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2008 U.S. organ and tissue transplant cost estimates and discussion



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I. OVERVIEW

This 2008 report represents Milliman's triennial summary of estimated U.S. average costs per member per month (PMPM), billed charges, and utilization related to the 30 days prior and 180 days after transplant admission for treatment for organ and tissue transplants. In this report we have redefined the time period included in charges because of the type of data available for the study. In addition, for charges pre- and post-transplant admission, we include all medical costs associated with the transplant patient. This change is discussed further in the Charges categories section of this report.

Organ transplants include single organ transplants such as heart, intestine, kidney, liver, lung, pancreas, and a number of multiple organ transplants.

Tissue transplants include bone marrow and cornea transplants. We split the bone marrow estimates by donor method: autologous, where the donor is the recipient; and allogeneic, where the donor may be related or unrelated to the recipient.

Highlights of this report include:

- **Section II:** 2008 PMPM costs are estimated to be \$5.88 and \$5.78 for under-age-65 and ages-65-and-over recipients, respectively. These PMPM costs reflect average annual increases of 14% and 29% compared with those in our 2005 report. There are significant increases in the PMPM costs for some multiple organ transplants, such as intestine with other organs, kidney-pancreas, and liver-kidney. Age-65-and-over transplants for bone marrow, cornea, heart, kidney, liver, lung, and liver-kidney increased significantly as well. Billed charges for most transplants have increased dramatically, although many recipients or health plans do not pay billed charges because of transplant provider networks. Hospital lengths of stay for most transplants have not changed much during 2005 to 2006. Lengths of stay from our 2005 report versus those in this report are not directly comparable because we have changed data sources. Maintenance therapy outpatient immunosuppressant charge estimates decreased significantly because we have redefined the time period during which we accumulate costs for immunosuppressants.
- **Section IV:** Survival rates generally stayed the same or increased slightly from those in our 2005 report, other than for intestine three-year survival and allogeneic bone marrow at one, three, and five years.

II. COSTS PMPM, CHARGES, AND UTILIZATION

Table 1 summarizes the estimated U.S. average 2008 transplant costs PMPM for the under-age-65 and ages-65-and-over populations. "Costs" means the product of utilization and billed charges. Table 2 summarizes the estimated U.S. average 2008 billed charges per transplant.

The estimated number of transplants shown in Table 1 reflects removal of transplants provided to foreign citizens. To determine utilization rates, we assumed 2008 U.S. under-age-65 and ages-65-and-over population estimates of 265.4 million and 38.8 million, respectively. These population estimates are based on U.S. government resident population census estimates as of Dec. 20, 2006.

For this report, we changed the definition of the time periods for which we developed charges. Evaluation, follow-up and outpatient (OP) immunosuppressants as used in our 2005 report have been redefined to 30 days pre-transplant, 180 days post-transplant admission for follow-up, and outpatient immunosuppressant and other drugs for 180 days post-transplant admission. Also for these categories, we include all medical costs associated with the transplant patient, not just those related to the transplant. We made these changes for several reasons:

TABLE 1

ESTIMATED U.S. AVERAGE 2008 TRANSPLANT COSTS PER MEMBER PER MONTH (PMPM)

TRANSPLANT	TOTAL ESTIMATED NUMBER OF TRANSPLANTS	ESTIMATED BILLED CHARGES	UNDER AGE 65			AGES 65 AND OVER		
			ESTIMATED NUMBER OF TRANSPLANTS	ESTIMATED ANNUAL UTILIZATION PER 1,000,000	ESTIMATED COSTS PMPM	ESTIMATED NUMBER OF TRANSPLANTS	ESTIMATED ANNUAL UTILIZATION PER 1,000,000	ESTIMATED COSTS PMPM
SINGLE ORGAN/TISSUE								
BONE MARROW- ALLOGENEIC	7,944	\$676,800	7,598	28.63	\$1.61	346	8.93	\$0.50
BONE MARROW- AUTOLOGOUS	11,583	300,400	9,875	37.21	0.93	1,708	44.08	1.10
CORNEA	34,898	20,700	11,977	45.13	0.08	22,921	591.48	1.02
HEART	2,247	787,700	1,952	7.35	0.48	295	7.61	0.50
INTESTINE	70	1,121,800	70	0.26	0.02	0	0.00	0.00
KIDNEY	17,447	259,000	14,633	55.13	1.19	2,814	72.62	1.57
LIVER	6,550	523,400	5,921	22.31	0.97	629	16.23	0.71
LUNG - SINGLE	802	450,400	626	2.36	0.09	176	4.54	0.17
LUNG - DOUBLE	764	657,800	720	2.71	0.15	44	1.14	0.06
PANCREAS	399	275,500	398	1.50	0.03	1	0.03	0.00
MULTIPLE ORGAN								
HEART-LUNG	31	1,123,800	31	0.12	0.01	0	0.00	0.00
INTESTINE WITH OTHER ORGANS	151	1,293,200	151	0.57	0.06	0	0.00	0.00
KIDNEY-HEART	52	1,005,700	48	0.18	0.02	4	0.10	0.01
KIDNEY-PANCREAS	955	439,000	953	3.59	0.13	2	0.05	0.00
LIVER-KIDNEY	536	763,500	450	1.70	0.11	86	2.22	0.14
OTHER MULTI- ORGAN	12	1,075,600	11	0.04	0.00	1	0.03	0.00
TOTAL					\$5.88			\$5.78

