

Kidney Transplantation: Overview and Impact of Blood Transfusions

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ESRD in the U.S. (2007)

- **Prevalence**

Total – 527,283

Medicare – 437,000 (1% of all beneficiaries)

- **Treatment modality**

Dialysis - 70 %

Transplant - 30 %

- **Cost**

Total (U.S.) - \$35.32 Billion

Medicare - \$24 Billion (6% of Medicare expenditures)

ESRD Demographics (2005)

- Prevalence – 485,000

- Ethnic Group (%)

White	54
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Black	30
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Hispanic	4
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- Age (%)

< 20 yr old	1
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20 - 64 yr old	63
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> 64 yr old	36
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ESRD Annual Changes (2007)

- Prevalence – 527, 283
- New patients – 110,000 (half with diabetes)
- Mortality – 87,812
- Transplantation – 17,513

Kidney Transplant Waiting List

Adults

2011 – 87,008

2000 – 47,000

Transplant Status (%)

First - 85

Repeat - 15

Waiting Time (%)

< 1 yr 33

1-3 yr 41

3-5 yr 18

> 5 yr 11

Transplant Trends (adults)

Year	Total	Donor Type	
		Deceased	Living
1990	8,775	6,967	1,808
1995	10,364	7,365	2,999
2000	12,992	7,845	5,147
2009	15,963	9,912	6,051

Adult Transplant Ethnicity (2009)

Ethnic Group (%)

White	53
Black	26
Hispanic	14
Asian	5

Patient Survival Rates (2007)

Duration	Dialysis	Transplant	
		Donor Type	
		Deceased	Living
1 year	79 %	95 %	98 %
5 years	33	81	90
10 years	10	61	76

Graft Survival Rates (2007)

Duration	Donor Type	
	Deceased	Living
1 year	90 %	96 %
5 years	68	81
10 years	43	59

Graft Loss

- The most common reason for graft loss is death with a functioning graft (about half)
- The most common cause of death in these patients is cardiovascular disease (about half)
- Historically (prior to 1990):

Graft loss primarily due to acute rejection

Death most commonly caused by infection (often as a result of the attempts to treat acute rejection)

Improvements: immunosuppression drugs/regimens (more potent and less toxic), anti-rejection therapy, antimicrobial agents (CMV and pneumocystis)

Other Causes of Graft Loss (excluding death with functioning graft)

- Early (First Year)

Medical	43 %
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Recurrent disease	25
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Acute Rejection	19
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- Late (Subsequent Years)

Fibrosis/atrophy	32 %
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Transplant glomerulopathy	20
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Recurrent disease	15
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Mayo Clinic series, El-Zoghy, Stegall, et al, AJT (2009)

Blood Transfusions and Kidney Transplantation

- 1973 Random Donor Transfusions (1-5)
Gerhard Opelz et al, “Effect of Blood Transfusions on Subsequent Kidney Transplants”, Transplantation Proceedings Vol 5:253-259
- 1980 Donor Specific Transfusions (3)
Oscar Salvatierra et al, “Deliberate Donor-specific Blood Transfusions Prior to Living Related Renal Transplantation”, Annals of Surgery Vol 192:543-552

Shrinking Impact of Transfusion Effect

Time Periods	Graft Survival
1970s Opelz, Lancet (1974)	+ 20%
1980s Cecka, Clinical Transplants (1987)	+ 10%
1990s Terasaki, Clinical Transplants (1995)	nearly none

Requirements for Transfusion Effect

- Fresh blood (not frozen/re-thawed)
- Whole blood or Packed RBC
- Within several months prior to transplant
- Minimum of 3 (DST) or 5 (random donors)
- Donor/Recipient HLA Matching (A, B, and DR):
 - 1 haplotype match (DST)
 - Or at least B and DR match (DST or random)

“Sensitization”

- DST – 29% (no azathioprine)
- Random - Excessive (PRA > 50%): < 10%
- Random – 7% Opelz (1997) Transplantation
- Random: Agrawal (2000) Current Science
 - 5 transfusions – 4%
 - 10 transfusion – 7%

Percent of Sensitized Patients after Blood Transfusions

Zhou and Cecka, Clinical Transplantation (1993)

Patient Type	Number of Transfusions					
	0		1-4		>4	
	11-50	>50	11-50	>50	11-50	>50
Male	14	2	18	4	22	12
Female						
nulliparous	17	9	20	12	24	21
multiparous	20	10	26	2	25	29

PRA Levels of Waiting List Patients

PRA Level	Percent (%)
0	66
1-50	19
50-80	4
80-90	2
90-100	3
missing	5

OPTN Histocompatibility Committee Meeting (10/28/2009)
UNOS Research Department Report (2006 data)

PRA Level and Waiting Time for Transplant

PRA Level Transplanted within 3 years (%)

0	66
1-50	25
50-80	20
80-90	25
90-95	15
95-100	15
All patients	25

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Options for “Sensitized” Patients

- Wait (a long time)
- Desensitization protocols (limited availability)
- Kidney Paired Donation (multiple exchanges) with or without desensitization protocols

Anemia after Renal Transplantation

With a prevalence of more than 30% in the kidney transplant population, anemia is a common complication of kidney transplantation and occurs out of proportion to the degree of kidney impairment. The multiple causes of anemia during the immediate and later post-transplant course include blood loss, low iron stores, medications (antiproliferative agents and angiotensin- converting enzyme [ACE] inhibitors), inflammation, and infections. Anemia in kidney transplant recipients is associated with increased mortality.

Bryce A Kiberd, Cardiovascular Disease in Kidney Transplant Recipients, Johns Hopkins Advanced Studies in Medicine (2007)

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