



# Paired Exchange Results

## Quarterly Report

As of September 30th, 2014

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## Message From the Founder

We are pleased to report that 86 transplants were facilitated this past quarter. Our Q3 results were up 8% over the same quarter last year. These results reflect an improvement in matching success with the critical “cross match to transplant” success rate increasing from 27% to 42%, quarter over quarter. Unexpected cross match failures and late stage donor declines continue to be the primary drivers for swap failures.

This past quarter we saw 3 compatible pairs enroll and move quickly to transplant, improving the compatible patients’ match and facilitating 10 additional transplants. We continue to see great matches including a 100 HLA point (i.e. 0 mismatched antigens) donor kidney that was transplanted into a 100% cPRA patient. Additionally, this past quarter there were 3 patients who were transplanted with 85 HLA point matches (i.e. only 1 mismatched antigen).

Our patient outcomes continue to outstrip the national averages. NKR exceeds the one year national average graft survival rate (NKR 97.9% vs. U.S. 97.0%) as well as the three year national average graft survival rate (NKR 93.3% vs. U.S. 91.7%). These superior graft survival rates provide hope for improved matching and better outcomes for patients with incompatible donors as well as patients with compatible donors who are not traditionally considered paired exchange candidates.

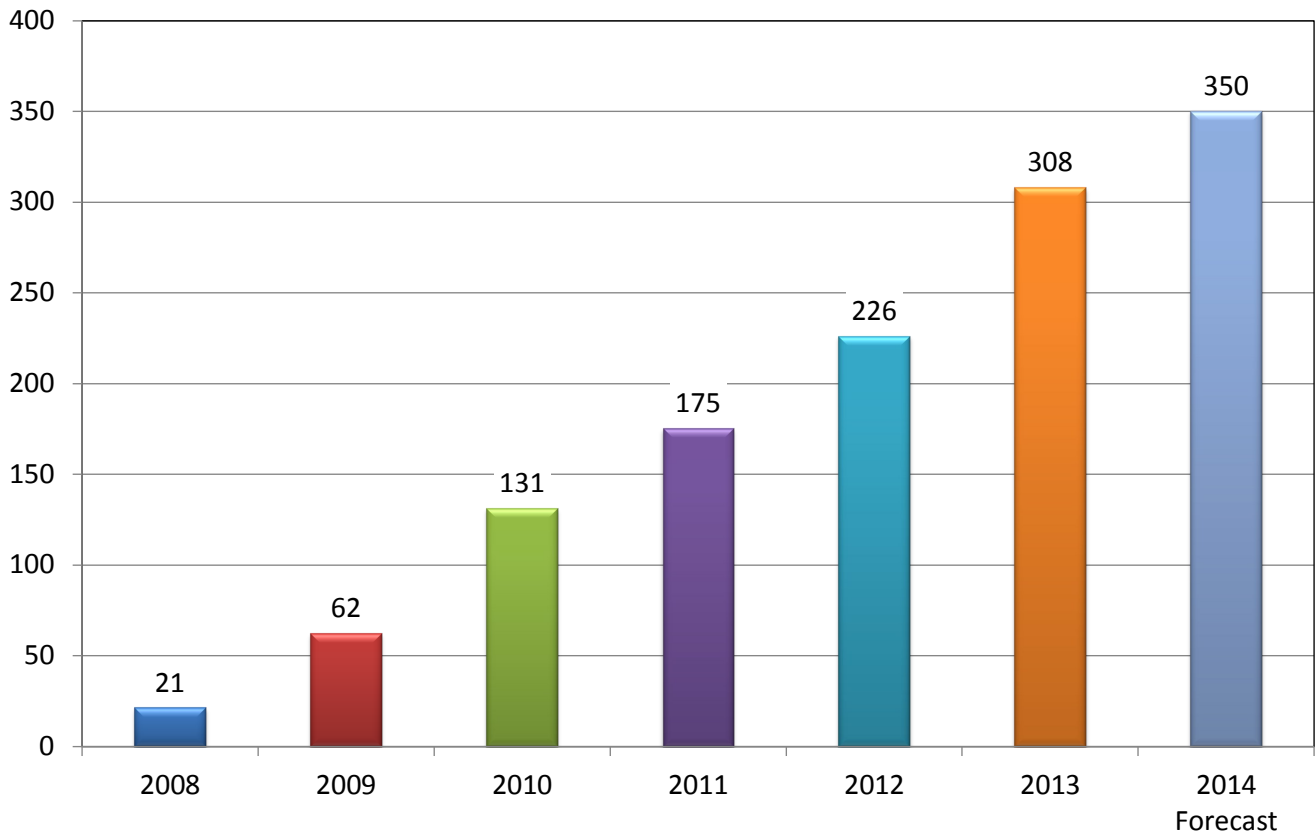
None of this success would be possible without the effort and dedication of the medical professionals at our member centers. Thank you and keep up the great work.

Sincerely,

A handwritten signature in blue ink, appearing to read 'G Hil', with a stylized flourish at the end.

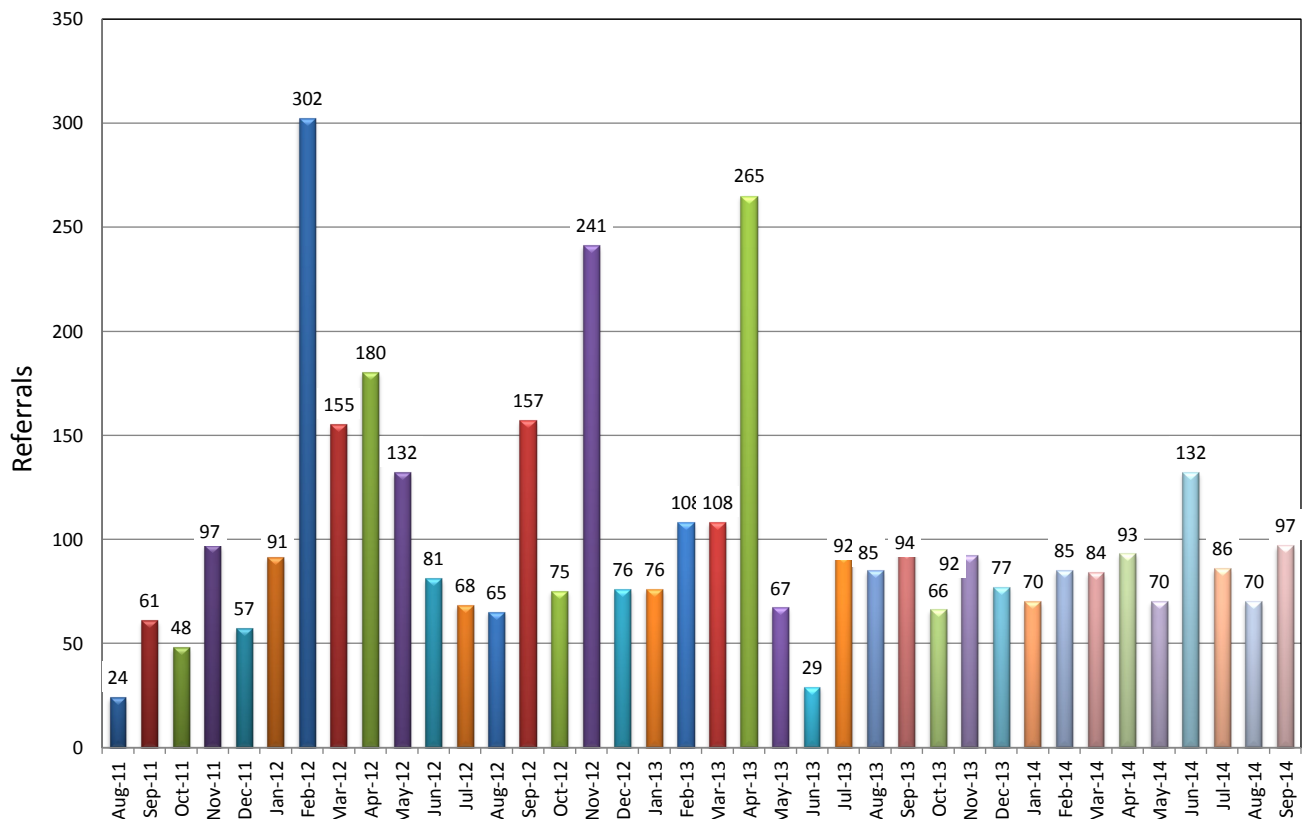
Garet Hil  
Founder & CEO  
National Kidney Registry