- Longitudinal data sources are required to find evaluation charges.
- Most follow-up charges occur within a short period after transplant admission discharge.
- Many negotiated provider transplant contracts provide follow-up for only three to six months after discharge.
- Drugs other than immunosuppressants are used as a result of the transplant.
- Outpatient drug costs, immunosuppressants, and other drugs not related to the transplant are typically not covered by negotiated transplant contracts and are covered by the patient's medical plan, if available.

Differences from Milliman's 2008 Health Cost Guidelines charge estimates

Users of both this report and the 2008 Milliman Health Cost Guidelines™ may notice differences in the estimated under-age-65 PMPM costs between the two sources. This report estimates total PMPM costs for under-age-65 recipients that are \$0.25 lower than the 2008 Health Cost Guidelines as a result of using more recent data to reflect the percentage of nonresident aliens and recipients age 65 and older for all transplants. Most of this decrease is attributed to bone marrow (\$0.05 decrease for allogeneic and \$0.08 decrease for autologous) and kidney (\$0.07 decrease). There are significant increases in the PMPM costs for age-65-and-over transplants, particularly bone marrow, heart, kidney, liver, liver-kidney, and lung transplants.

Charges

Table 2 shows estimated U.S. average 2008 billed charges per transplant. Categories making up the total charges are defined below.

TABLE 2

ESTIMATED U.S. AVERAGE 2008 BILLED CHARGES PER TRANSPLANT

TRANSPLANT	30 DAYS PRE-TRANSPLANT	PROCUREMENT	HOSPITAL TRANSPLANT ADMISSION	PHYSICIAN DURING TRANSPLANT	180 DAYS POST-TRANSPLANT ADMISSION	OP IMMUNO-SUPPRESSANTS AND OTHER RX	TOTAL
SINGLE ORGAN/TISSUE							
BONE MARROW-ALLOGENEIC	\$30,400	\$29,400	\$380,700	\$19,600	\$197,100	\$19,600	\$676,800
BONE MARROW-AUTOLOGOUS	31,300	21,200	169,900	10,600	62,100	5,300	300,400
CORNEA	0	0	13,200	7,500	0	0	20,700
HEART	34,200	94,300	486,400	50,800	99,700	22,300	787,700
INTESTINE	48,400	77,200	743,800	100,600	124,300	27,500	1,121,800
KIDNEY	16,700	67,500	92,700	17,500	47,400	17,200	259,000
LIVER	21,200	73,600	286,100	44,100	77,800	20,600	523,400
LUNG - SINGLE	7,500	53,600	256,600	27,900	84,300	20,500	450,400
LUNG - DOUBLE	20,700	96,500	344,700	59,300	113,800	22,800	657,800
PANCREAS	16,500	68,400	93,400	16,300	58,700	22,200	275,500
MULTIPLE ORGAN							
HEART-LUNG	49,100	151,900	682,500	73,000	143,300	24,000	1,123,800
INTESTINE WITH OTHER ORGANS	58,200	175,200	772,700	116,200	136,900	34,000	1,293,200
KIDNEY-HEART	34,400	145,600	608,800	66,000	129,600	21,300	1,005,700
KIDNEY-PANCREAS	18,400	122,300	171,100	32,000	73,800	21,400	439,000
LIVER-KIDNEY	31,300	127,000	403,400	65,000	114,700	22,100	763,500
OTHER MULTI-ORGAN	40,500	149,700	612,400	87,000	157,200	28,800	1,075,600

