



# Where Are We Going with Kidney Paired Donation? A Nationally-run Private Program Works Best

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CUTTING EDGE OF  
TRANSPLANTATION

AST | AMERICAN SOCIETY OF  
TRANSPLANTATION

**RESOLVING THE ORGAN SHORTAGE**



PRACTICE |



POLICY |



POLITICS

FEBRUARY 25-27, 2016 • PHOENIX, ARIZONA

# Conflict of Interest Disclosure

I have no financial relationship(s) within the last 12 months relevant to my presentation

**AND**

My presentation does not include discussion of off-label or investigational use any drugs nor do I reference unlabeled/unapproved uses of drugs or products in my presentation

# Polling Question

The two **primary** factors that lead patients to seek Kidney Paired Exchange are:

- a. To find a donor from a certain ethnic group
- b. To find a lymphocytotoxic crossmatch negative donor
- c. To find a donor of the same gender
- d. To find an ABO blood type identical donor
- e. To find an ABO blood type compatible donor

**Select only 2 answers**

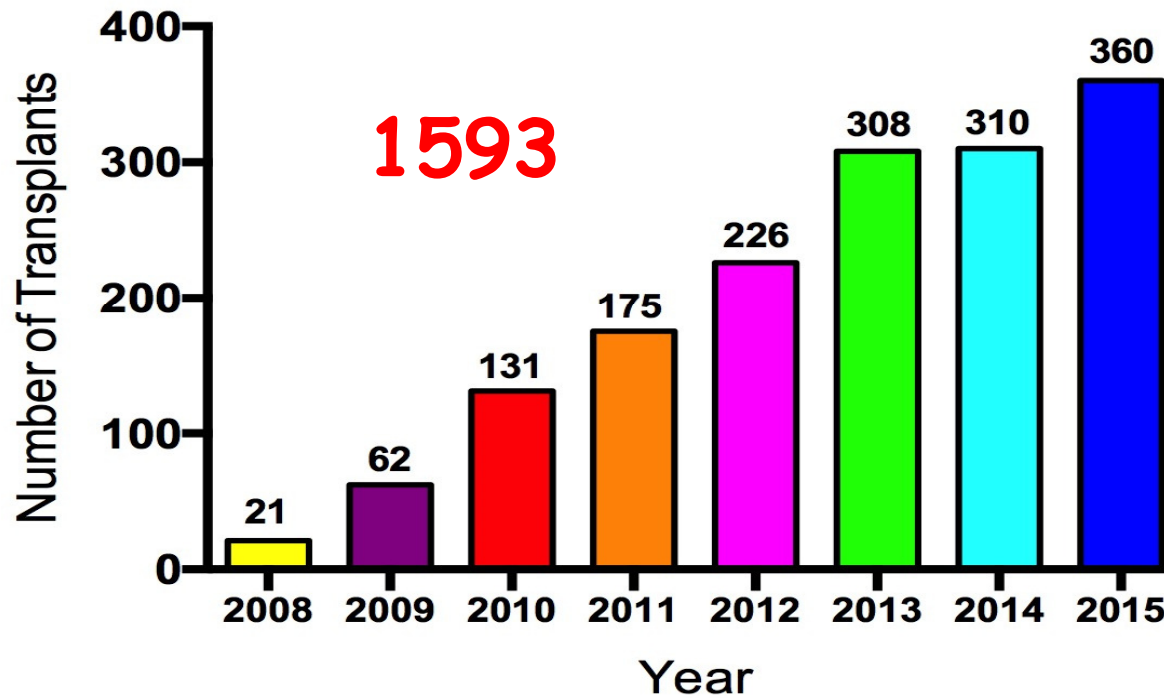
The National Kidney Registry (NKR) is a voluntary network of 76 Transplant centers in 28 States in the United States, focused on the timely transplantation of live donor kidneys through novel computational algorithms that facilitate exchanges of kidneys between participating centers.

Donors and Recipients voluntarily consent to enter their medical information into a secured computer database that is HIPPA compliant.

Transplant loops and chains are constructed and reviewed via a shared central Website, followed by final logistics that are confirmed by direct center to center communication.

Transplants are facilitated by a central administrative infrastructure along with each participating transplant center and commercial transport agency.

## Annual Growth of NKR Transplants



[http://kidneyregistry.org/pages/p364/NKR\\_QtrlyReport4thQuarter2015.php](http://kidneyregistry.org/pages/p364/NKR_QtrlyReport4thQuarter2015.php)

