR 7.5 Total and per-person per-year (PPPY) Medicare costs ($) among heart transplant recipients in the first post-transplant year

Costs among recipients transplanted in 2008 and 2009 who had Medicare as the primary payer at the time of transplant. First year costs include the transplant hospitalization. Costs incurred after a transplant failure are excluded. Values for cells with 9 or fewer patients are suppressed.

		# patients	Total costs Part A	Total costs Part B	PPPY costs Part A	PPPY costs Part B
	All patients	376	8,744,418	5,344,505	23,671	14,468
Age	0-11	*	*	*	*	*
	12-17	*	*	*	*	*
	18-34	18	361,264	204,893	20,015	11,352
	35-49	71	1,829,046	1,127,822	26,230	16,174
	50-64	173	4,740,020	2,474,462	27,909	14,569
	65+	112	1,718,713	1,507,747	15,633	13,714
Sex	Male	282	6,692,421	3,918,017	24,145	14,135
	Female	94	2,051,997	1,426,488	22,248	15,466
Race	White	255	5,312,175	3,650,250	21,233	14,590
	Black	75	2,099,023	1,056,383	28,302	14,244
	Hispanic	39	1,272,609	575,628	33,449	15,130
	Asian/Pac. Isl.	*	*	*	*	*
	Other/unk.	*	*	*	*	*
Primary cause of disease	Coron. artery dis.	176	4,004,437	2,485,618	23,278	14,449
	Cardiomyopathy	187	4,555,854	2,697,376	24,714	14,632
	Congenital dis.	*	*	*	*	*
	Valvular disease	*	*	*	*	*
	Other/unk.	*	*	*	*	*

HR 7.6 Total and per-person per-year (PPPY) Medicare costs ($) among heart transplant recipients in the second post-transplant year

Costs among recipients transplanted in 2008 who had Medicare as the primary payer at the time of transplant. The second post-transplant year runs from 366 to 730 days after transplant. Costs incurred after a transplant failure are excluded. Values for cells with 9 or fewer patients are suppressed.

Medicare data

Total costs

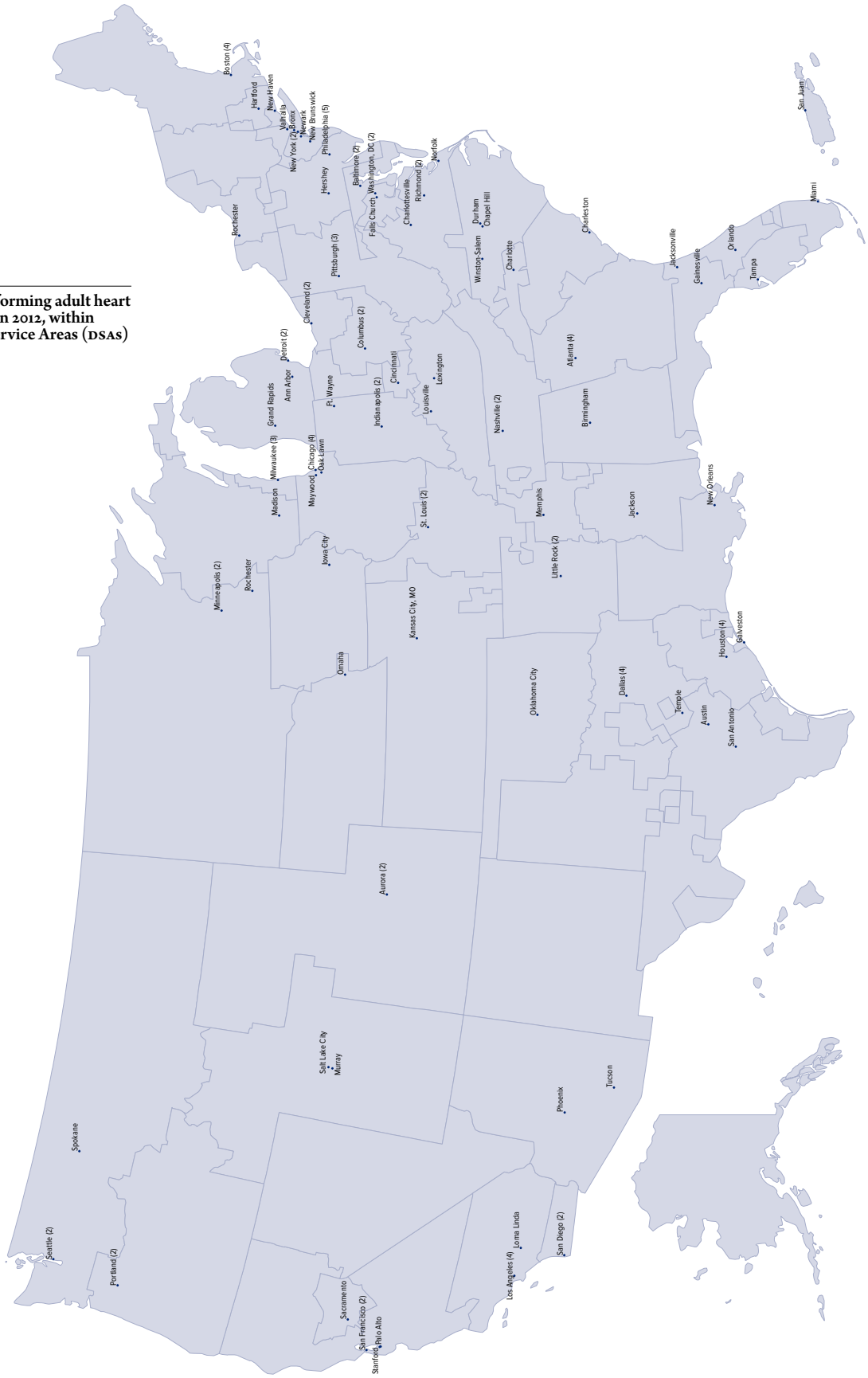
		2008 total costs			2009 total costs			2010 total costs		
		# patients	Part A	Part B	# patients	Part A	Part B	# patients	Part A	Part B
	All patients	12,228	273,002,263	82,649,717	12,485	295,983,294	98,915,517	12,783	311,817,476	100,072,579
Age	0-11	35	2,383,768	270,417	34	1,029,470	399,041	44	1,664,842	410,835
	12-17	44	739,576	171,666	47	869,202	262,211	49	1,191,674	277,932
	18-34	705	17,777,422	4,400,795	749	17,349,792	5,375,256	788	22,413,225	5,783,450
	35-49	2,592	50,590,887	15,314,323	2,704	56,815,216	18,937,292	2,757	57,130,238	18,675,818
	50-64	7,314	150,461,215	48,150,906	7,338	161,598,418	55,877,140	7,399	164,819,127	55,600,202
	65+	1,538	51,049,395	14,341,611	1,613	58,321,196	18,064,577	1,746	64,598,371	19,324,342
Sex	Male	9,761	208,851,479	64,620,773	9,955	233,851,989	77,959,642	10,156	243,888,427	78,891,633
	Female	2,467	64,150,784	18,028,945	2,530	62,131,305	20,955,875	2,627	67,929,049	21,180,946
Race	White	9,760	199,479,895	64,022,322	9,886	218,717,251	75,589,883	9,999	227,450,966	75,973,396
	Black	1,555	47,147,633	12,048,401	1,628	52,277,403	15,077,292	1,736	53,923,588	15,662,692
	Hispanic	671	20,656,985	4,939,650	710	19,107,796	6,330,281	766	20,768,420	6,156,476
	Asian/Pacific Islander	171	3,939,655	1,229,077	191	4,599,543	1,373,615	203	6,843,163	1,725,373
	Other/unk.	71	1,778,094	410,268	70	1,281,302	544,446	79	2,831,338	554,642
Primary cause of disease	Coronaru artery dis.	6,215	137,728,716	42,945,029	6,240	143,570,961	49,746,702	6,296	151,827,311	50,011,716
	Cardiomyopathy	5,312	119,065,358	34,972,552	5,507	132,745,035	42,880,132	5,719	139,545,710	44,051,172
	Congenital disease	205	5,460,775	1,329,914	219	5,566,505	1,709,231	237	6,037,871	1,778,519
	Valvular disease	313	6,248,450	2,192,025	323	7,843,713	2,902,435	334	7,734,098	2,791,670
	Other/unk.	183	4,498,963	1,210,197	196	6,257,080	1,677,017	197	6,672,485	1,439,502