- **30 days pre-transplant:** These charges include all medical costs for the transplant patient incurred during the 30 days prior to the transplant hospital admission. They can include medical costs not related to the transplant. In our 2005 report, the comparable category was called Evaluation. Evaluation could include history of the candidate, noting indications and contraindications for the transplant; comprehensive physical, psychological, and laboratory evaluations, including blood and tissue typing and serum and cell compatibility matching; cross-matching for donor compatibility; hepatitis and HIV screening; antibody screening; medical and psychological testing; lab tests; and X-rays. Because of the time period between evaluation and transplant, evaluation costs became exceedingly difficult to identify in claim data bases, which are now our primary source of charge data. It was not practical to separate these charges into those related and not related to the transplant because of the short 30-day time period defined.
- **Procurement:** Donated organ or tissue recovery services, which may include retrieval, preservation, transportation, and other acquisition costs. This category definition is unchanged from that used in our 2005 report.
- **Hospital transplant admission:** Facility charges only for the transplant. Any re-admissions within 180 days of the transplant admission date are included in the 180 Days Post-Transplant Admission category, whether related to the transplant or not. Hospital services include room and board and ancillary services such as use of surgical and intensive care facilities, inpatient nursing care, pathology and radiology procedures, drugs, supplies, and other facility-based services. Hospital services may also include use of immunosuppressive and other drugs provided during the hospital stay. This category definition is unchanged from that used in our 2005 report.
- **Physician during transplant:** Professional nonfacility services while the recipient is hospitalized for the transplant, including surgery procedures and other services identified by CPT or HCPCS procedure codes. This category definition is unchanged from that used in our 2005 report.
- **180 days post-transplant admission:** Post-discharge facility and professional nonfacility services, including any hospital readmissions. Services may also include regular lab tests, regular outpatient visits, and evaluation and treatment of complications. These services can include both those related and not related to the transplant. Previously this category included only charges related to the transplant up to one year after the transplant admission.
- **OP immunosuppressants and other Rx:** This category now includes all outpatient drugs prescribed from discharge for the transplant admission to 180 days post-transplant admission, including immunosuppressants, other drugs related to the transplant, and other drugs not related to the transplant. Antianxiety medications, antifungal antibiotics, antivirals, colony-stimulating factors, gastrointestinal drugs, hypertension drugs, and post-operative pain management drugs are examples of drugs other than outpatient immunosuppressants related to the transplant that could also be used in treatment. Previously this category included only outpatient immunosuppressants for one year from the transplant hospital admission. To be consistent with drug charges as defined in the Health Cost Guidelines, drug charges in this report include assumed discounts of 55% and 16% from average wholesale prices for generics and brand drugs, respectively.

Basis of utilization and charge estimates

We based utilization estimates on data from the U.S. Organ Procurement and Transplantation Network (OPTN), the Scientific Registry of Transplant Recipients (SRTR), the Center for International Blood and Marrow Transplant Registry (CIBMTR), and the Eye Bank Association of America. None of the entities on which we relied for data have reviewed or approved our estimates. The content of this report is the responsibility of the authors alone and does not necessarily reflect the views or policies of the Department of Health and Human Services, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. government.

We developed charge estimates for 30 days pre-transplant, physician during transplant, 180 days post-transplant admission, and nonimmunosuppressant drugs on Milliman proprietary claim data. We based procurement charge estimates on our judgment and on 2005 and 2006 data from Texas and Washington state hospital data, trended to 2008 and normalized to a national average basis using Milliman area relativity research.

We based hospital charge estimates on 2006 California, Florida, Maryland, New York, Pennsylvania, Virginia, Washington state, and Wisconsin hospital data normalized to a national average basis.

Our bone marrow charge estimates do not reflect any savings from outpatient treatment because we lacked sufficient outpatient bone marrow data.

We developed cornea hospital charges from 2006 Wisconsin hospital inpatient and outpatient data. The 2006 Wisconsin hospital data showed that outpatient cornea transplants represent about 99% of these transplants and more than 96% of billed charges.

Outpatient immunosuppressant charges reflect fewer than 180 days of coverage because the transplant patient has inpatient status equal to the estimated hospital length of stay. We assumed no outpatient immunosuppressant charges for autologous bone marrow and cornea transplants. For all other transplants, we estimated when outpatient immunosuppressant coverage began by using estimated 2006 hospital lengths of stay. Average wholesale prices were based on the ReadyPrice database and our judgment to project these charges to 2008. We assumed average dosing regimens from MedlinePlus.