**Transplant Loops: exchanged pairs**

79 with mean length 2.33 pairs

**Transplant Chains:**

Total

310

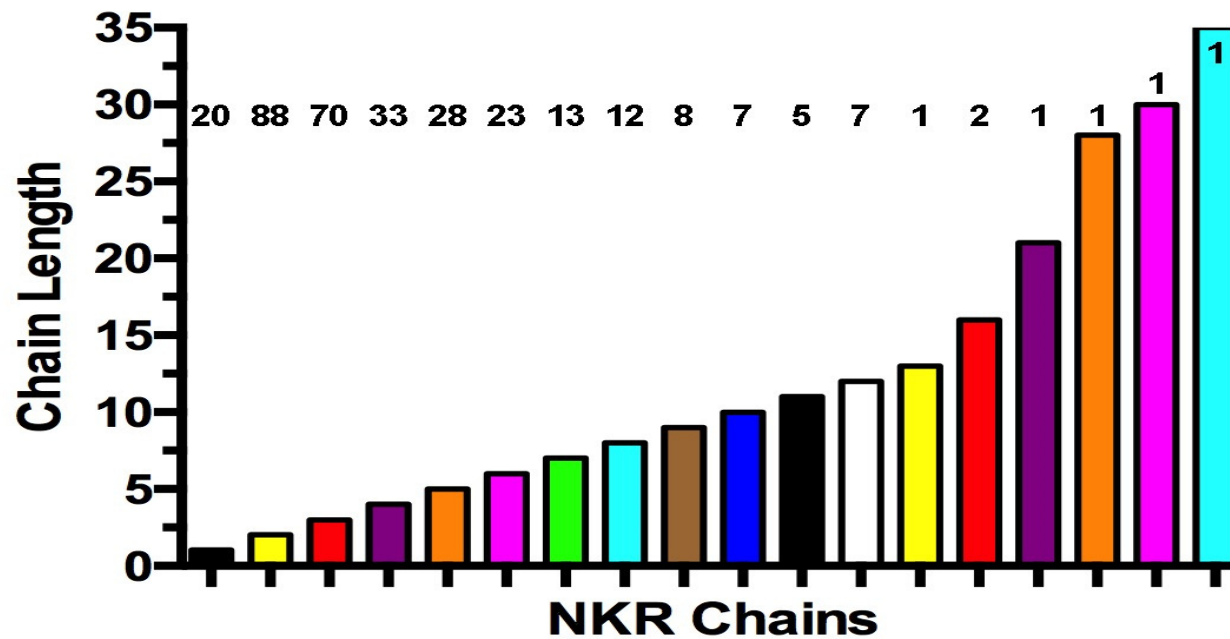
Length

2-35 pairs

mean

4.6 pairs; median 3 pairs

## Number of Each Chain Length

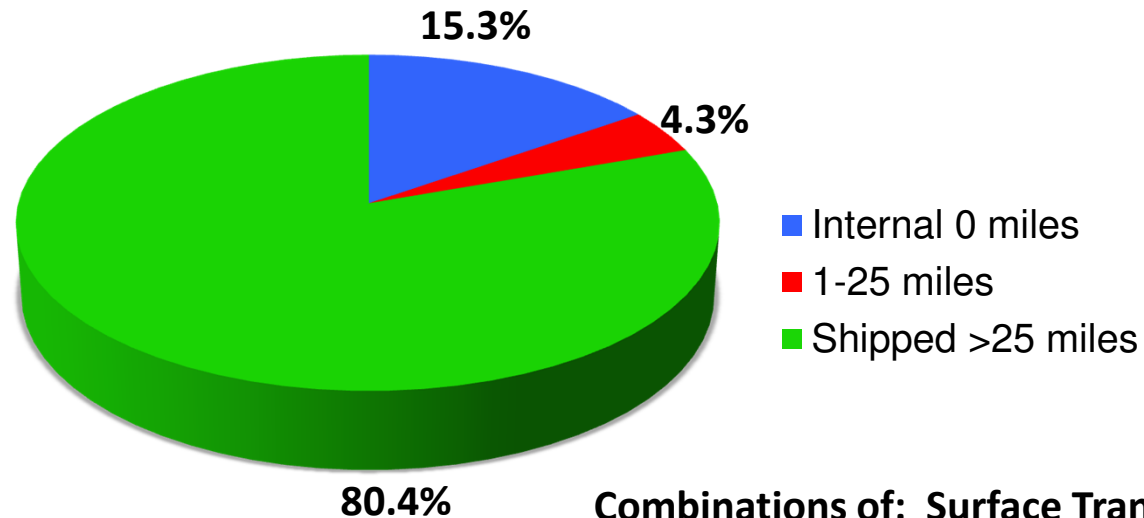


# 1593 Live Donor Transplants Facilitated by NKR (February 14, 2008 to December 31, 2015)

## NKR 1593 Shipped Kidneys

2008-2015

Range: 0 to 2,697 miles



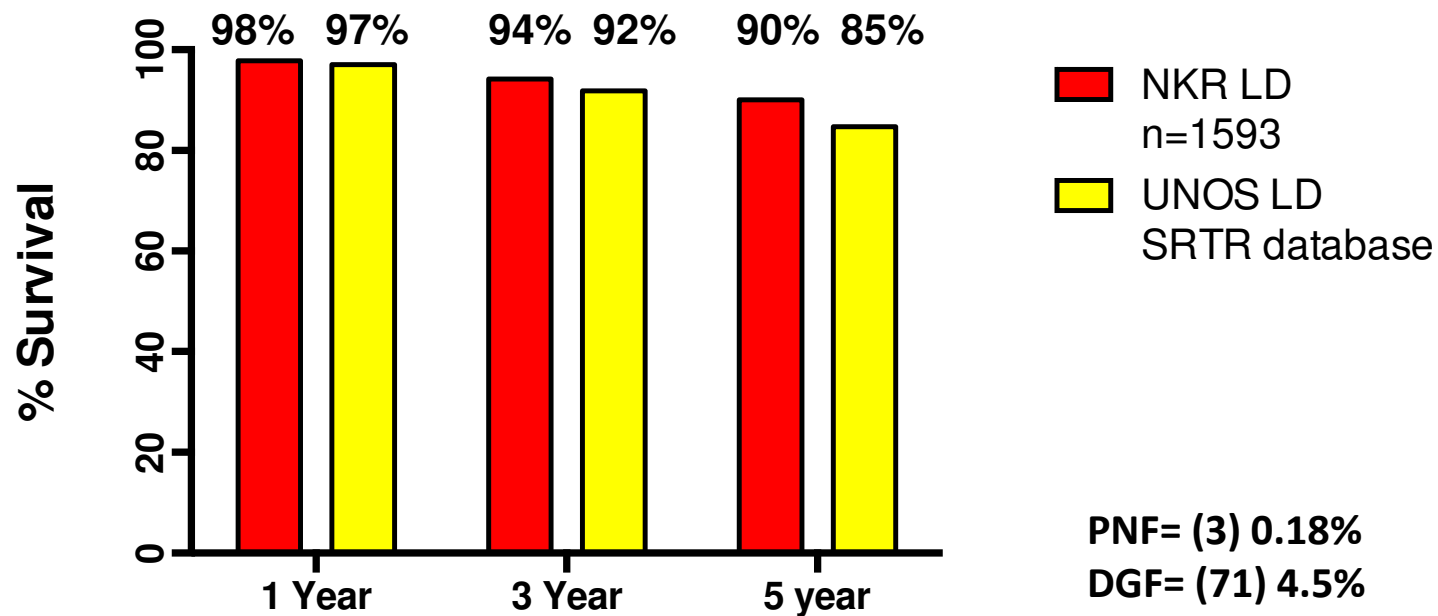
Median CIT 8 hrs (range 1-25 hrs)