Total costs

		2008 total costs			2009 total costs			2010 total costs		
		# patients	Part A	Part B	# patients	Part A	Part B	# patients	Part A	Part B
	All patients	12,228	23,878	7,229	12,485	25,534	8,533	12,783	26,284	8,435
Age	0-11	35	72,283	8,200	34	31,170	12,082	44	39,795	9,820
	12-17	44	18,410	4,273	47	18,926	5,709	49	25,559	5,961
	18-34	705	27,030	6,691	749	24,655	7,639	788	30,617	7,900
	35-49	2,592	20,654	6,252	2,704	22,390	7,463	2,757	22,055	7,210
	50-64	7,314	21,910	7,012	7,338	23,635	8,173	7,399	23,843	8,043
	65+	1,538	36,849	10,352	1,613	40,655	12,593	1,746	41,948	12,549
Sex	Male	9,761	22,860	7,073	9,955	25,291	8,431	10,156	25,885	8,373
	Female	2,467	27,930	7,849	2,530	26,490	8,935	2,627	27,823	8,676
Race	White	9,760	21,786	6,992	9,886	23,751	8,209	9,999	24,399	8,150
	Black	1,555	32,820	8,387	1,628	35,304	10,182	1,736	34,330	9,972
	Hispanic	671	33,426	7,993	710	28,967	9,597	766	29,280	8,680
	Asian/Pacific Islander	171	25,303	7,894	191	25,968	7,755	203	35,867	9,043
	Other/unk.	71	26,750	6,172	70	19,521	8,295	79	40,070	7,849
Primary cause of disease	Coronaru artery dis.	6,215	23,720	7,396	6,240	24,845	8,609	6,296	25,995	8,563
	Cardiomyopathy	5,312	23,961	7,038	5,507	25,907	8,369	5,719	26,328	8,311
	Congenital disease	205	28,965	7,054	219	26,779	8,223	237	26,754	7,881
	Valvular disease	313	20,971	7,357	323	25,847	9,564	334	24,270	8,760
	Other/unk.	183	26,322	7,080	196	35,181	9,429	197	37,427	8,074

HR 7.7 Total calendar-year Medicare costs ($) spent on heart transplant recipients, 2008, 2009, & 2010

Costs paid by Medicare in each calendar year among recipients alive with graft function in the given year, regardless of Medicare eligibility at the time of transplant. Costs incurred after transplant failure are excluded.



HR 8.1 Centers performing adult heart transplants in 2012, within Donation Service Areas (DSAs)

HR 8.2 Centers performing pediatric heart transplants in 2012, within Donation Service Areas (DSAs)