Charge estimates compared to prior research

Our 2008 combined hospital and procurement charge estimates generally show significant increases from our 2005 report. The source for these charges has changed and is now based on state hospital data bases.

Procurement charges increased from those in our 2005 report but not at unusual rates. For a number of transplants, hospital billed charges excluding procurement have increased more than 20% per year.

Our 2008 maintenance therapy outpatient immunosuppressant and other drug charge estimates for all transplants decreased from our 2005 report because we have redefined the period during which we include immunosuppressants and other drugs both related and not related to the transplant.

Hospital lengths of stay

Table 3 shows that estimated hospital lengths of stay generally have been stable. However, comparison to lengths of stay in our 2005 report, which were for 2000 and 2003, is not necessarily meaningful because we changed data sources.

TABLE 3

HOSPITAL LENGTHS OF STAY BY TRANSPLANT (DAYS)

TRANSPLANT	2005	2006
SINGLE ORGAN/TISSUE		
BONE MARROW - ALLOGENEIC	34.0	33.9
BONE MARROW - AUTOLOGOUS	20.4	20.7
HEART	38.0	38.8
INTESTINE	56.1	64.1
KIDNEY	8.5	8.1
LIVER	22.4	22.2
LUNG - SINGLE	20.6	19.6
LUNG - DOUBLE	30.8	29.9
PANCREAS	9.7	8.2
MULTIPLE ORGAN		
HEART-LUNG	47.8	44.0
KIDNEY-HEART	64.6	60.4
KIDNEY-PANCREAS	14.2	12.6
LIVER-KIDNEY	25.9	30.9

Annual number of transplants

Tables 4A, 4B, and 4C show the annual number of transplants performed in the United States from 2004 to 2008. These numbers include all ages and transplants for non-U.S. citizens. We project increases in the numbers of most transplants from 2006 to 2008 because we expect the transplant rate per million people to increase and/or the population to increase.

We based Tables 4A and 4B on OPTN data as of Nov. 2, 2007. We estimated the split of lung transplants between single and double lung using 2006 state hospital data bases and actuarial judgment. We based the bone marrow estimates in Table 4C on North American data from the CIBMTR. We based the cornea estimates in Table 4C on information from the 2006 Eye Banking Statistical Report.

TABLE 4A

SINGLE ORGAN TRANSPLANTS PERFORMED IN THE UNITED STATES

YEAR	HEART	INTESTINE	KIDNEY	LIVER	LUNG-SINGLE	LUNG-DOUBLE	PANCREAS
2004	1,958	52	15,676	5,781	597	569	547
2005	2,061	68	16,075	6,003	718	684	465
2006	2,147	61	16,640	6,139	718	684	380
2007*	2,207	66	17,108	6,374	760	724	391
2008*	2,269	72	17,588	6,617	804	766	402

Above numbers include ages 65+ and foreign citizens

* Milliman estimates

TABLE 4B

MULTIPLE ORGAN TRANSPLANTS PERFORMED IN THE UNITED STATES

YEAR	HEART-LUNG	INTESTINE WITH OTHER ORGANS	KIDNEY-HEART	KIDNEY-PANCREAS	LIVER-KIDNEY	OTHER MULTI-ORGANS
2004	40	100	46	881	279	16
2005	35	110	57	903	337	15
2006	31	114	39	924	399	12
2007*	31	131	45	941	463	12
2008*	31	151	52	958	536	12

Above numbers include ages 65+ and foreign citizens

* Milliman estimates

TABLE 4C

TISSUE TRANSPLANTS PERFORMED IN THE UNITED STATES

YEAR	BONE MARROW-AUTOLOGOUS	BONE MARROW-ALLOGENEIC	CORNEA
2004*	9,200	6,830	32,106
2005	9,756	7,090	31,952
2006*	10,341	7,380	33,674
2007*	10,945	7,656	34,282
2008*	11,583	7,943	34,898

Above numbers include ages 65+ and foreign citizens

* Milliman estimates

Bone marrow classifications

Table 5 shows that bone marrow transplants can be classified according to graft source: bone marrow, peripheral blood stem cell, bone marrow cell plus peripheral blood stem cell, or umbilical cord blood stem cell. Generally speaking, bone marrow cell graft use continues to decrease and peripheral blood stem cell graft use continues to increase. Cord blood stem cell graft continues to increase for allogeneic bone marrow transplants for children.