Combinations of: Surface Transport  
Commercial Flights  
Charter Flights



## 1593 Live Donor Transplants Facilitated by NKR (February 14, 2008 to December 31, 2015)

### NKR vs. UNOS Graft Survival



NKR Kaplan-Meier LD Survivals vs. SRTR LD Survivals;

[www.srtr.org/annual\\_reports/2011/509d\\_ki.aspx](http://www.srtr.org/annual_reports/2011/509d_ki.aspx). Accessed 2/12/2016

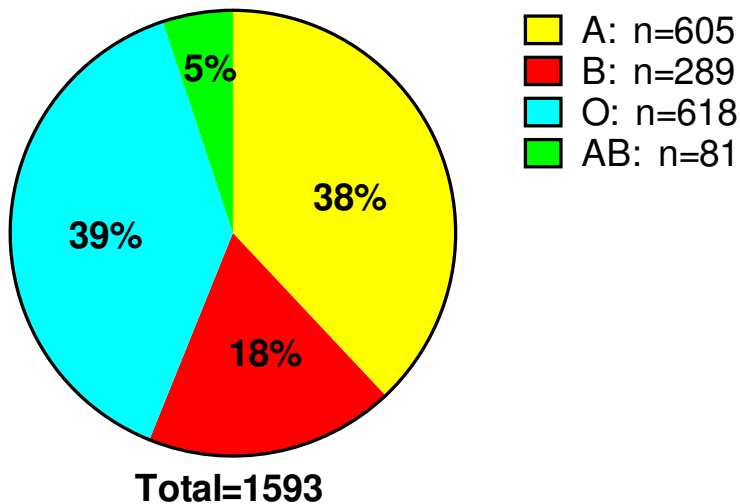
## Demographics-research database

	<b>Recipients N=1593</b>	<b>Actual Donors N=1593</b>	<b>Non-Directed Donors N=310</b>	<b>P- value</b>
Age (yrs.) (range)	48.5 ± 14 (2-84)	46.8 ± 12 (20-77)	46.1 ± 11 (21-73)	0.001
Gender M:F %	53.6:46.4%	37.9:62.1%	41.6:58.3%	0.0001
Race: white	60.6%	71.4%	91.9%	
black	16.9%	10.2%	1.6%	
hispanic	10.2%	7.8%	1.3%	
asian	6.6%	4.0%	2.9%	
Other/NA	5.7%	6.4%	2.3%	
ABO: A-B-AB-O	564-297-112-620	605-289-81-618	114-44-7-145	
Pre-emptive	573 (35.9%)			
BMI kg/m2	27.4 ± 5.7 (13.6-55)	26.4 ± 4.1 (15.7-42)	25.2 ± 3.3 (18.1-36.2)	0.001
HLA MM A,B,Dr	1572 pairs		4.32 Range (0-6)	

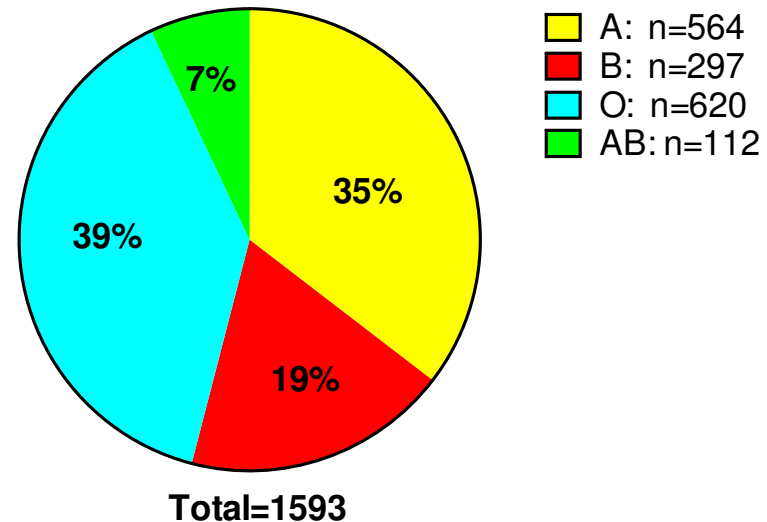
## 1593 Live Donor Transplants Facilitated by NKR (February 14, 2008 to December 31, 2015)