## Transplants Facilitated



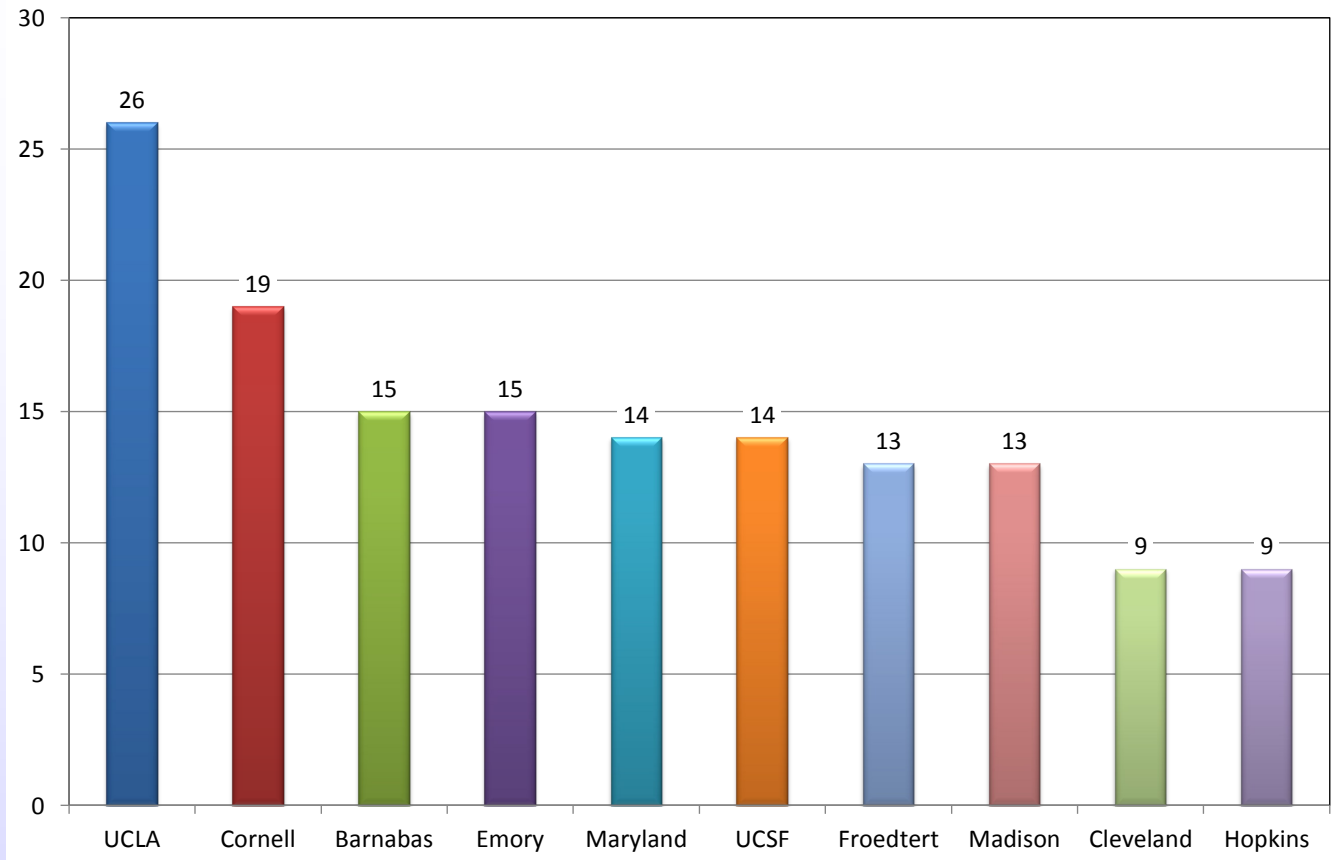
## Patient Referrals

To NKR Member Centers



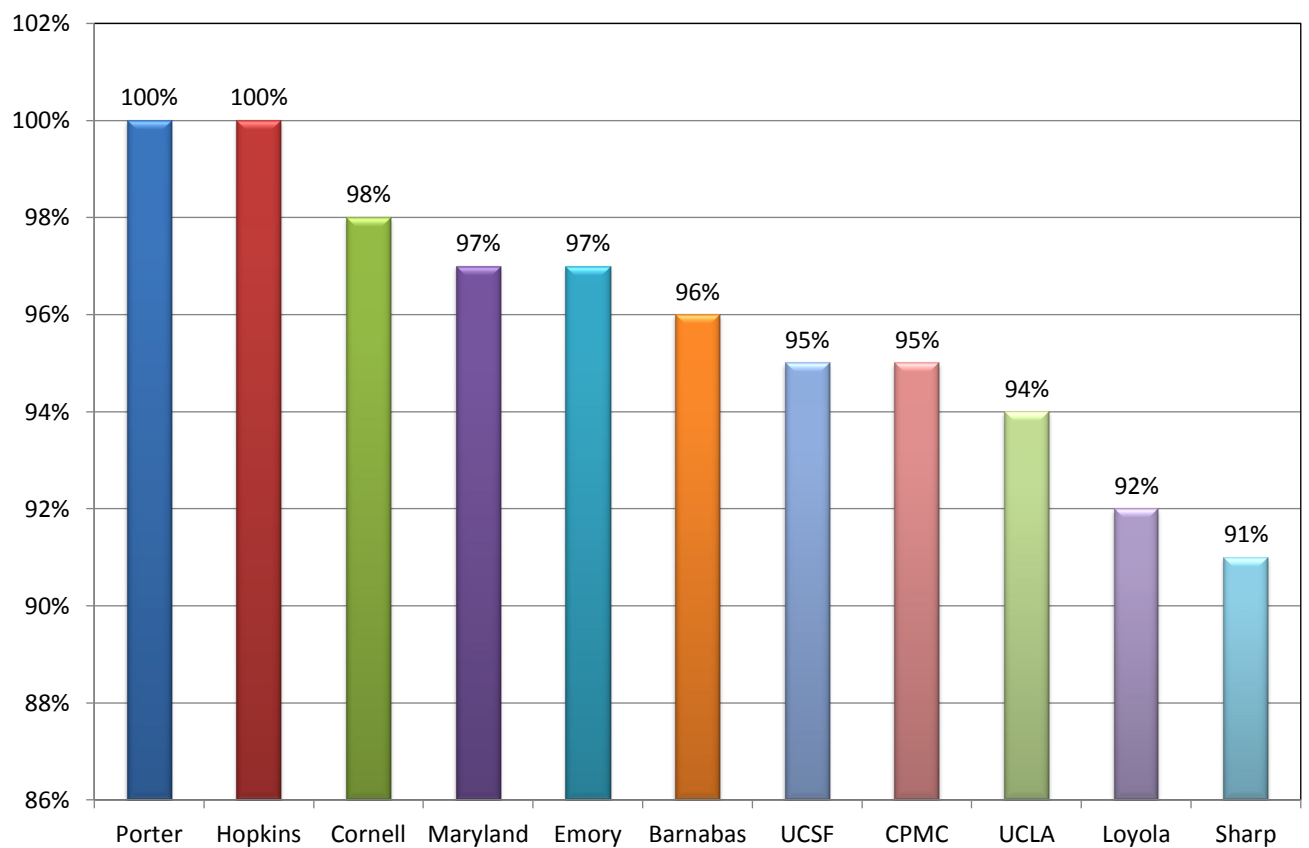
# Top 10 Centers

Transplants in Last 12 Months



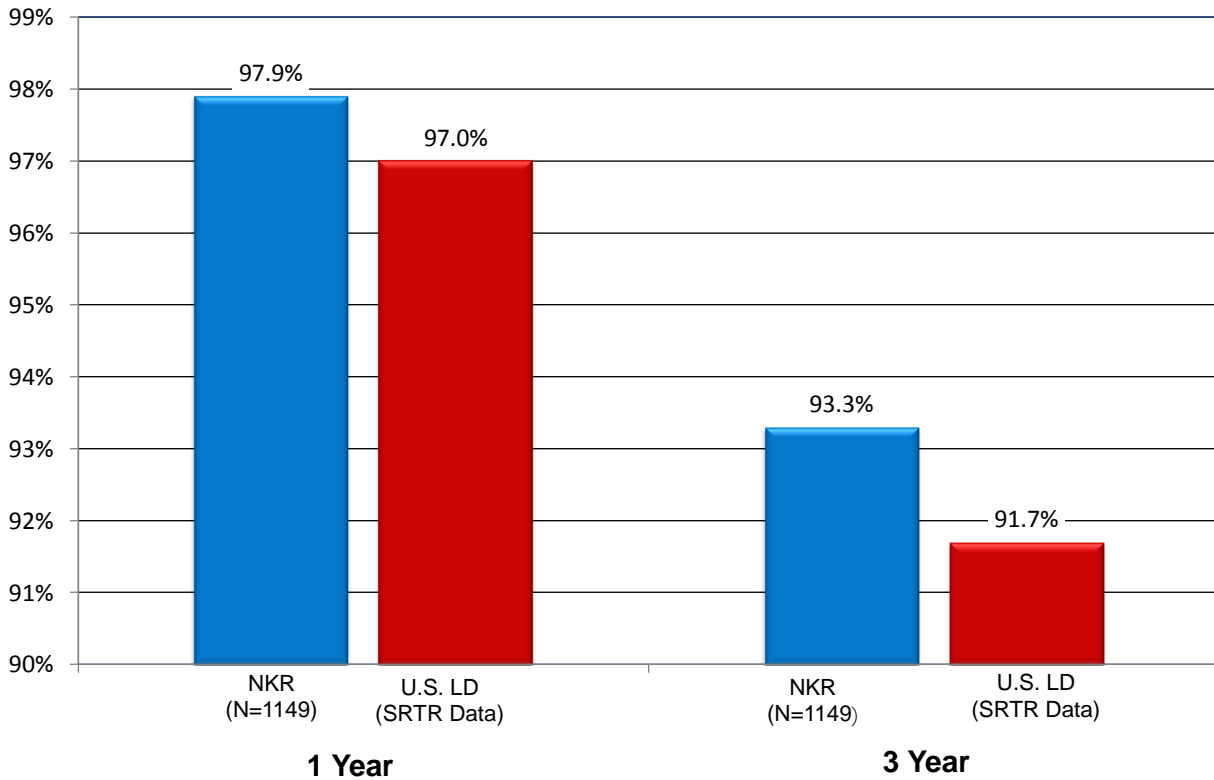
# Success Rate of Top Centers

Patients Matched/Transplanted



## Graft Survival

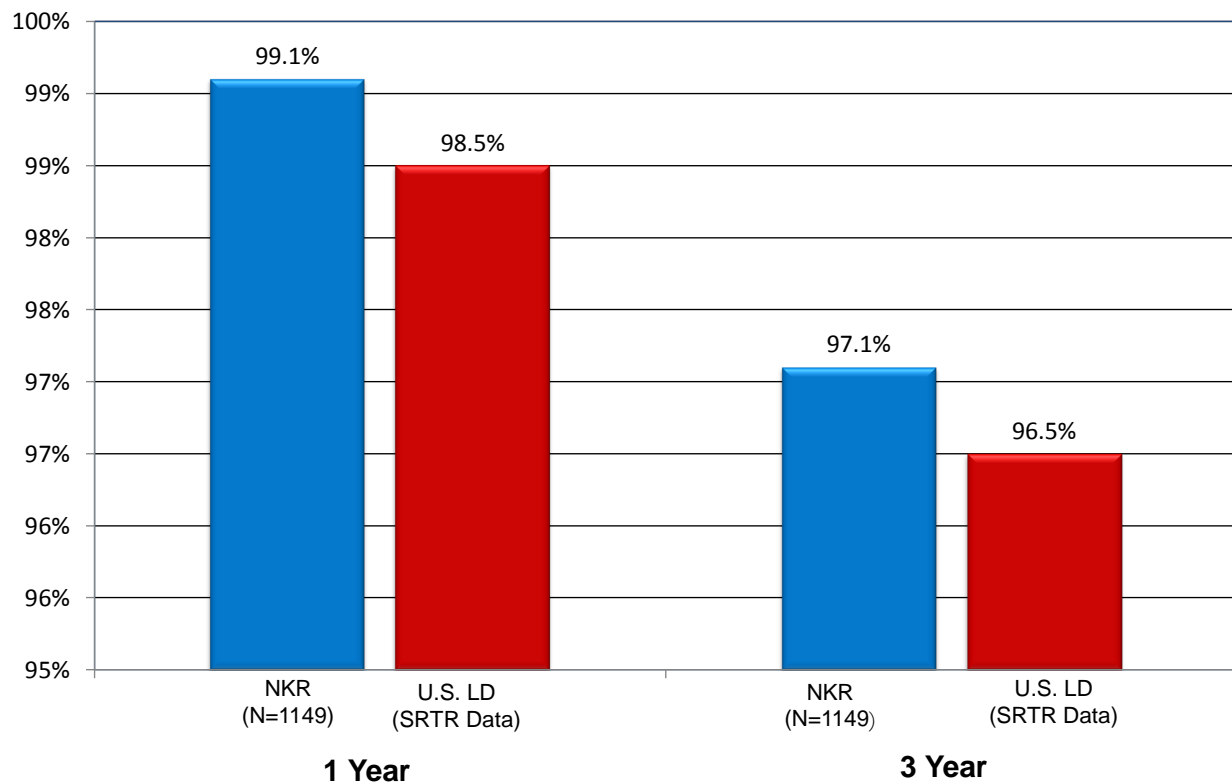
NKR Transplants vs. U.S. Living Donor Transplants  
As of 9/30/2014



\*\*NKR Kaplan-Meier GS calculations provided courtesy of UCLA Departments of Nephrology and Urology.

## Patient Survival

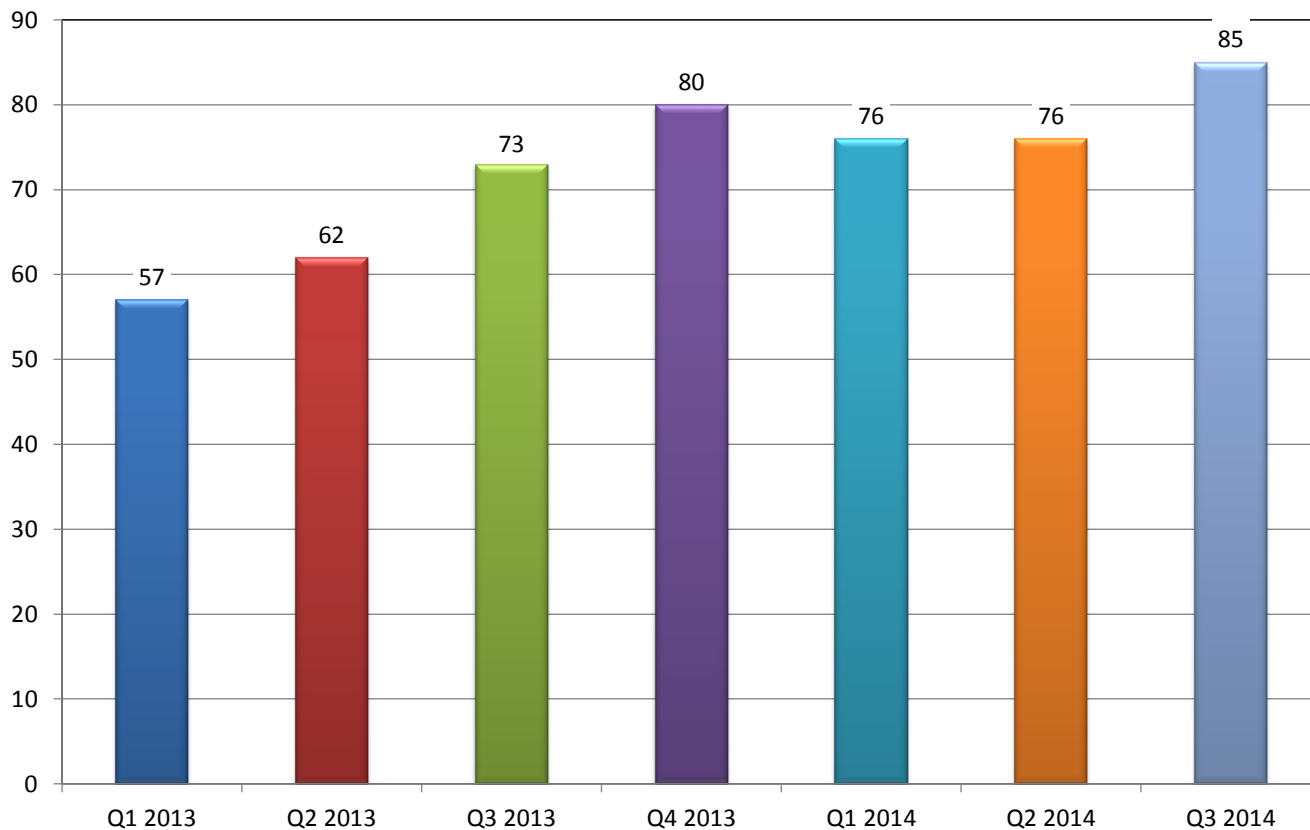
NKR Transplants vs. U.S. Living Donor Transplants  
As of 9/30/2014



\*\*NKR Kaplan-Meier PS calculations provided courtesy of UCLA Departments of Nephrology and Urology.