Actual costs versus Milliman estimates

As we mentioned in Section II, “costs” means the product of utilization and billed charges. We did not research the actual costs that hospitals and physicians incur to provide transplants, as that would involve proprietary arrangements. Actual PMPM transplant costs may vary from our estimates for a variety of reasons that are beyond the scope of our report:

- The transplant cost estimates assume full insurance coverage; patient cost-sharing and benefit limitations would reduce full coverage costs.
- Costs may vary by geographic area and transplant center due to volume or incidence of complications.
- Growth in the average number of organs procured per donor and number of centers may change costs, as long as suitable donor organs and tissue can continue to be found.
- Private insurance, Medicare, Medicaid, and uninsured recipient costs may vary by transplant; for example, Medicare covers a significant portion of kidney transplants through the End Stage Renal Disease program.
- Federal and state legislative efforts and private initiatives may increase utilization and costs.
- Changes in selection criteria may affect costs.
- Costs may vary by underlying diagnosis and/or disease state.
- Medical management may reduce costs, particularly with respect to hospital charges.
- Costs may be reduced with use of cost-control mechanisms such as greater donor and recipient selectivity by centers, critical pathways to reduce inpatient lengths of stay, and aggressive use of outpatient therapies and other more cost-effective treatments.
- Wide availability of mechanical, artificial, or cloned organs; experimental procedures becoming accepted practice; or other innovations may affect costs.
- Cost estimates may be subject to change if the OPTN data and other data relied on changes due to future data submissions or corrections.
- Any estimate of costs after the first year should reflect adjustments for trend, survival, and probability of re-transplantation.
- Administration costs and profit margins will vary, and were not considered in our analysis.

TABLE 5

BONE MARROW TRANSPLANT GRAFT SOURCES, 2002 - 2006

AGE AT TIME OF TRANSPLANT	GRAFT SOURCES			
	BONE MARROW	PERIPHERAL BLOOD STEM CELL	BONE MARROW PLUS PERIPHERAL BLOOD STEM CELL	CORD BLOOD STEM CELL
AUTOLOGOUS				
UNDER 21	5% - 10%	ABOUT 90%	LESS THAN 5%	N/A
21+	LESS THAN 5%	GREATER THAN 95%	LESS THAN 5%	N/A
ALLOGENEIC				
UNDER 21	ABOUT 55%	25% - 30%	N/A	ABOUT 20%
21+	ABOUT 25%	70% - 75%	N/A	LESS THAN 5%

Actual charges compared to Milliman billed charge estimates

“Charges” in this report refer to the amount billed, which may not be the actual amount paid for the transplant services due to the presence of case rates, discounts, or other negotiated reimbursement arrangements. Significant reductions from billed charge levels may be obtained and the chances for successful treatment may be maximized by directing patients to specific centers. Actual charges will likely vary for private insurers, Medicare, or Medicaid.

Negotiated case rates may combine hospital and physician charges. Procurement charges may be included in the negotiated case rate, but usually the procurement charges reflect slight, if any, discounts from billed levels.

We have observed that case rates do not typically cover pre-transplant medical services and maintenance therapy outpatient immunosuppressants. Some case rates may include follow up costs within a specified time period such as the first 90 days after discharge. Services and charges not defined under a case rate may be provided by the patient’s normal provider network.

Some transplant centers address charge variation by developing separate payment rates by diagnosis or by patient disease state. Our charge estimates may require adjustment to reflect diagnosis, disease state, or other variables specific to a given situation.

An outlier provision may provide additional payment beyond the case rate after a specified number of days in the hospital or after a certain level of billed charges. The outlier provision may pay for hospital days at a discount from billed charges or at a per diem rate. Centers may also have outlier payments for physician services.

Actual outpatient immunosuppressant charges will vary from our estimates for several reasons:

- Actual hospital lengths of stay that we used to estimate when outpatient immunosuppressant charges begin will vary from our estimates.
- Drug discounts other than those assumed in this report will yield different estimates.
- Actual dosing regimens will vary from the dosing regimens assumed.
- The actual use and prevalence of single and multiple outpatient immunosuppressant regimens will vary from our estimates.

The transplant charge estimates do not reflect differences in charges due to age. Billed transplant charges may vary for pediatric patients, adults under the age of 65, and patients ages 65 and over.