### ABO Type of Transplanted Patients

Donors



Recipients



**98.1% were ABO compatible**

**ABOi: A to O=24 (21 donors were A<sub>2</sub>)**

**B to O=3 AB to A=2 AB to B=2**

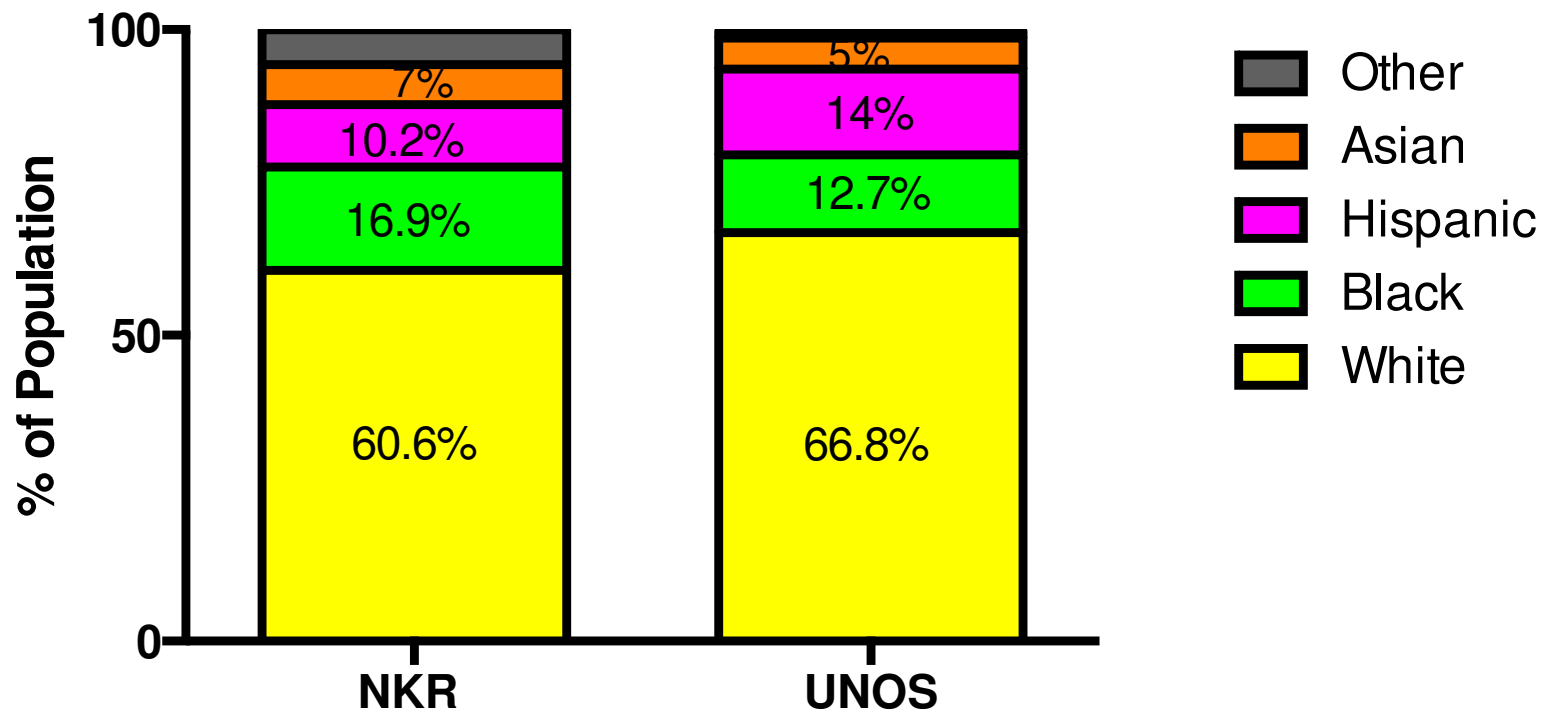
[http://kidneyregistry.org/pages/p20/NKR\\_QtrlyReport4thQuarter2015.php](http://kidneyregistry.org/pages/p20/NKR_QtrlyReport4thQuarter2015.php)

## 1593 Live Donor Transplants Facilitated by NKR

(February 14, 2008 to December 31, 2015)

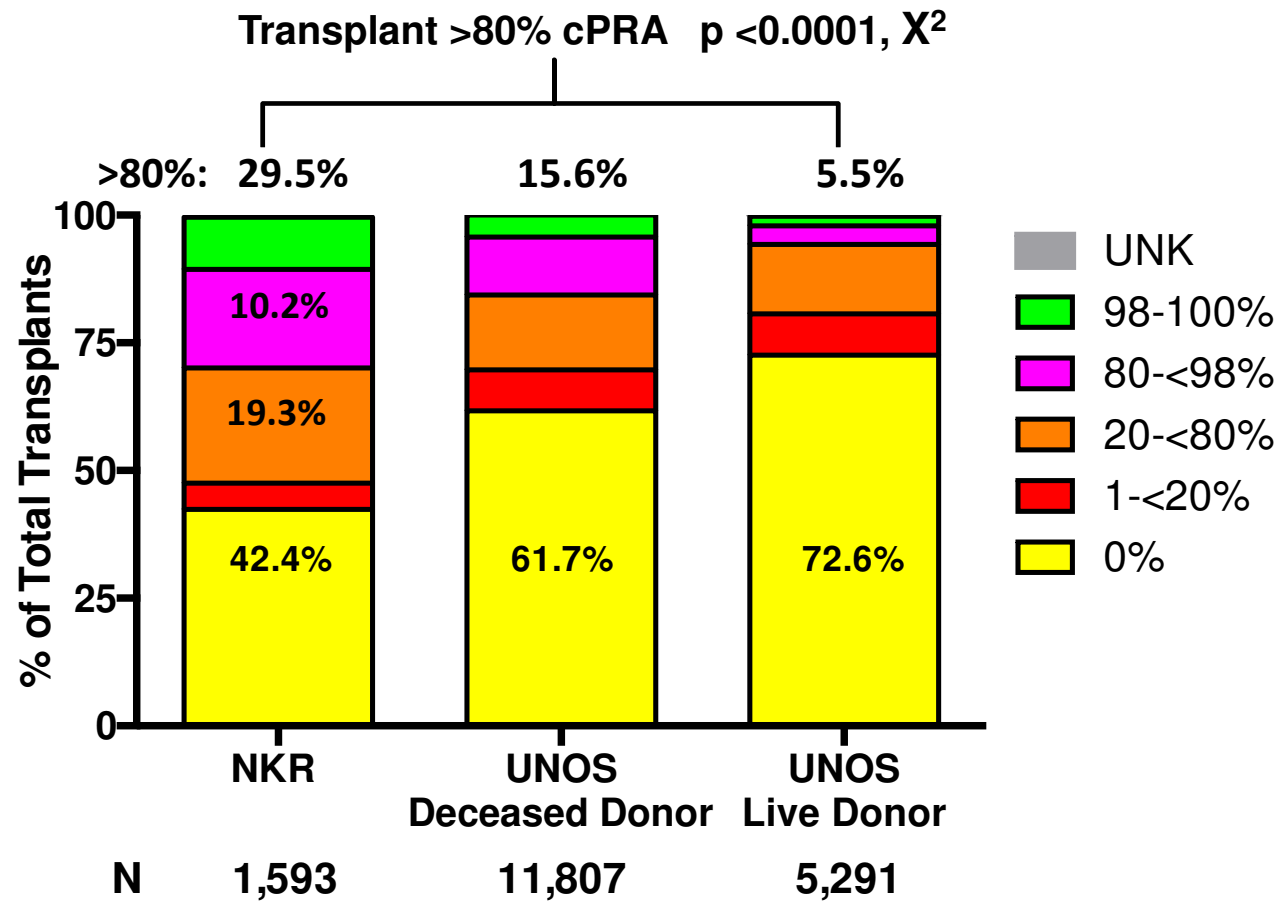
Racial Mix LD Recipients: NKR 2008-15 vs. UNOS 2014 Annual