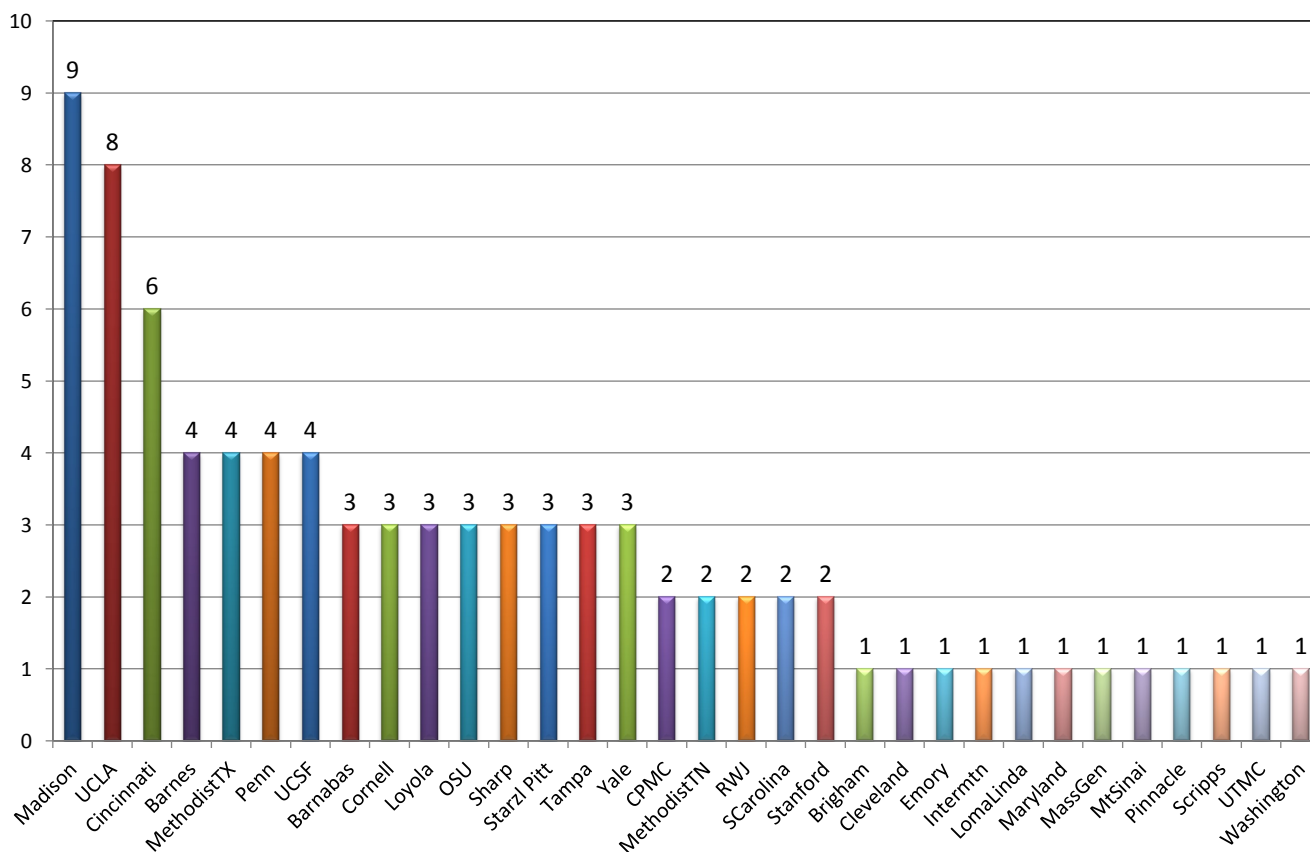
## Patients Waiting > 1 Year

As of 9/30/2014



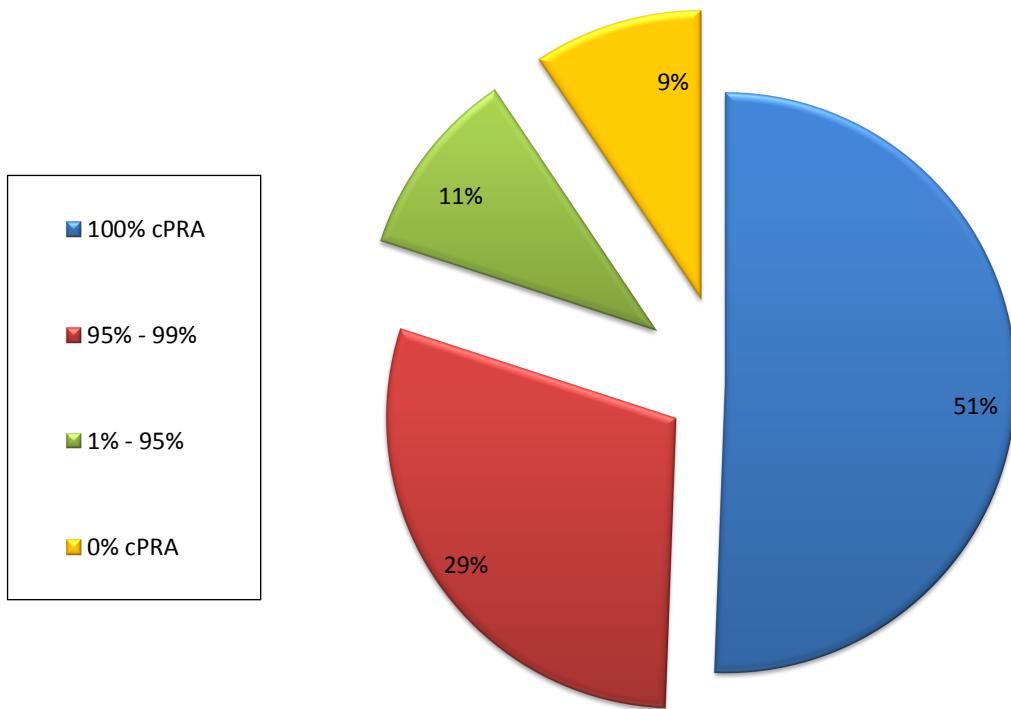
## Patients Waiting > 1 Year by Center

As of 9/30/2014



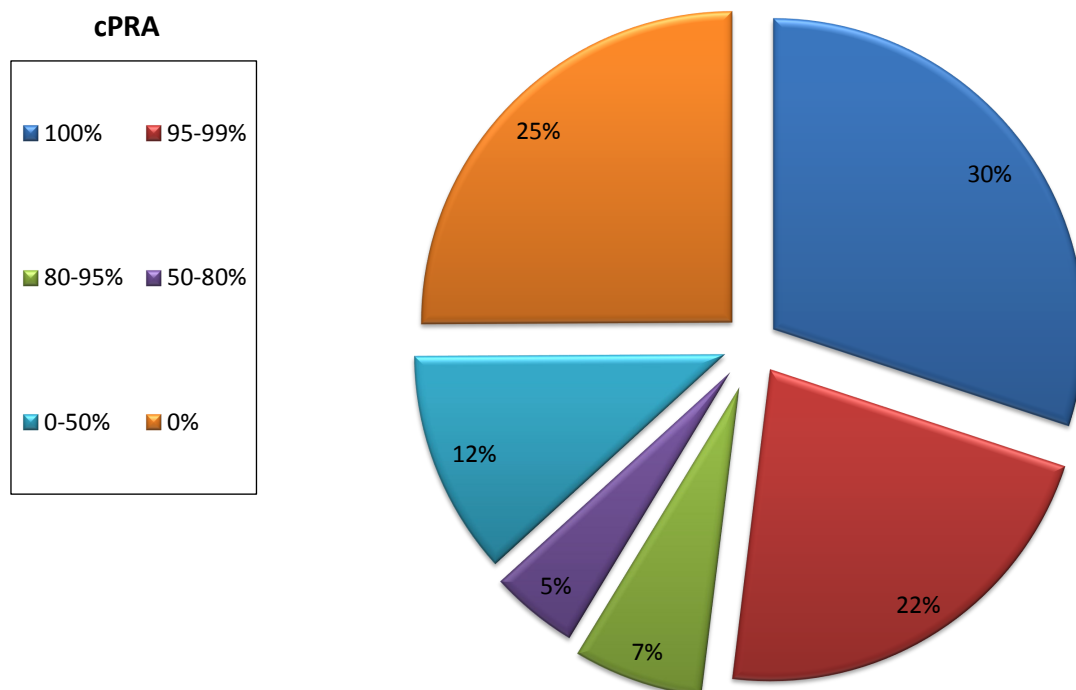
## Patients Waiting > 1 Year by cPRA

As of 9/30/2014



## Pool Composition by cPRA

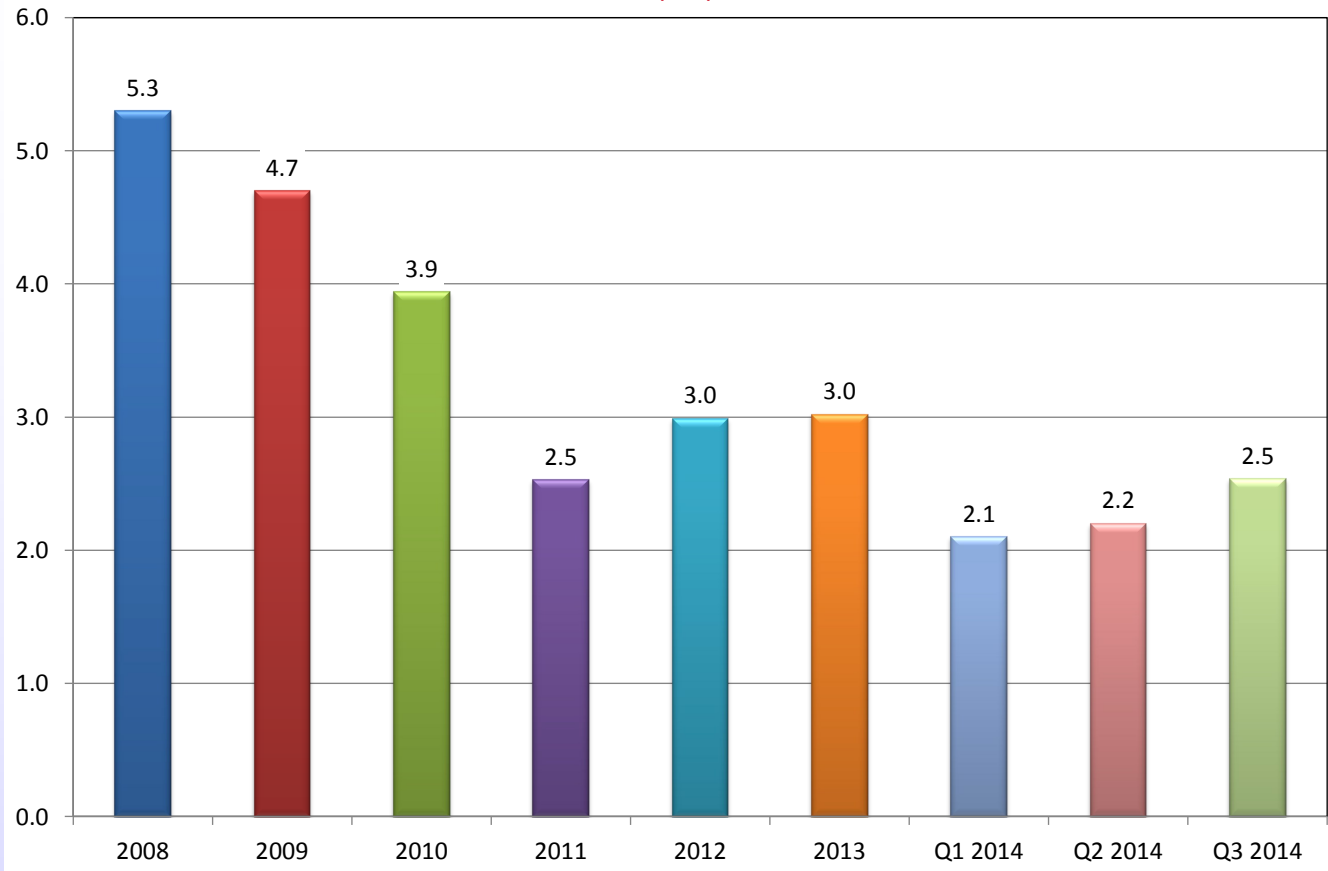
As of 9/30/2014





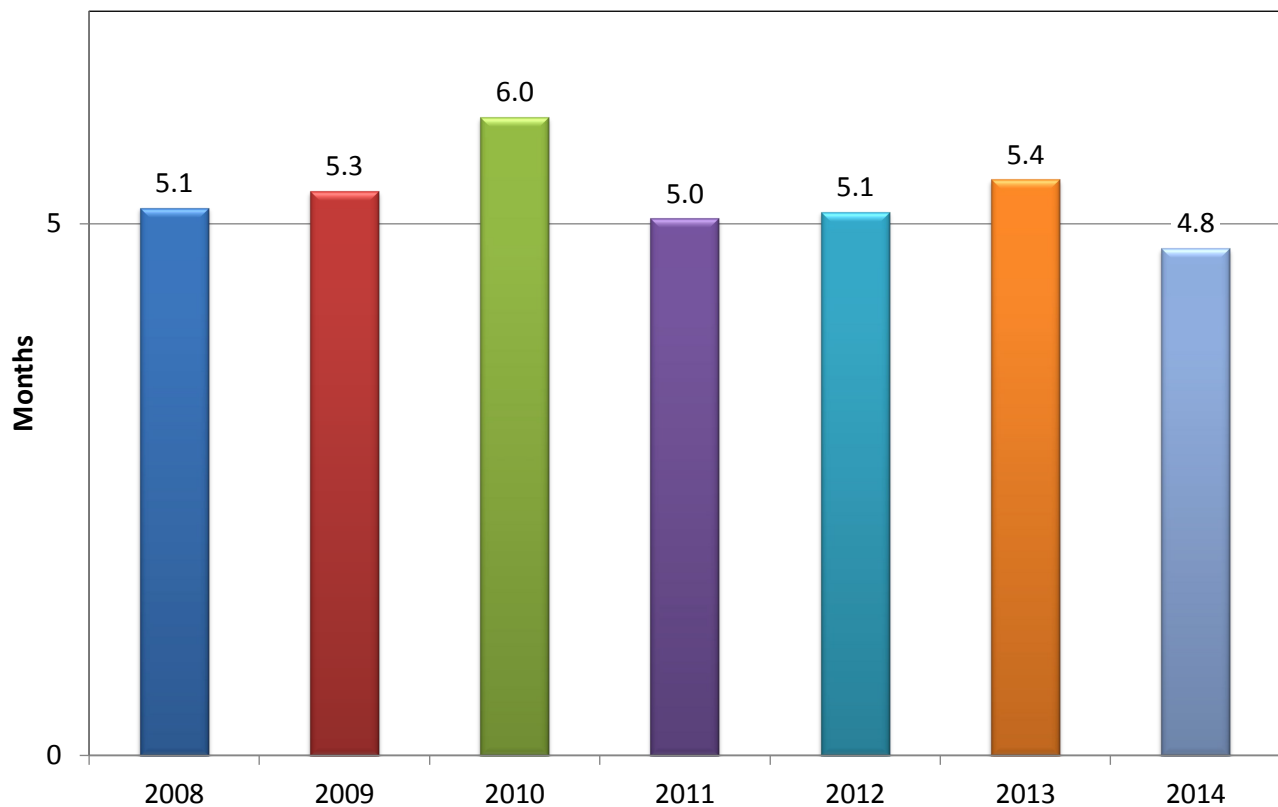