Charges may continue after the first year and may include continued testing and evaluation, medical services for transplant rejection, and outpatient immunosuppressants.

III. PRIMARY DIAGNOSES

Table 6 summarizes the most common primary indications for transplantation by organ/tissue. Organ data is based on OPTN data as of Dec. 21, 2007. Bone marrow data is based on 2005 North American data from the CIBMTR 2007 Summary Slides. Cornea data comes from the 2006 Eye Banking Statistical Reports. Since our 2005 report, the order and magnitude of the top indications has changed for several types of transplants.

TABLE 6

INDICATIONS FOR TRANSPLANT

ORGAN OR TISSUE	MOST COMMON PRIMARY DIAGNOSIS AND PREVALENCE	SECOND-MOST COMMON PRIMARY DIAGNOSIS AND PREVALENCE	NEXT MOST COMMON PRIMARY DIAGNOSIS AND PREVALENCE
SINGLE ORGAN/TISSUE			
BONE MARROW-ALLOGENEIC	ACUTE MYELOGENOUS LEUKEMIA (32%)	ACUTE LYMPHOCYTIC LEUKEMIA (15%)	MYELOYDYSPLATIC SYNDROME/ MYELOPROLIFERATIVE DISEASE (12%)
BONE MARROW-AUTOLOGOUS	MULTIPLE MYELOMA (42%)	NON-HODGKIN'S LYMPHOMA (30%)	HODGKIN'S DISEASE (13%)
CORNEA	POST-CATARACT SURGERY EDEMA (19%)	KERATOCONUS (17%)	REPEAT CORNEAL TRANSPLANT (15%)
HEART	DILATED MYOPATHY; IDIOPATHIC (32%)	DILATED MYOPATHY; ISCHEMIC (32%)	CONGENITAL HEART DEFECT-WITH SURGERY (7%)
INTESTINE	SHORT GUT SYNDROME; GASTROSCHISIS (14%)	SHORT GUT SYNDROME: NECROTIZING ENTEROCOLITIS (11%)	SHORT GUT SYNDROME: OTHER (9%)
KIDNEY	HYPERTENSIVE NEPHROSCLEROSIS (20%)	DIABETES MELLITUS-TYPE II (15%)	POLYCYSTIC KIDNEYS (9%)
LIVER	CIRRHOSIS: TYPE C (23%)	ALCOHOLIC CIRRHOSIS (11%)	PRIMARY LIVER MALIGNANCY: HEPATOMA (HEPATOCELLULAR CARCINOMA) AND CIRRHOSIS (8%)
LUNG (SINGLE AND DOUBLE)	COPD/EMPHYSEMA (30%)	IDIOPATHIC PULMONARY FIBROSIS (28%)	CYSTIC FIBROSIS (16%)
PANCREAS	DIABETES MELLITUS - TYPE I (70%)	RETRANSPLANT/GRAFT FAILURE (10%)	DIABETES MELLITUS - TYPE II (4%)
MULTIPLE ORGAN			
HEART-LUNG	PRIMARY PULMONARY HYPERTENSION (29%)	CONGENITAL HEART DISEASE-WITH SURGERY (13%)	EISENMENGER'S SYNDROME: MULTI CONGENITAL ANOMALY (10%)
KIDNEY-PANCREAS	DIABETES MELLITUS - TYPE I (82%)	DIABETES MELLITUS - TYPE II (7%)	HYPERTENSIVE NEPHROSCLEROSIS (3%)

IV. WAITING TIMES AND SURVIVAL RATES

Waiting times

Table 7 summarizes transplant waiting times in days by organ, based on OPTN data as of May 1, 2006, from the OPTN/SRTR 2006 annual report. The waiting times take the point of view of a patient who has been registered on a waiting list and takes into account all the things that can happen to the patient after wait listing, such as receiving a transplant, being removed from the waiting list, and dying. No data is shown for bone marrow or cornea transplants because we were unable to find a data source for tissue transplant waiting times.

The percentile-based waiting times shown in Table 7 are estimates of the time in which 50% of patients received a transplant. For example, a heart transplant patient placed on a waiting list in 2005 had a 50% chance of being transplanted within 130 days.

Table 7 also shows that waiting times vary by organ over time. Waiting times may also vary by other characteristics not shown. Waiting time estimates shown in Table 7 can differ from the estimates shown in our 2005 report because of additions, deletions, or other revisions that OPTN may have made to its data or the manner in which it measures the wait. The waiting times for more recent years appear to be understated, as they seem to develop to higher values over time. For example, if one compares waiting times for 2001 and 2002 in our 2005 report to that shown in Table 7 below, the initial values shown in the 2005 report are significantly lower than those in Table 7 now.