### KPD Recipients by Race



<https://optn.transplant.hrsa.gov/converge/latestData/rptData.asp>

## cPRA Ranges: NKR 2008-15 vs. UNOS 2014 Annual



<http://onlinelibrary.wiley.com/doi/10.1111/ajt.13666/epdf>

## 1593 Live Donor Transplants Facilitated by NKR (February 14, 2008 to December 31, 2015)

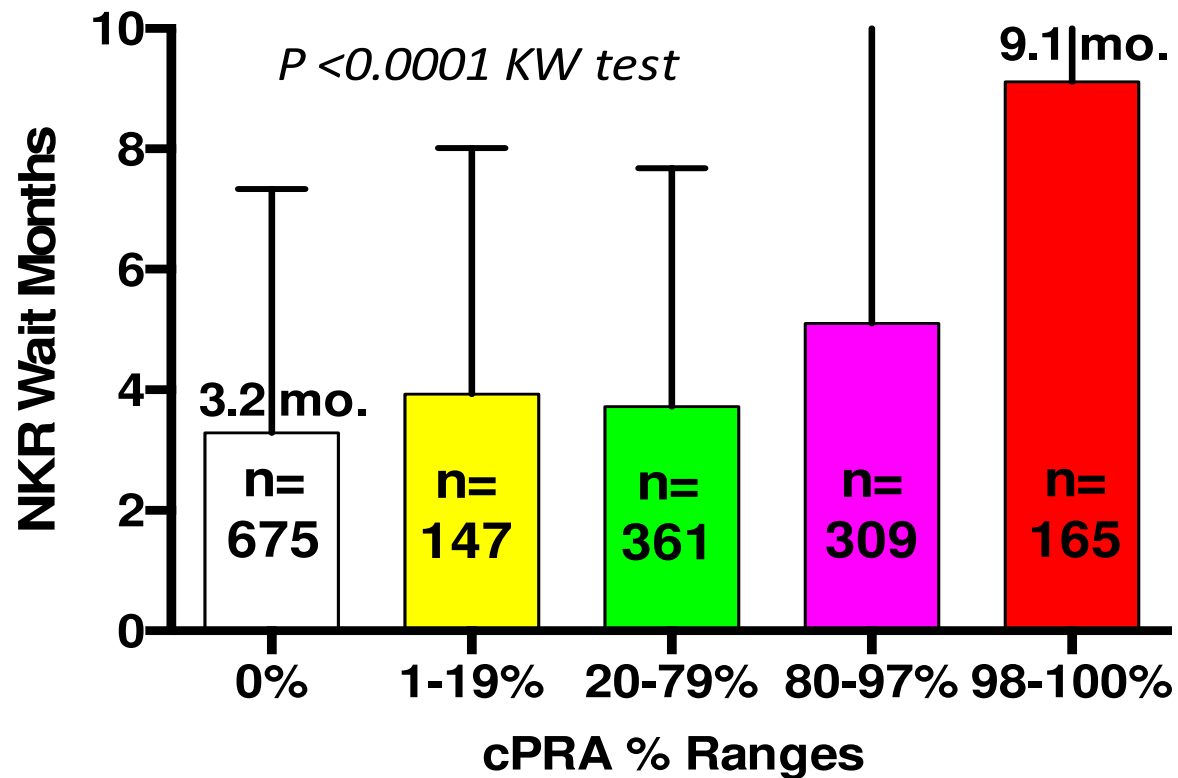
### Time Waiting of Transplanted Recipients by Blood Group

Recipient	Wait time (months)		
	Registration to Transplant		
ABO (N)	Mean	Median	Range
A: 564 (35.4%)	3.05	2	0-34
B: 297 (18.6%)	4.04	3	0-42
O: 620 (38.9%)	*6.11	4	0-36
AB: 112 (7.0%)	2.24	2	0-26
<b>Total (1593)</b>			

\*O vs. all groups  $p < 0.0001$

## 1593 Live Donor Transplants Facilitated by NKR (February 14, 2008 to December 31, 2015)

### NKR Wait Times According to Recipient cPRA



# 1593 Live Donor Transplants Facilitated by NKR (February 14, 2008 to December 31, 2015)

## cPRA of the Transplanted Recipients by ABO Type similar distribution across all blood groups

Recipient	cPRA				
ABO (N)	0%	1- <20%	20- <80%	80- <98%	98- 100%
A: 564	221	21	133	106	83
B: 297	144	16	62	53	22
O: 620	243	43	149	136	<b>49 (3%)</b>
AB: 112	68	3	17	14	10
<b>Total (1593)</b>	<b>676 (42.4%)</b>	<b>83</b>	<b>361</b>	<b>309</b>	<b>164 (10.3%)</b>