# Transplanted Patient Median Wait Time

As of 9/30/2014

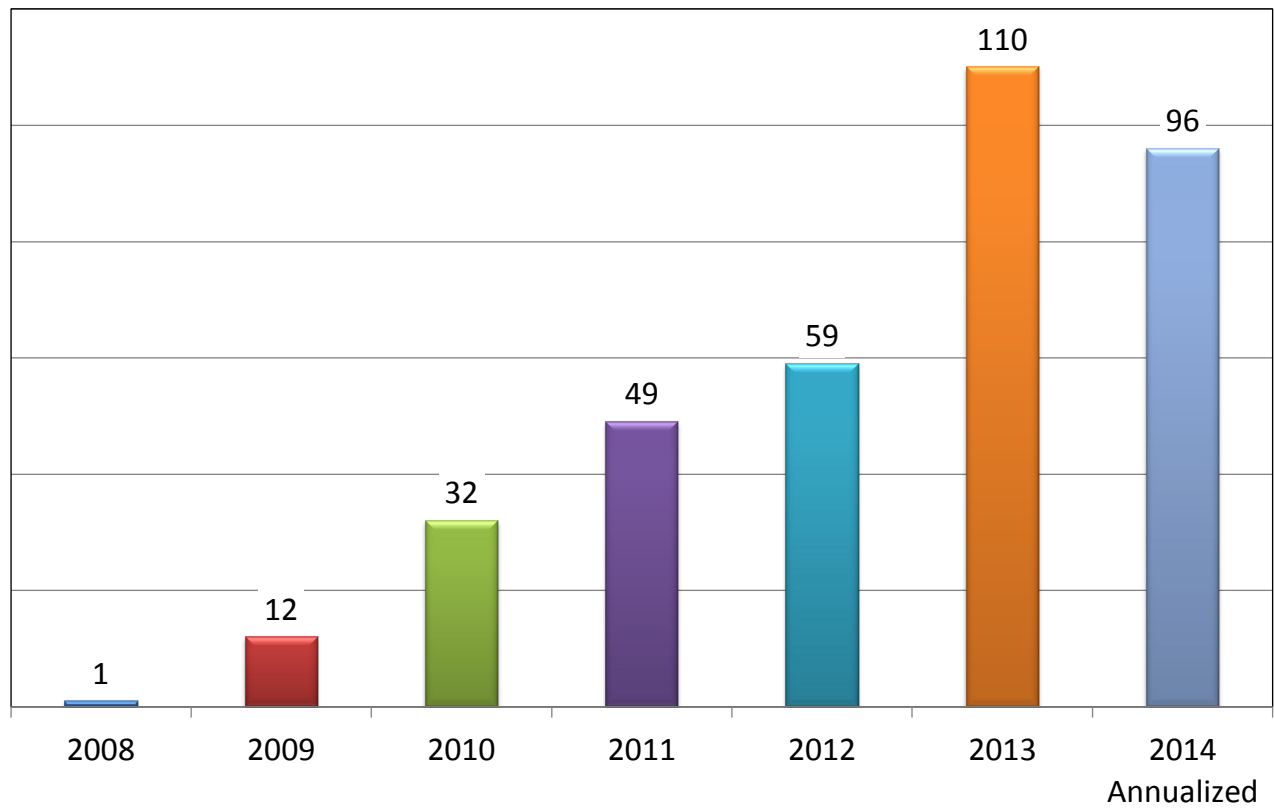


# Transplanted Patient Mean Wait Time

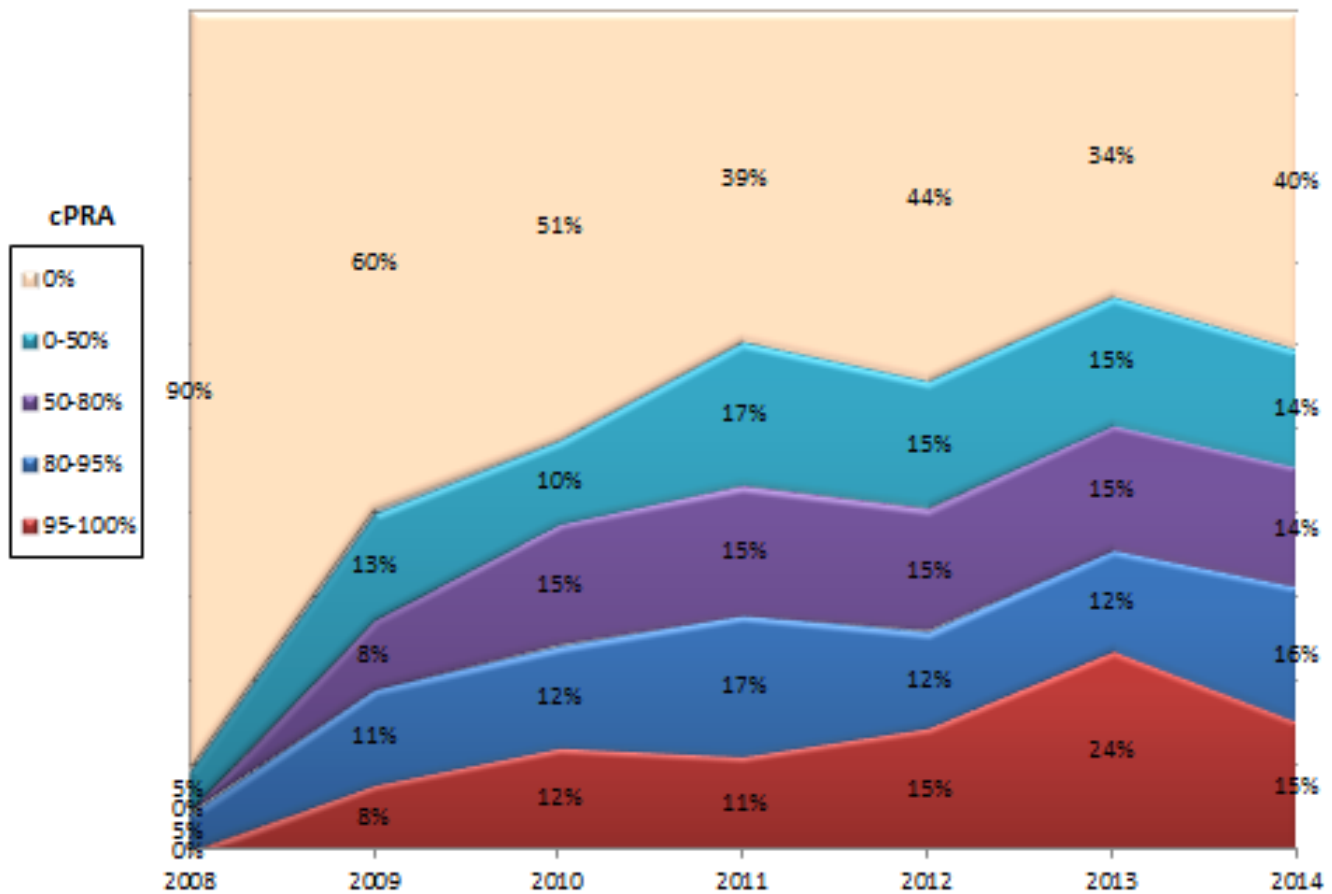
As of 9/30/2014



## Transplanted Patients with cPRA > 80%



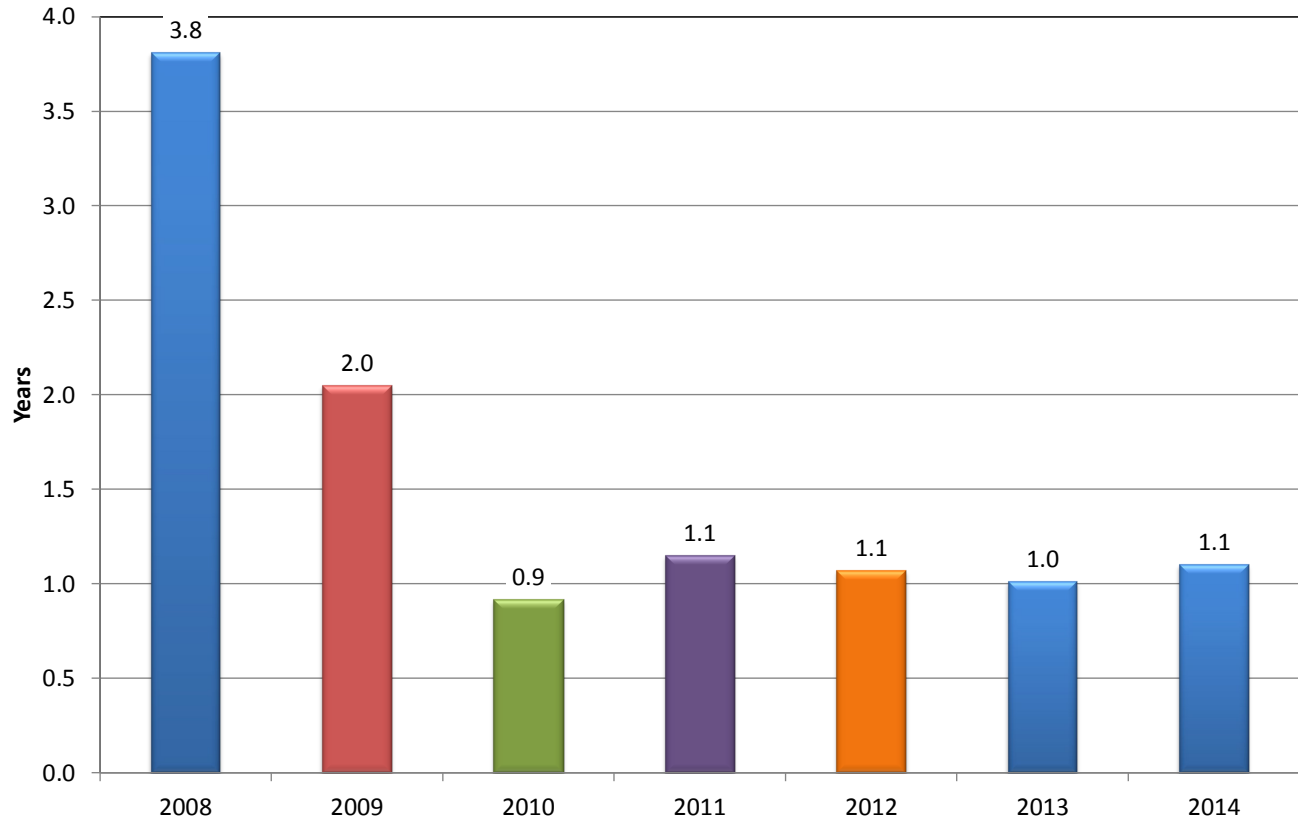
## Transplanted Patients by cPRA



## Enrolled Patient Mean Wait Time

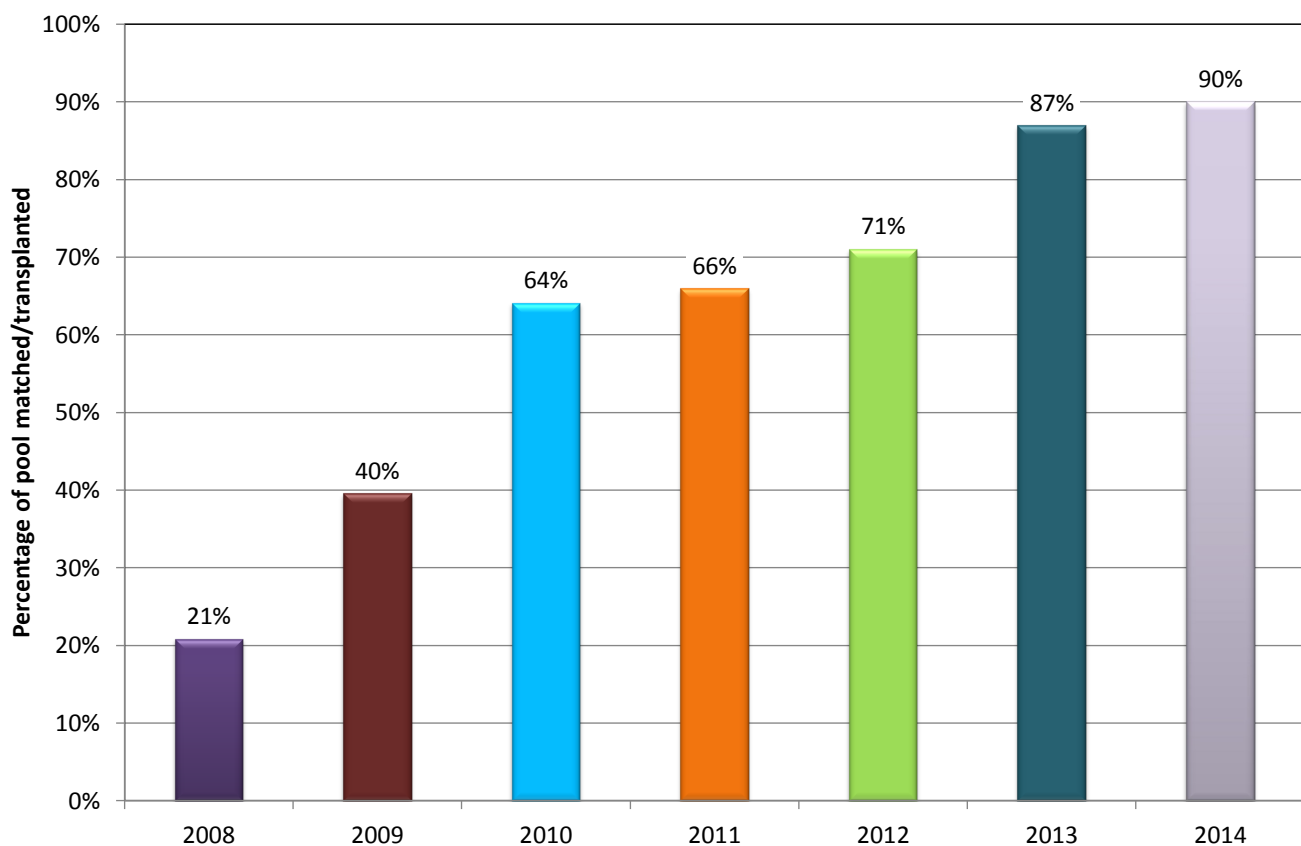
Ending unmatched patient pool/annual transplant run rate