Survival rates

Table 8 summarizes one-year, three-year, and five-year patient survival rates by transplant. The organ transplant survival rates for patients transplanted during 1997 through 2004 are generally similar to those in our 2005 report, and are based on OPTN data as of Dec. 21, 2007.

Bone marrow transplant survival rates are based on 1998 to 2004 CIBMTR survival rate data. Autologous and allogeneic survival rates vary significantly by individual diagnosis, age, type of donor, and disease stage. We developed composite autologous bone marrow estimates reflecting survival rates for multiple myeloma, non-Hodgkin's lymphoma, Hodgkin's disease, and acute myelogenous leukemia, which represented more than 90% of all autologous bone marrow transplants in 2005. The composite allogeneic bone marrow estimates we developed reflect survival rates for acute myelogenous leukemia, chronic myelogenous leukemia, acute lymphoblastic leukemia, myelodysplasia, non-Hodgkin's lymphoma, diffuse large cell lymphoma, and multiple myeloma, which represent more than 80% of all allogeneic bone marrow transplants in 2005. The CIBMTR has not reviewed or approved our composite survival estimates.

TABLE 7

WAITING TIMES BY TRANSPLANT

ORGAN	2001	2002	2003	2004	2005
50TH PERCENTILE (i.e., MEDIAN) TIME TO TRANSPLANT IN DAYS					
HEART	264	230	209	166	130
INTESTINE	333	310	289	212	232
KIDNEY	1,175	1,136	*	*	*
LIVER	*	974	563	400	321
LUNG (SINGLE AND DOUBLE)	1,239	1,057	932	*	202
PANCREAS ALONE	751	300	348	376	*
PANCREAS AFTER KIDNEY	551	594	500	575	*
HEART-LUNG#	534	409	225	284	100
KIDNEY-PANCREAS	492	471	454	428	*

* Not determined due to insufficient follow-up; fewer than this percentile have been transplanted.
#These values are the 25th percentile as all 50th percentile values were not determined.

TABLE 8

PATIENT SURVIVAL RATES BY TRANSPLANT

ORGAN	ONE-YEAR		THREE-YEAR		FIVE-YEAR	
	2005 REPORT	1997-2004	2005 REPORT	1997- 2004	2005 REPORT	1997-2004
HEART	86%	88%	78%	79%	72%	72%
INTESTINE	79	79	73	59	47	48
KIDNEY	96	96	91	91	84	85
LIVER	86	86	78	78	72	72
LUNG	78	83	59	63	45	47
PANCREAS	96	94	90	90	78	82
HEART-LUNG	67	66	41	50	37	39
KIDNEY-PANCREAS	95	95	90	90	84	86
TISSUE	1996-2001	1998-2004	1996-2001	1998-2004	1996-2001	1998-2004
BONE MARROW- AUTOLOGOUS	80-85%	85-89%	60-65%	65-69%	45-50%	50-54%
BONE MARROW- ALLOGENEIC	65-70%	59-63%	50-55%	47-51%	45-50%	43-47%

V. 2006 RECIPIENT DEMOGRAPHICS

Tables 9A and 9B highlight 2006 transplant recipient demographics. The demographic data and categories are based on OPTN data as of Dec. 21, 2007 for solid organs and state hospital data bases for bone marrow.

TABLE 9A

2006 RECIPIENT DEMOGRAPHICS: SINGLE ORGAN/TISSUE TRANSPLANTS

		BONE MARROW	HEART	INTESTINE	KIDNEY	LIVER	LUNG	PANCREAS
GENDER	MALE	57%	74%	47%	61%	65%	56%	51%
	FEMALE	43	26	53	39	35	44	49
	TOTAL	100%	100%	100%	100%	100%	100%	100%
RACE	WHITE	72%	68%	69%	55%	70%	84%	88%
	BLACK	11	19	14	24	11	9	7
	HISPANIC	11	9	13	14	14	5	4
	ASIAN	3	3	1	5	4	1	0
	OTHER	3	1	3	2	1	1	1
	TOTAL	100%	100%	100%	100%	100%	100%	100%
AGE (AT TIME OF TRANSPLANT)	UNDER 1	1%	4%	18%	0%	3%	0%	2%
	1-5	5	3	29	1	3	0	4
	6-10	4	2	3	1	1	1	1
	11-17	4	5	5	3	2	2	1
	18-34	14	10	19	15	6	13	20
	35-49	21	20	14	28	22	16	53
	50-64	41	45	11	38	54	56	19
	65+	10	11	1	14	9	12	0
	TOTAL	100%	100%	100%	100%	100%	100%	100%