[http://kidneyregistry.org/pages/p20/NKR\\_QtrlyReport4thQuarter2015.php](http://kidneyregistry.org/pages/p20/NKR_QtrlyReport4thQuarter2015.php)



## The Bane of KPD:



### The Highly Sensitized O Recipient

Often: cPRA >95%

Common HLA phenotypes

5 years on dialysis

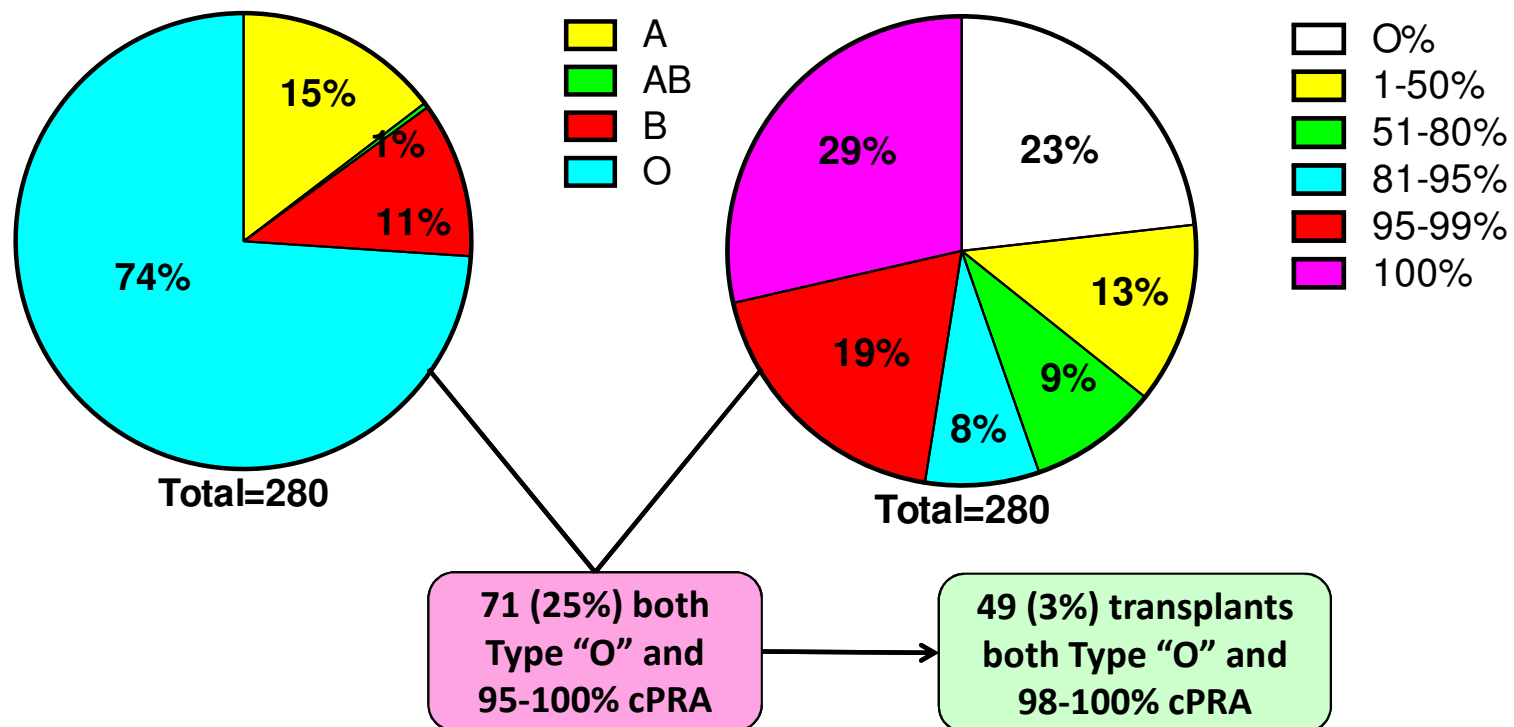
Retransplanted

Failed to secure OMM DD

# 1593 Live Donor Transplants Facilitated by NKR

(February 14, 2008 to December 31, 2015)