As of 9/30/2014

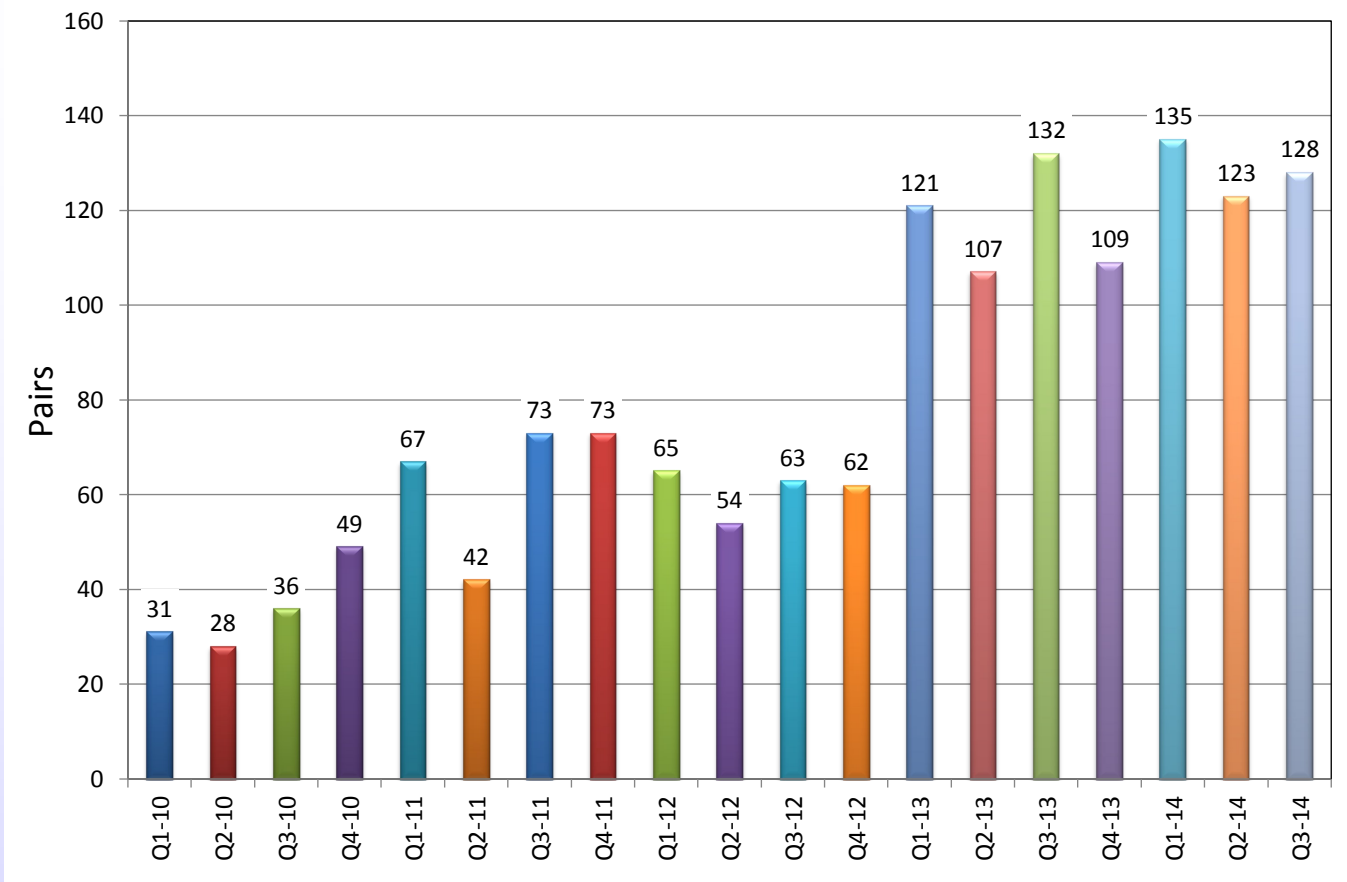


## Percent of Pool Matched/Transplanted

As of 9/30/2014

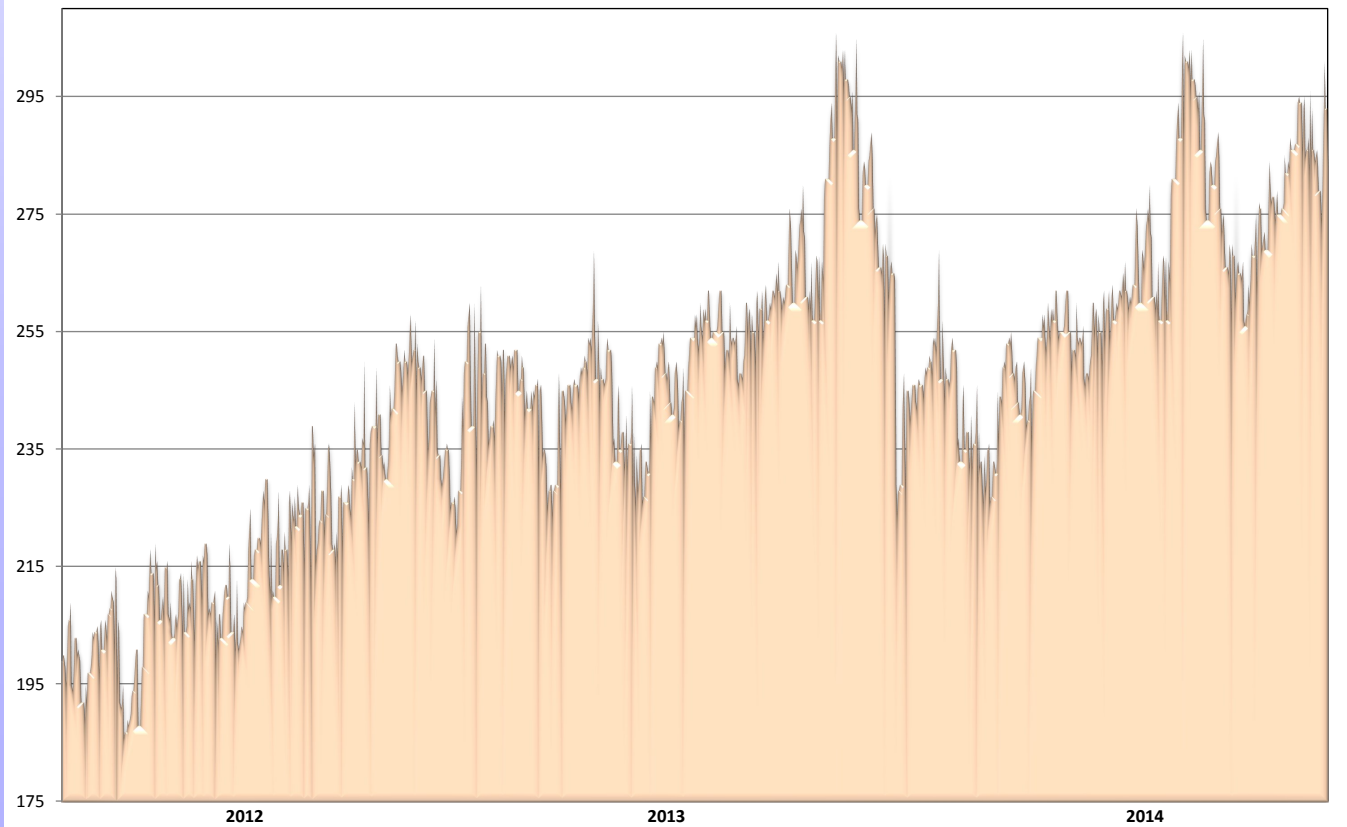


# New Pair Enrollments



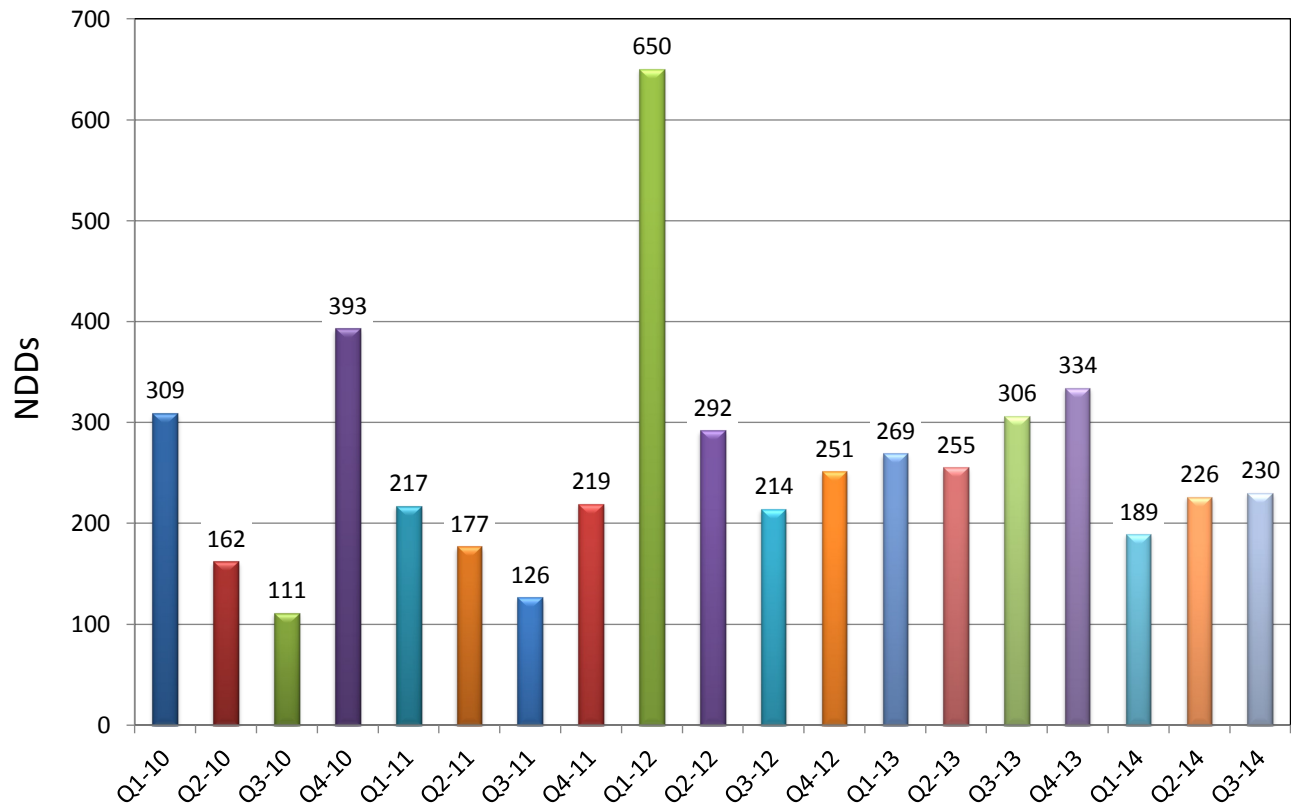
## Pool Size - Unmatched Recipients

1/1/2012 - 9/30/2014



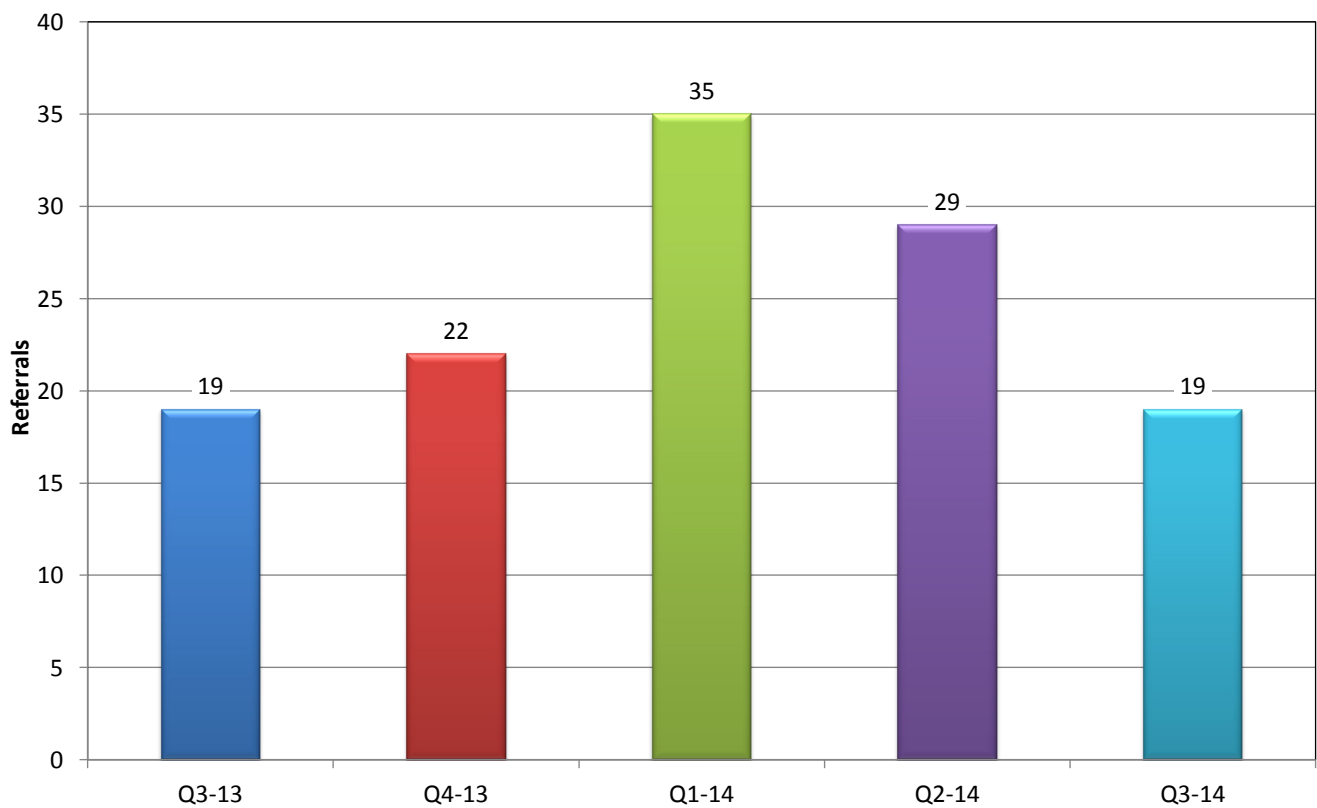
# NDD Registrations

NKR Web Site

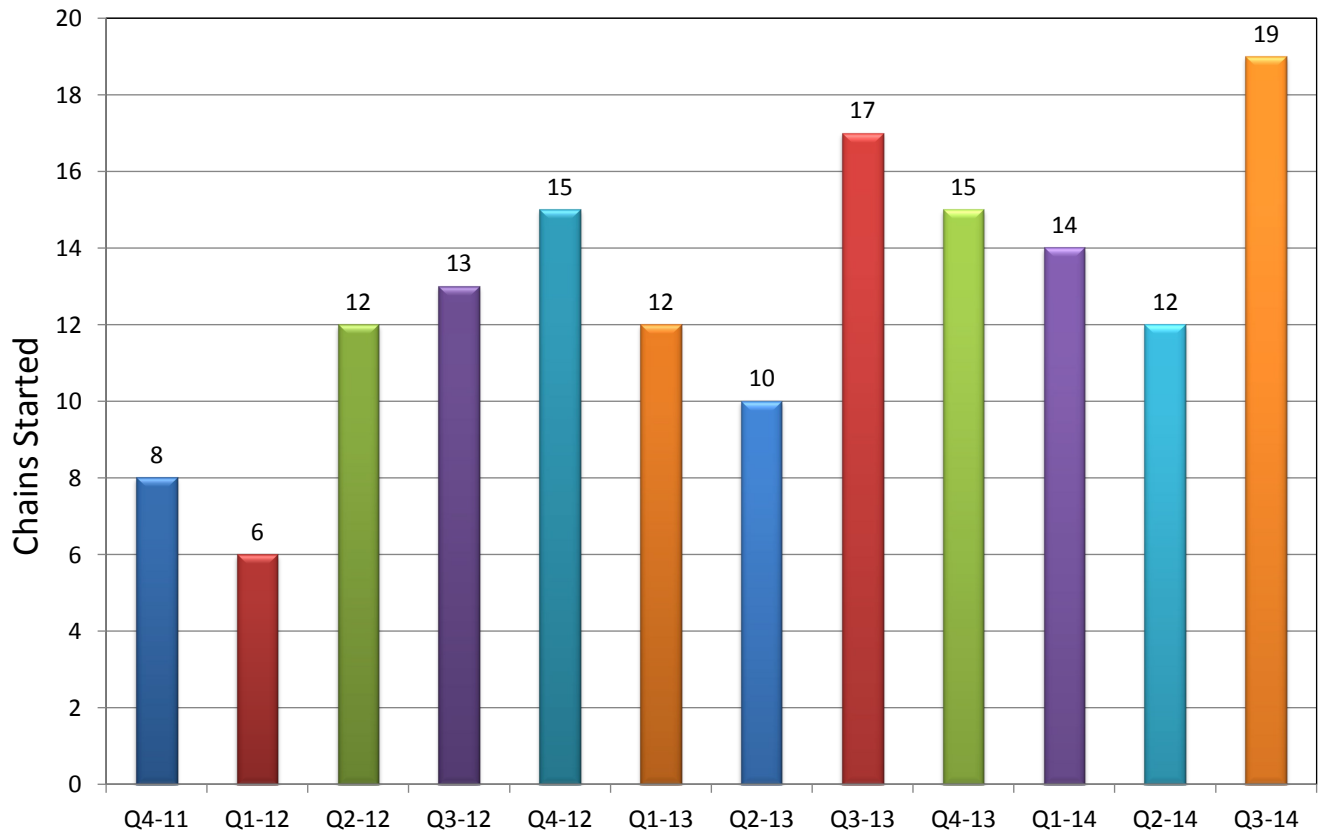


# NDD Referrals

To NKR Member Centers



## Chains Started



## Chain & Loop Length Statistics

Category	Count	Mean Length	Transplants
Ended	205	4.6	944
Broken	16	4.25	68
Active	2	5	10
Chain Total	223	4.58	1022
Loops	57	2.3	131
Total	280	4.12	1153

# Great HLA Matches

> 80 Match Points

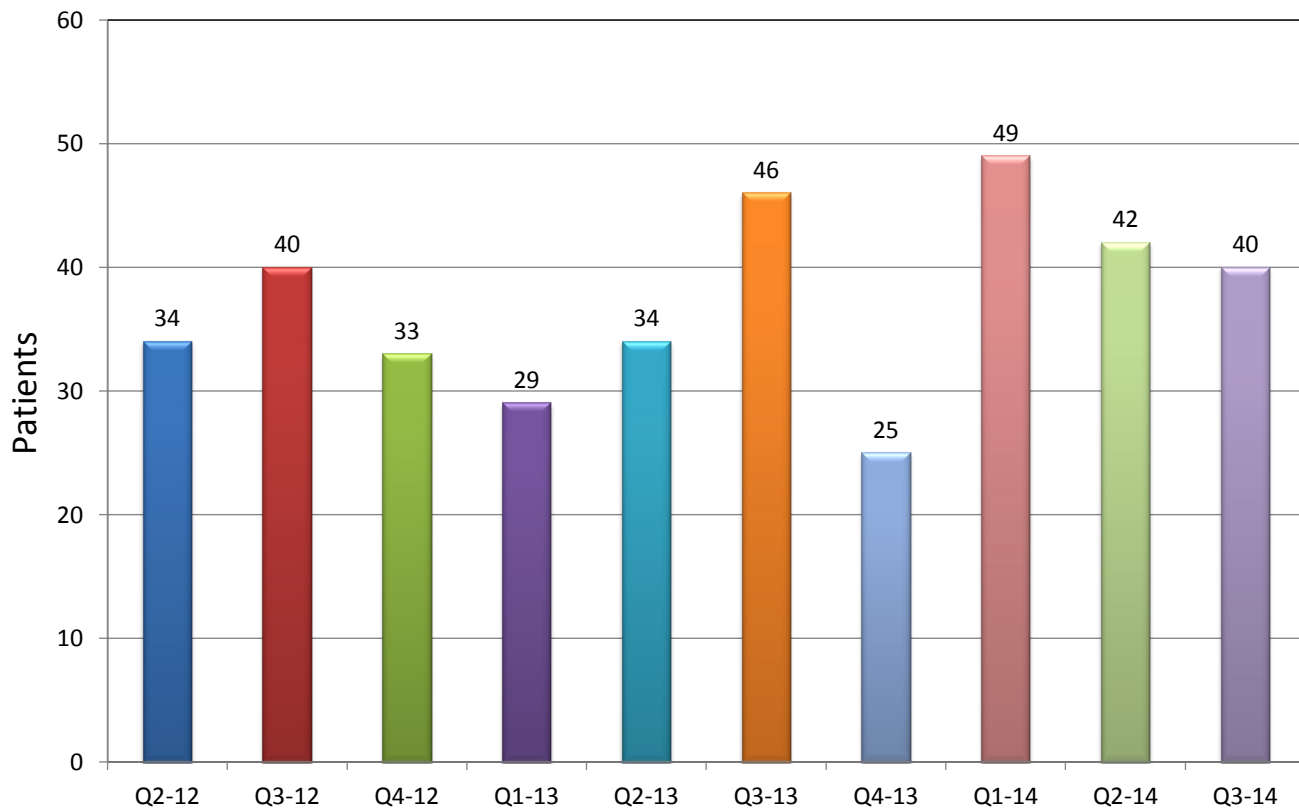
Count	Recipient Center	Swap #	XP Date	Donor ABO	Recipient ABO	NKR cPRA	Wait Time In Months	Donor Age ATOT	Recipient Age ATOT	HLA Points
1	Barnes	105	3/31/2011	A	A	100	7	60	32	100
2	UCSF	58	6/15/2010	A	A	100	6	47	58	100
3	Barnabas	182	10/3/2012	A	A	92	4	51	50	100
4	Loyola	324	8/5/2014	A	A	100	1	37	55	100
5	Madison	674	1/9/2014	O	A	99	5	29	33	100
6	MethodistTX	124	12/7/2011	A	A	99	14	39	68	90
7	VAHD	161	6/12/2012	O	O	100	7	29	62	90
8	CPMC	115	6/22/2011	B	B	33	1	44	62	90
9	UCLA	124	8/31/2011	O	O	100	12	33	22	90
10	Barnabas	266	1/16/2014	O	O	99	23	54	67	90
11	MethodistTN	266	1/29/2014	A	A	89	2	44	66	90
12	Barnabas	187	12/4/2012	A	A	94	2	48	45	90
13	Madison	221	4/30/2013	O	O	99	17	45	52	90
14	Starzl Pitt	109	4/21/2011	A	A	70	2	59	49	90
15	Madison	169	7/25/2012	B	B	97	3	30	62	85
16	Penn	199	12/11/2012	B	B	87	5	47	52	85