TABLE 9B

2006 RECIPIENT DEMOGRAPHICS: MULTIPLE ORGAN TRANSPLANTS

		HEART-LUNG	INTESTINE WITH OTHER ORGANS	KIDNEY-HEART	KIDNEY- PANCREAS	LIVER-KIDNEY	OTHER MULTI- ORGAN
GENDER	MALE	58%	47%	90%	64%	67%	58%
	FEMALE	42	53	10	36	33	42
	TOTAL	100%	100%	100%	100%	100%	100%
RACE	WHITE	72%	68%	58%	75%	60%	75%
	BLACK	6	16	31	15	18	0
	HISPANIC	6	11	5	8	16	25
	ASIAN	16	2	3	1	5	0
	OTHER	0	3	3	1	1	0
TOTAL	100%	100%	100%	100%	100%	100%	
AGE (AT TIME OF TRANSPLANT)	UNDER 1	10%	25%	0%	0%	0%	0%
	1-5	3	29	0	0	1	8
	6-10	0	3	0	0	0	0
	11-17	10	4	3	0	1	8
	18-34	10	18	3	19	5	25
	35-49	48	14	15	62	22	17
	50-64	19	7	66	19	58	34
	65+	0	0	13	0	13	8
TOTAL	100%	100%	100%	100%	100%	100%	

VI. DONOR FACTS AND DATA

Deceased donor

Deceased donor data reflects only donors recovered by U.S. organ procurement organizations. United Network for Organ Sharing defines a recovered, deceased donor as one from whom at least one vascularized solid organ—heart, intestine, kidney, liver, lung, or pancreas—was recovered for transplantation. Hearts recovered for heart valves would not be counted.

Table 10 summarizes U.S. deceased donor counts from 2003 to 2006, based on OPTN data as of Dec. 21, 2007. Unlike Tables 1, 4A, and 4B, heart, intestine, kidney, liver, lung, and pancreas transplants in Table 10 include multiple organ transplants with that organ. Heart-lung and kidney-pancreas transplants are the exception, as those transplants are counted separately and only counted once.

Living donor

The most common transplants using living donors include bone marrow, intestine, kidney, liver, lung, pancreas, and kidney-pancreas transplants. Living lung donors have a segment of one lung removed for transplants. Lung lobes do not regenerate the donated segment, but the average decrease of 15% in the living donor's lung capacity generally yields minimal physical limitations for the donor. The liver can regenerate the donated segment. A donor may live with one kidney with little danger because the remaining kidney enlarges to do the work that both kidneys previously shared.

Living donor data includes living donors from whom organs were transplanted in the United States. The number of living donor transplants may differ from the number of living donors because living donors might donate segments from more than one organ, or there may be multiple donors for one transplant.

Table 11 summarizes U.S. living donor counts from 2003 to 2006, based on OPTN data as of Dec. 21, 2007. Unlike Tables 1, 4A, and 4B, intestine, kidney, liver, lung, and pancreas transplants include multiple organ transplants with that organ. Kidney-pancreas transplants are the exception, as these transplants are counted separately and only counted once.

TABLE 10

PRIMARY ORGAN TRANSPLANTS FROM DECEASED DONORS

YEAR	HEART	INTESTINE	KIDNEY	LIVER	LUNG	PANCREAS	HEART-LUNG	KIDNEY-PANCREAS
2003	2,057	112	8,667	5,351	1,070	502	29	868
2004	2,015	146	9,357	5,846	1,157	602	40	881
2005	2,125	171	9,913	6,120	1,405	540	35	902
2006	2,191	171	10,659	6,362	1,401	463	31	923

TABLE 11

PRIMARY ORGAN TRANSPLANTS FROM LIVING DONORS

YEAR	INTESTINE	KIDNEY	LIVER	LUNG	PANCREAS	KIDNEY-PANCREAS
2003	4	6,470	322	15	0	3
2004	6	6,647	323	15	0	0
2005	7	6,568	323	1	1	1
2006	4	6,432	268	4	0	1

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