## ABO and cPRA of 280 UnTransplanted Patients in Pool as of 12/31/2015

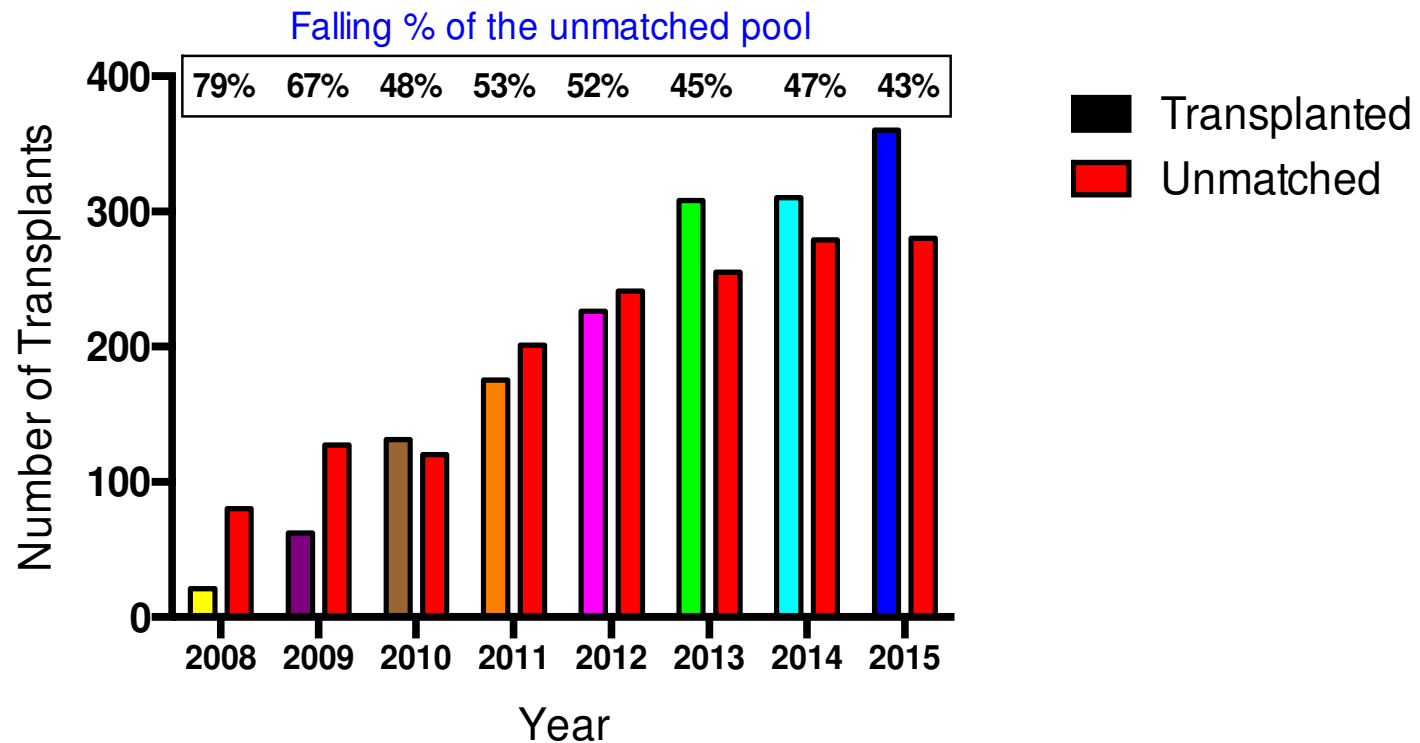


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# 1593 Live Donor Transplants Facilitated by NKR

(February 14, 2008 to December 31, 2015)

## Annual NKR Transplants vs. Unmatched Recipients



[http://kidneyregistry.org/pages/p20/NKR\\_QtrlyReport4thQuarter2015.php](http://kidneyregistry.org/pages/p20/NKR_QtrlyReport4thQuarter2015.php)

## 1593 Live Donor Transplants Facilitated by NKR

(February 14, 2008 to December 31, 2015)

### Planned Desensitization (11%): 167 + crossmatch, and 7 ABOi

- Desensitization Regimens Used Among 1593 NKR Transplants
- Self reported by Centers; dosing and time of treatment uncertain
- Lymphocyte crossmatch status uncertain day of transplant

Treatment	Number of Patients Given Each Therapy
I.V. Immunoglobulin/CMV-IG	108
Plasmapheresis	76
Thymoglobulin	41
Bortezomib	6
Rituximab	36
Eculizumab	4
Splenectomy	1

## Broken Chains and Real Time Swap Failures

Year	Bridge Donors	Real Time Swap Failures	Broken Chains	% Broken per Year
2008	9	0	3	33%
2009	29	1	2	7%
2010	61	0	2	3%
2011	75	0	0	0%
2012	54	0	4	7%
2013	37	3	3	8%
2014	49	2	4	8%
2015	54	1	1	2%
<b>Totals</b>	<b>368</b>	<b>7(0.4%)</b>	<b>19</b>	

[http://kidneyregistry.org/pages/p20/NKR\\_QtrlyReport4thQuarter2015.php](http://kidneyregistry.org/pages/p20/NKR_QtrlyReport4thQuarter2015.php)

## 1593 Live Donor Transplants Facilitated by NKR

(February 14, 2008 to December 31, 2015)

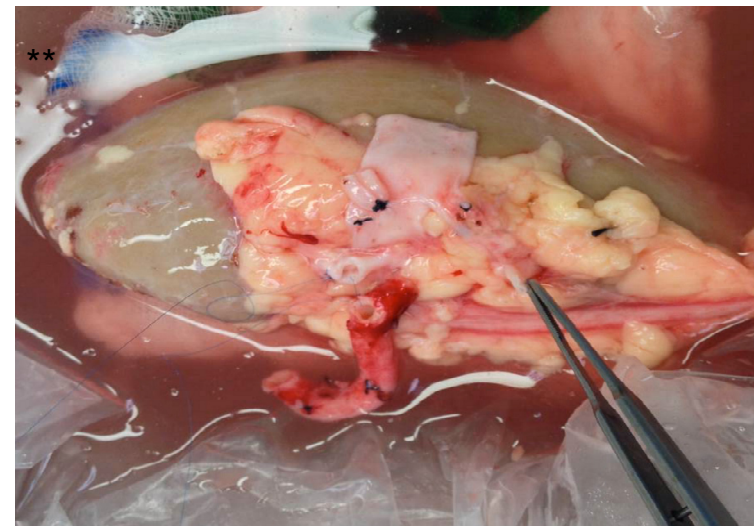
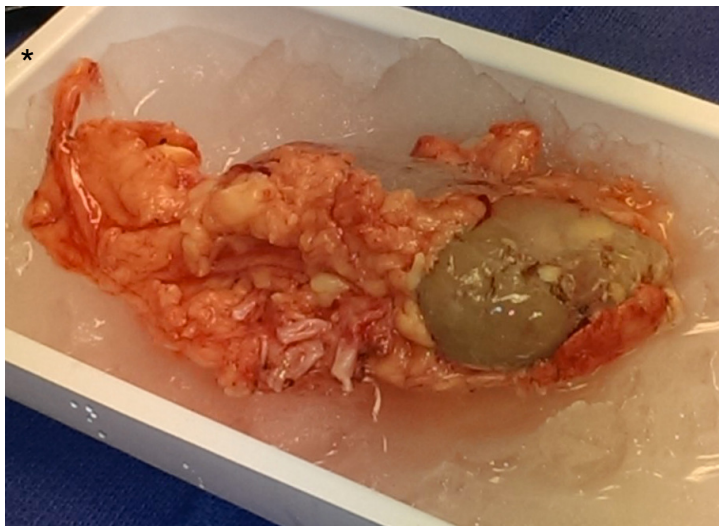
### 50-60% of Match Offers are Declined or Fail to Complete