17	UCLA	538	5/22/2012	A	O	88	7	28	12	85
18	Allegheny	62	5/6/2010	A	A	0	5	60	70	85
19	Intermtn	118	6/29/2011	O	O	96	16	27	27	85
20	UCLA	659	10/24/2013	O	O	100	25	54	56	85
21	Barnabas	304	7/17/2014	O	O	99	1	53	62	85
22	PorterAH	322	9/3/2014	O	O	27	5	29	24	85
23	Cornell	733	7/8/2014	A	A	0	1	57	67	85
24	SCarolina	266	1/14/2014	O	O	89	3	55	44	85
25	Barnes	266	1/16/2014	A	A	100	13	33	40	85
26	CPMC	19	7/31/2009	A	A	0	5	51	54	80
27	UCLA	258	10/3/2013	A	A	98	1	47	36	80

## Compatible Pairs Transplanted

#	Recipient Center	Recipient Alias	XP Date	Recipient ABO	Paired Donor ABO	Donor ABO	Recipient Age	Paired Donor Age	Donor Age	Age Advantage	Donor HLA Pts	Paired Donor HLA Pts	HLA Points Advantage	Paired Donor Relationship
1	Hopkins	KAAS1021	10/3/2013	A	O	A	19	65	38	27	25	50	-25	Other
2	Cornell	TRAC78	11/20/2013	O	O	O	34	37	59	-22	75	25	50	Spouse
3	Cleveland	RCCF23	12/18/2013	O	O	O	43	41	55	-14	25	0	25	Internet friend
4	Maine	MOOD082970	1/28/2014	A	O	A	43	40	53	-13	75	10	65	Spouse
5	UCLA	R4037	1/29/2014	A	A	A	7	34	37	-3	60	50	10	Mother
6	Dartmouth	RW022168	4/9/2014	O	O	O	45	37	43	-6	35	50	-15	Friend
7	Cornell	BLUMC10	4/23/2014	O	O	O	3	24	43	-19	0	0	0	Cousin
8	Stanford	SUR2220	4/23/2014	O	O	O	29	66	24	42	25	50	-25	Father
9	Madison	HAWKR	4/28/2014	O	O	O	62	57	39	18	45	10	35	Friend
10	Barnabas	GEOKOC	6/11/2014	B	O	B	69	57	41	16	10	40	-30	Significant Other
11	UCSF	RCV275	8/26/2014	O	O	O	28	57	22	35	10	85	-75	Father
12	MassGen	GCAR	8/28/2014	A	O	A	69	51	33	18	60	0	60	Niece through marriage
13	Emory	AL2140339	9/30/2014	A	A	A	18	52	37	15	50	65	-15	Father