#### Root Causes of Failed Swaps

- Recipient Not Ready: Intervening change in status **30%**
- Unacceptable crossmatch: virtual vs. actual crossmatch **24%**  
variability in MFI stringency  
need and comfort with desensitization
- Late Stage Donor Decline: medical or surgical complexity **20%**
- Donor Not Ready: change in status and/or logistics **11%**

[http://kidneyregistry.org/pages/p20/NKR\\_QtrlyReport4thQuarter2015.php](http://kidneyregistry.org/pages/p20/NKR_QtrlyReport4thQuarter2015.php)

Year	Real Time Swap Failures: 7(0.4%)
2009	Donor Reneged
2013	Aborted donor surgery-OR complication; kidney never removed
2013	<b>*Kidney declined at recipient center-vascular injury</b>
2013	Recipient Medical Issue-fever, WBC 19,000
2014	<b>**Kidney declined at recipient center—short artery</b>
2014	Recipient Medical Issue
2015	<b>Kidney declined at recipient center</b>





# 1593 Live Donor Transplants Facilitated by NKR (February 14, 2008 to December 31, 2015)

## NKR Medical Board Policies

**Ending Chains - The NKR shall end chains according to the following priorities:**

1. To former NKR Non-Directed Donors (NDDs) in need of a kidney transplant.
2. To patients involved in real-time swap failures where the donor has donated but the patient did not get a kidney.
3. To ADP patients who are ready for a transplant.
4. To CHiPs at Member Centers with:  
Net chains started (NCS) > 0.  
Forecasted net chains started (FNCS) > 0.
5. To Member Centers with:  
Net chains started (NCS) > 0.  
Forecasted net chains started (FNCS) > 0.

Tiebreaker for 4 & 5 above: when there is more than one Member Center for a chain end offer, the offer will go to the Member Center with the least chain end match offer declines in the prior 12 months.

[http://kidneyregistry.org/transplant\\_center.php#policies](http://kidneyregistry.org/transplant_center.php#policies)



## Conclusions

- The NKR provides a network to exchange live donor kidneys across the US among both large and small transplant centers using both loops and chains.
- From 2008-15, 1593 transplants were facilitated: 98% ABO compatible; 81% of kidneys were shipped; 11% desensitized; and 39.4% were non-white.
- NKR recipients were significantly more hyper-immunized (29.5%) with cPRA >80% than LD (5.5%) transplants in the USA during the same time interval.

## Conclusions

- Average wait times varied between 3-9 months, with type O and cPRA >80% patients the hardest to match.
- Sufficient & sustainable pool sizes are needed to maximize the opportunity for hard to match patients. These include the judicious use of type O non-directed donors and possibly compatible pairs.



Allegheny General Hospital, Aurora St. Luke's Medical Center, University Medical Center, Saint Barnabas Medical Center, Barnes-Jewish Hospital, Baystate Medical Center, Brigham and Scripps Green Hospital, Seattle Children's, Sentara Norfolk Women's Hospital, California Pacific Medical Center, Cedars- General Hospital, Sharp Memorial Hospital, St Louis Children's Sinai Medical Center, Centura Porter Adventist Hospital, Hospital, St. David's North Austin Medical Center, St. Vincent Children's Hospital of Pittsburgh Children's Hospital of Medical Center CA, Stanford University Medical Center, Tampa Pittsburgh, Christiana Care Health System, Cleveland Clinic, General Hospital, The Christ Hospital Health Network, The Crozer-Chester Medical Center, Dartmouth-Hitchcock MC, Transplant Center at Robert Wood Johnson, Thomas Jefferson Emory Transplant Center, Fletcher Allen Health Care, Fort University Hospital, U. Pittsburgh Thomas E. Starzl, UCLA Worth Transplant Institute at PMC, Froedtert, Georgia Regents Medical Center, UCSF Medical Center, University of Chicago Health System, Hospital of the University of Pennsylvania, Medicine, University of Cincinnati Hospital, University of Indiana University Health Transplant, Intermountain Medical Center, Maryland Medical Center, University of Minnesota Medical Center, J.C. Walter Transplant Center, Johns Hopkins Hospital, Center, University of Rochester Medical Center, University of Lahey Clinic, Legacy Good Samaritan Hospital, Loma Linda Utah Medical Center, University of Virginia Transplant Center, Medical Center, Loyola University Medical Center, Lucile University of Washington Medical Center, University of Packard Children's Hospital, Maine Medical Center Transplant Wisconsin, Madison University of California San Diego Medical Program, Massachusetts General Hospital, Medical College of Center, Virginia Transplant Center, Walter Reed National Virginia Hospitals, Medical University of South Carolina, Military MC, Yale New Haven Hospital, Hackensack University Methodist Specialty Hospital San Antonio Methodist Medical Center, Mayo Clinic Phoenix, Montefiore Medical University Transplant-TN, Mount Sinai Medical Center, New Center, New York Presbyterian Hospital/Columbia, UC Davis York Presbyterian-Weill Cornell Transplant, North Shore Medical Center, UMC Southern Nevada University Hospital Transplant, Ohio State University Medical Center, Our Lady of Lourdes Transplant Center, Penn State Milton S Hershey Medical Center, Piedmont Hospital, Pinnacle Health Systems, Rady Children's Hospital San Diego, Riverside Community Hospital, Royal Melbourne Hospital, Rush

## 76 Participating Centers