## Patients Deleted

As of 9/30/2014



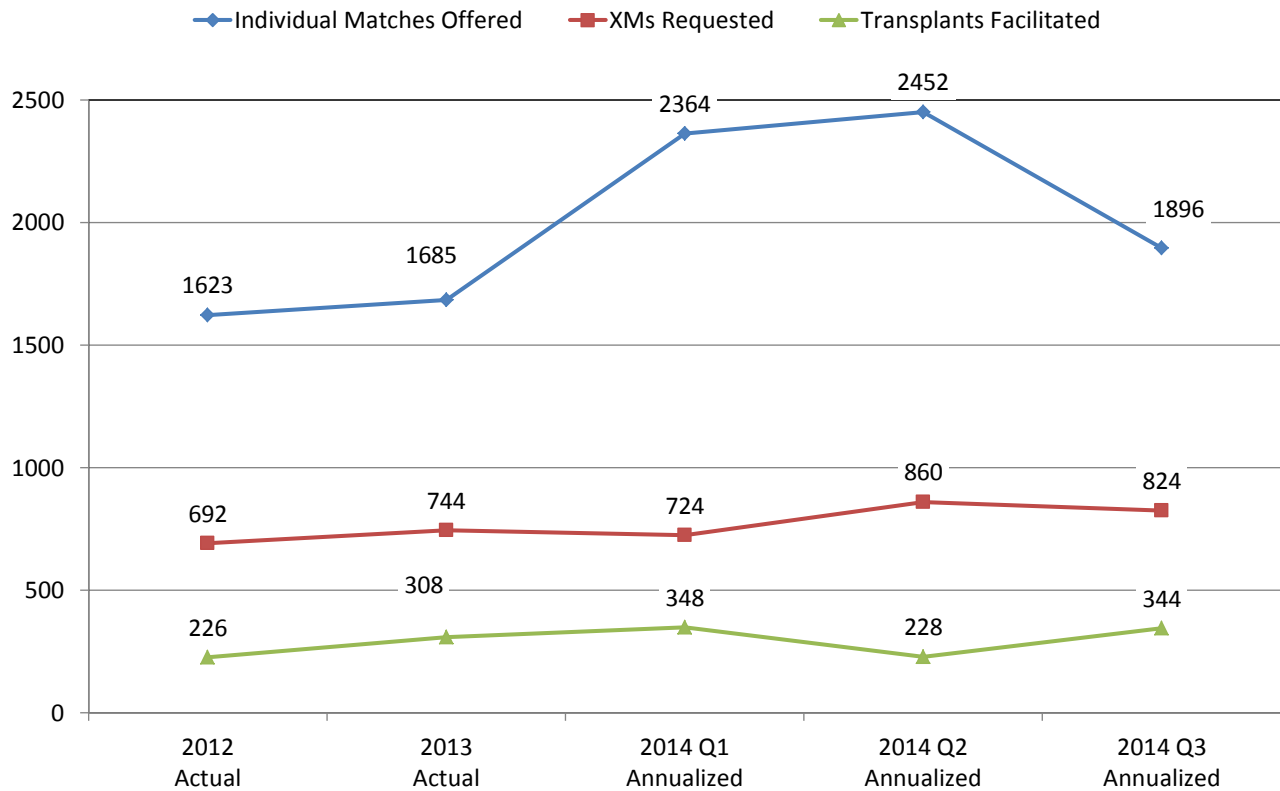
## New System Innovations

Third Quarter 2014

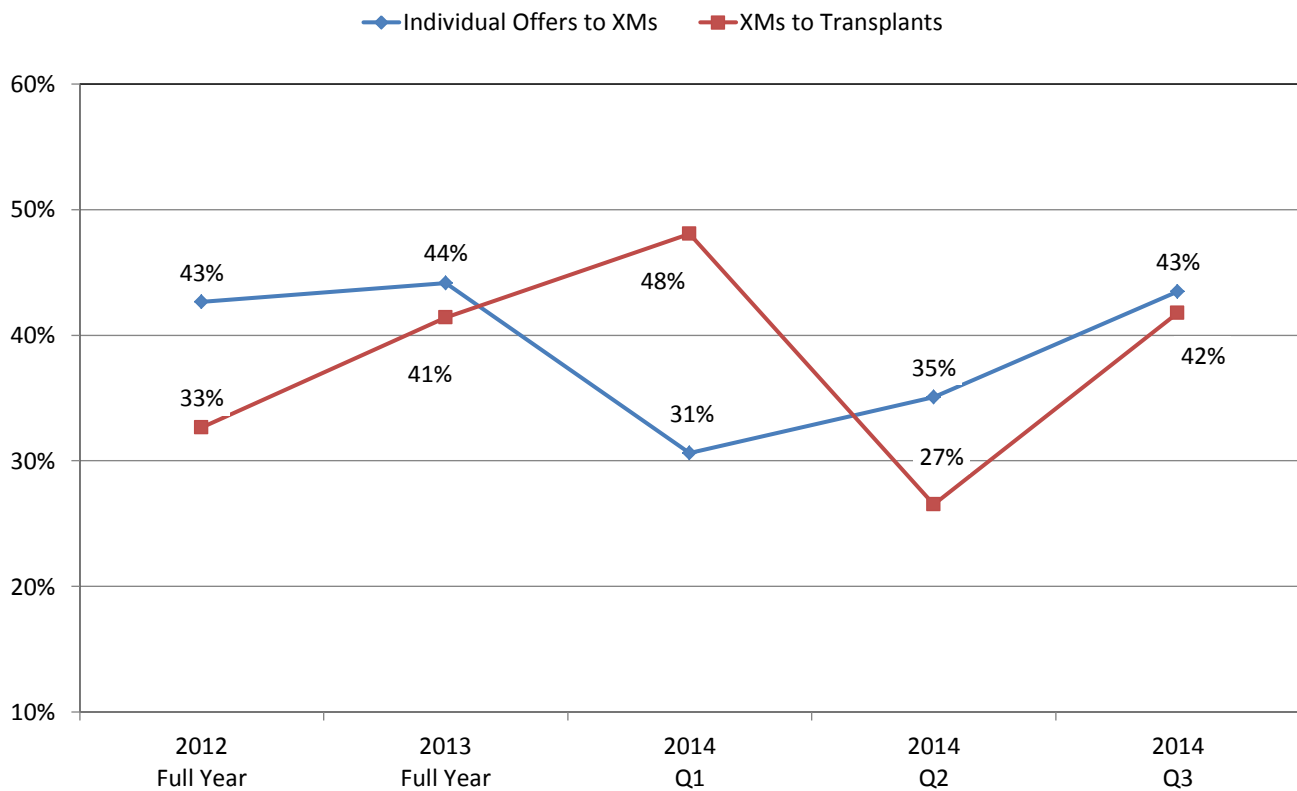
1. *Donor Surveillance Emails – Notifies centers of potential new donors*
2. *Advanced matching tips section on website. Compilation of all matching tips emails sent to the network.*
3. *Donor ABO subtypes added to swap emails. Clarifies A2 or A2B donors matched with eligible O or B recipients.*
4. *Center Liquidity Contribution (CLC) Program*
5. *Improved research support. Enhanced patient outcomes data capture*
6. *Transportation type and costs for each swap is displayed in pending swaps screen*
7. *Cross match history now available on recipient record*
8. *System for utilizing Cryo-preservation of donor blood for cross matching was initiated*



## Process Volume

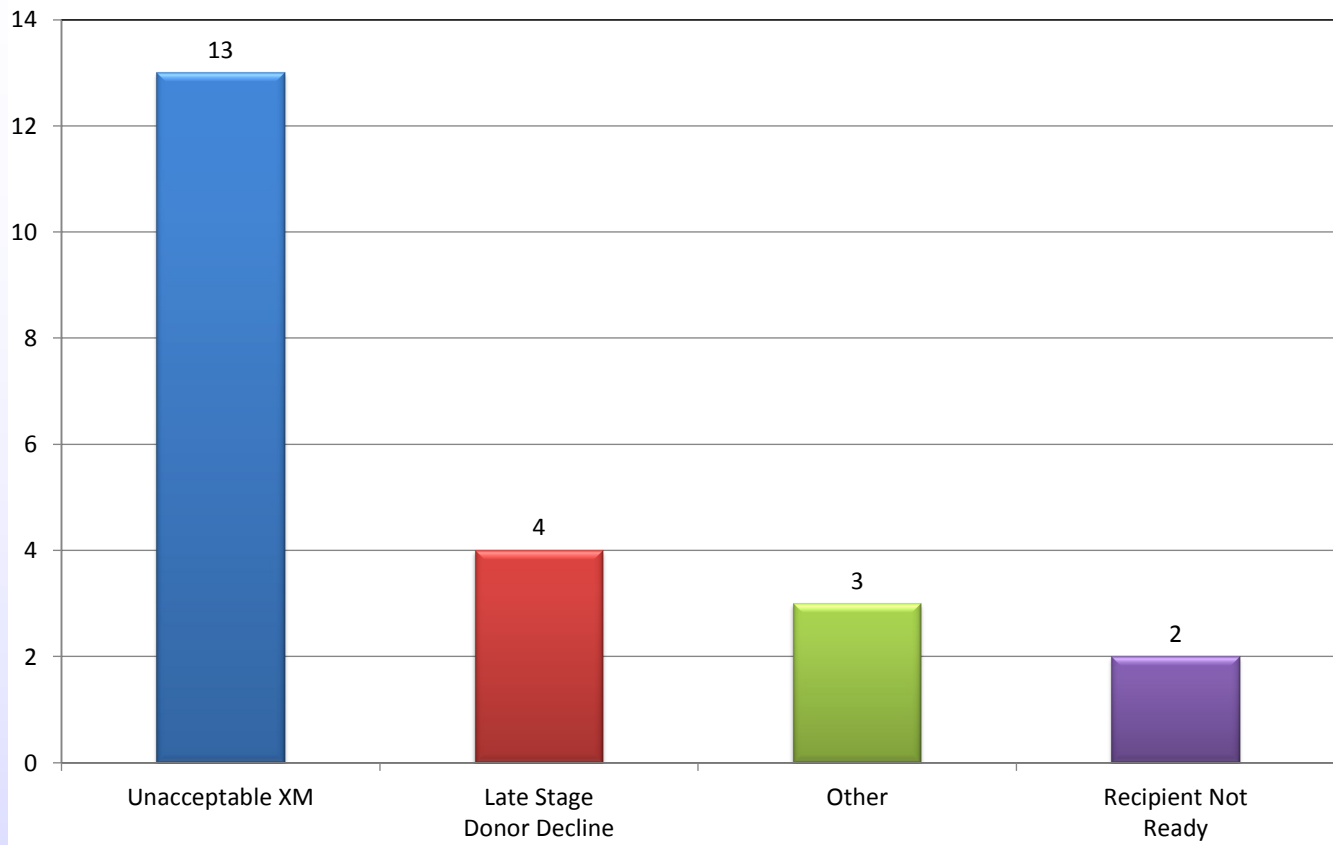


## Match Success Rates



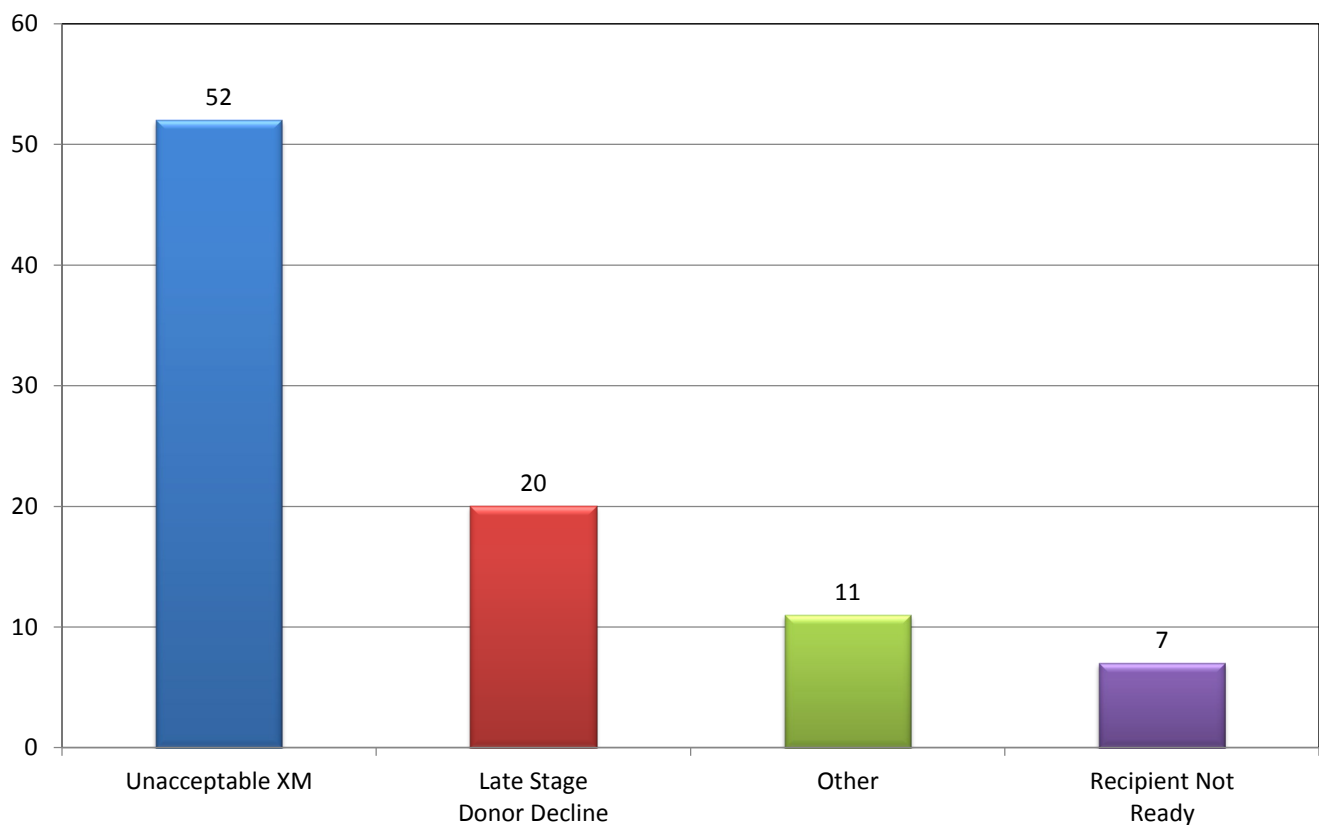
## Swap Failures by Primary Root Cause

Q3 2014



## Transplants Impacted by Primary Root Cause

Q3 2014



# Pair Match Power is the Key to Understanding Wait Time

Pair Match Power (a.k.a. PMP) along with pair blood type combination is the most accurate predictor of paired exchange wait time and should be used by patients and clinicians to develop individual matching strategies for all pairs enrolling in the NKR program

## How is PMP Calculated

5 out of 100 viable exportable donors match this recipient



**Recipient**  
**Match Power**  
 $5/100 = \underline{5\%}$

**Paired Donor**

40 out of 200 recipients match this donor

**Donor**  
**Match Power**  
 $40/200 = \underline{20\%}$

$$\text{PMP} = (5\% \times 20\% \times 10,000) + (5\% \times 1,000) = \underline{150}$$

## NKR Wait Times

Matching Ease	ABO Combination	PMPc
1-Very Easy	Any	> 125
2-Easy	Favorable	31 to 125
3-Hard	Favorable	1 to 30
4-Very Hard	Unfavorable	31 to 125
5-Ext Hard	Unfavorable	1 to 30
6-No Match	Any	0

**ABO Combination:** Patients with a non-O blood type are favorable. Patients with an O blood type who are paired to at least 1 exportable donor with an O blood type are favorable. All others are unfavorable and CHIP patients are excluded from this population.

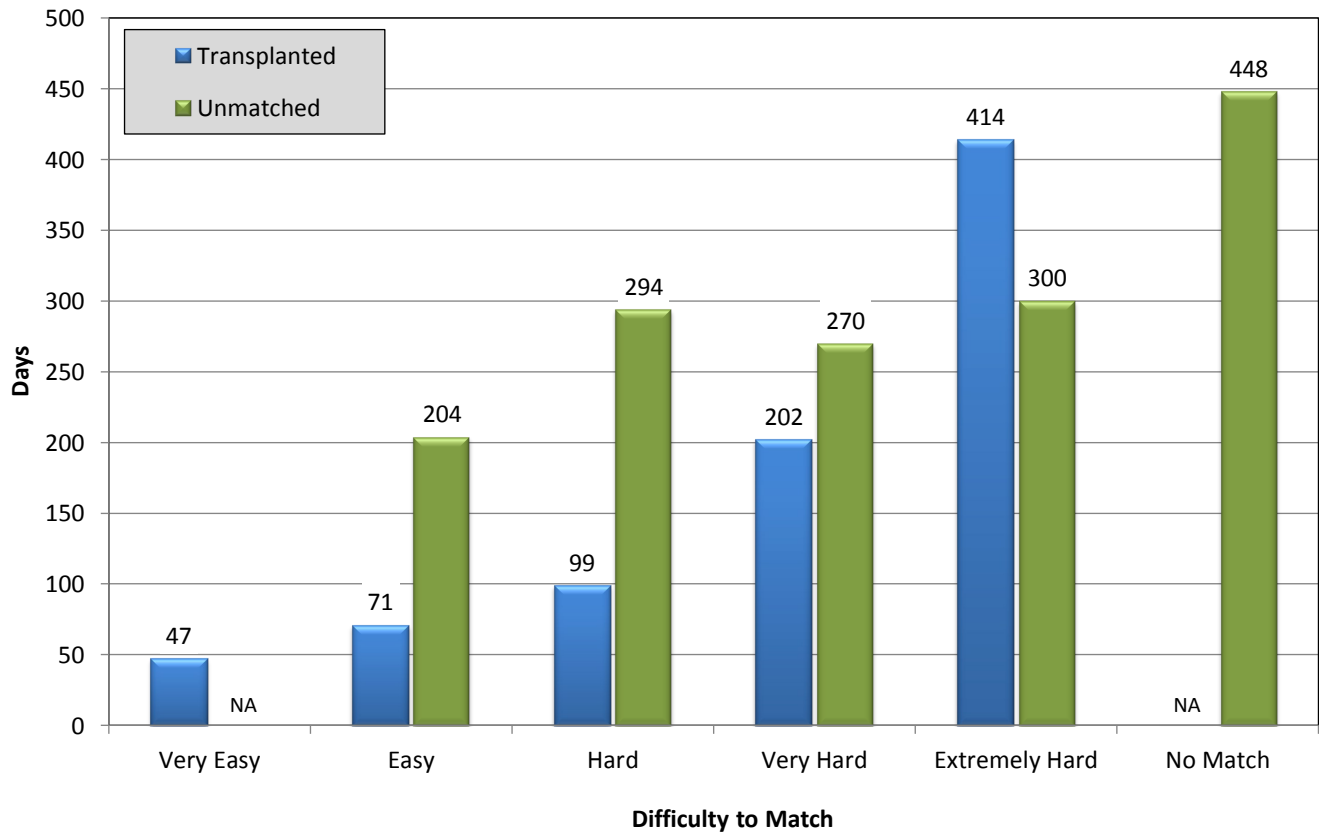
### Paired Transplants Completed Between 1/1/2014 and 9/30/2014

Match Ease	Pairs	%	Mean	Median	Std Dev	Range Min	Range Max
1-Very Easy	69	38	75	47	82	8	439
2-Easy	51	28	114	71	123	6	674
3-Hard	35	19	174	99	163	23	705
4-Very Hard	24	13	243	202	173	26	623
5-Ext Hard	5	3	447	414	263	42	770
6-No Match	0	---	---	---	---	---	---
<b>7-ALL</b>	<b>184</b>	<b>100</b>	<b>137</b>	<b>70</b>	<b>153</b>	<b>6</b>	<b>770</b>

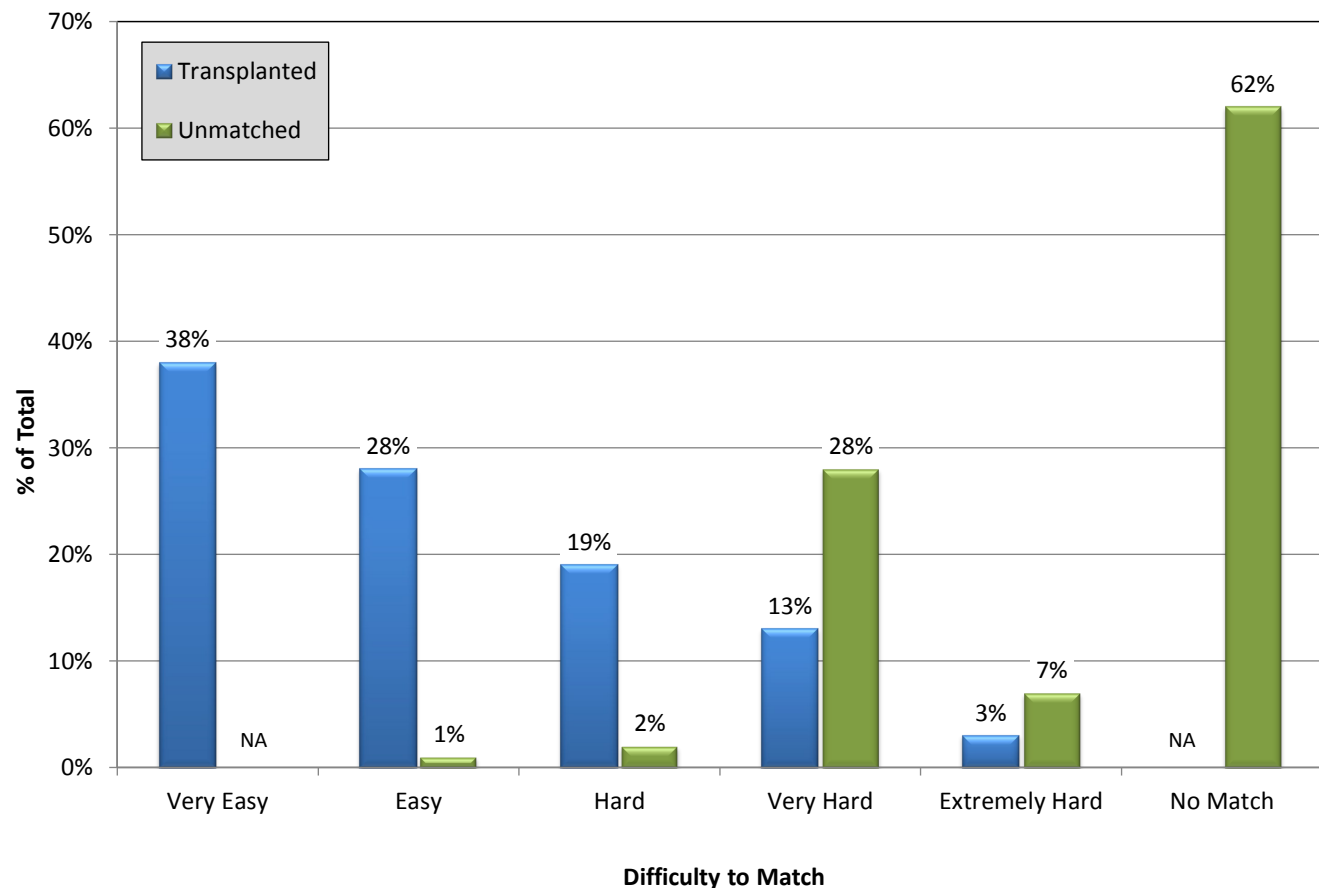
### Paired Patients Waiting 6 Months or Greater as of 10/3/2014

Match Ease	Pairs	%	Mean	Median	Std Dev	Range Min	Range Max
1-Very Easy	0	---	---	---	---	---	---
2-Easy	1	1	204	204	n/a	204	204
3-Hard	3	2	312	294	46	267	376
4-Very Hard	42	28	316	270	103	185	544
5-Ext Hard	10	7	366	300	165	199	712
6-No Match	93	62	575	448	321	204	1700
<b>7-ALL</b>	<b>149</b>	<b>100</b>	<b>481</b>	<b>386</b>	<b>290</b>	<b>185</b>	<b>1700</b>

## Median Wait Time Analysis



## Population Wait Time Analysis



## Broken Chains by Year - Detail

<i><b>Year</b></i>	<i><b># Bridge Donors</b></i>	<i><b># Broken Chains</b></i>	<i><b>% Broken Per Year</b></i>
2008	9	3	33%
2009	29	2	7%
2010	61	2	3%
2011	75	0	0%
2012	54	4	7%
2013	37	3	8%
2014	33	3	9%
<b>Total Bridge Donors</b>	<b>265</b>	<b>17</b>	

## Summary of Broken Chains

<i><b>#</b></i>	<i><b>Reason Given</b></i>	<i><b>Center</b></i>	<i><b>Date</b></i>
1	Job Issues/ long wait time/ many failed XMs	Cornell	5/1/2008
2	No Reason	Cornell	8/21/2008
3	No Reason	CPMC	11/19/2008
4	Real Time Swap Failure – Donor Reneged	UTMC	6/9/2009
5	Medical	UCSF	11/10/2009
6	Medical	UCLA	3/16/2010
7	Second nuclear GFR test < 80 (79 down from 82)	AGH	9/16/2010
8	No Reason	MethodistTX	2/3/2012
9	No Reason	UCSF	4/4/2012
10	Medical	UCLA	6/28/2012
11	Medical/Surgical	Washington	11/5/2012
12	Real Time Swap Failure – Aborted donor surgery	CPMC	6/27/2013
13	Real Time Swap Failure – Kidney declined by recipient surgeon	RWJ/UPenn	7/23/2013
14	Real Time Swap Failure – Recipient Medical Issue	Porter	10/16/13
15	Real Time Swap Failure – Kidney Declined by Recipient Surgeon	Porter/Jefferson	1/9/14
16	Medical	UCLA	3/4/14
17	Medical	Hopkins	7/15/14

# NKR Program Statistics

As of 9/30/2014

		2008	2009	2010	2011	2012	2013	2014
1	Transplants Facilitated	21	62	131	175	226	308	230
2	Paired Transplants Facilitated	21	39	91	131	164	252	189
3	Chip Transplants Facilitated	0	23	40	44	62	56	41
4	Ending Unmatched Patient Pool	80	127	120	201	241	255	283
5	Cumulative Transplants	21	83	214	389	615	923	1153
6	Cumulative Paired Transplants	21	60	150	280	526	777	964
7	Cumulative Chip Transplants	0	23	64	109	89	146	189
8	Cumulative Paired Patient Pool	101	210	334	590	805	1062	1284
9	Percent of Pool Transplanted (Paired Recipients)	21%	40%	64%	66%	71%	87%	90%
10	Enrolled Patient Mean Wait Time (years)	3.8	2.0	0.9	1.1	1.1	1.0	1.1
11	Transplanted Patient Mean Wait Time (months)	5.1	5.3	6.0	5.0	5.1	5.4	4.8
12	Transplanted Patient Median Wait Time (months)	5.3	5.3	3.9	2.5	3.0	3.0	2.1
13	Mean cPRA of Transplanted Patients	4.1%	25.9%	34.5%	40.3%	44.1%	54.0%	48.5%
14	Number of Transplants Completed by cPRA							
15	100%	0	1	4	10	4	5	2
16	95-100%	0	4	12	10	29	68	33
17	80-95%	1	7	16	29	26	37	37
18	50-80%	0	5	19	27	33	46	33
19	0-50%	1	8	13	30	34	47	32
20	0%	19	37	67	69	100	105	93
21	Sub-total	21	62	131	175	226	308	230
22	Percent of Transplants Completed by cPRA							
23	100%	0%	2%	3%	6%	2%	2%	1%
24	95-100%	0%	6%	9%	6%	13%	22%	14%
25	80-95%	5%	11%	12%	17%	12%	12%	16%
26	50-80%	0%	8%	15%	15%	15%	15%	14%
27	0-50%	5%	13%	10%	17%	15%	15%	14%
28	0%	90%	60%	51%	39%	44%	34%	40%
29	Sub-total	100%	100%	100%	100%	100%	100%	100%
30	Number of Transplanted Patients with cPRA >80%	1	12	32	49	59	110	72
31	Percent of Transplanted Patients with cPRA >80%	5%	19%	24%	28%	26%	36%	31%

# NKR Program Statistics

As of 9/30/2014

		2008	2009	2010	2011	2012	2013	2014
32	Number of Unmatched Patients by cPRA (9/30/2014)							
33	100%				79	73	83	85
34	95-99%				73	73	61	62
35	80-95%				15	15	24	19
36	50-80%				14	11	14	13
37	0-50%				14	10	22	33
38	0%				50	59	51	71
39	Sub-total				245	241	255	283
40	Percent of Unmatched Patients by cPRA (9/30/2014)							
41	100%				32%	30%	33%	30%
42	95-99%				30%	30%	24%	22%
43	80-95%				6%	6%	9%	7%
44	50-80%				6%	5%	5%	5%
45	0-50%				6%	4%	9%	12%
46	0%				20%	24%	20%	25%
47	Sub-total				100%	100%	100%	100%
48	Number of Transplants Completed by Wait Time (9/30/2014)							
49	< 6 months	21	42	74	106	180	232	182
50	6-12 months	0	10	14	19	24	44	23
51	1-2 years	0	4	15	14	20	25	21
52	2+ years	0	0	2	2	2	7	4
53	Sub-total	21	56	105	141	226	308	230
54	Percent of Transplants Completed by Wait Time (9/30/2014)							
55	< 6 months	100%	75.0%	70.5%	75.2%	79.6%	75.3%	79.1%
56	6-12 months	0.0%	17.9%	13.3%	13.5%	10.6%	14.3%	10.0%
57	1-2 years	0.0%	7.1%	14.3%	9.9%	8.8%	8.1%	9.1%
58	2+ years	0.0%	0.0%	1.9%	1.4%	0.9%	2.3%	1.7%
59	Sub-total	100%	100%	100%	100%	100%	100%	100%
60	Total Chains Started	4	9	28	36	46	55	48
61	Total Loops Completed	0	3	2	3	12	24	2
62	Number of broken chains	3	2	2	0	4	3	3
63	Bridge Donors Held (2014)	9	29	61	75	54	37	33
64	Percent of broken chains	33%	7%	3%	0%	7%	8%	9%



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