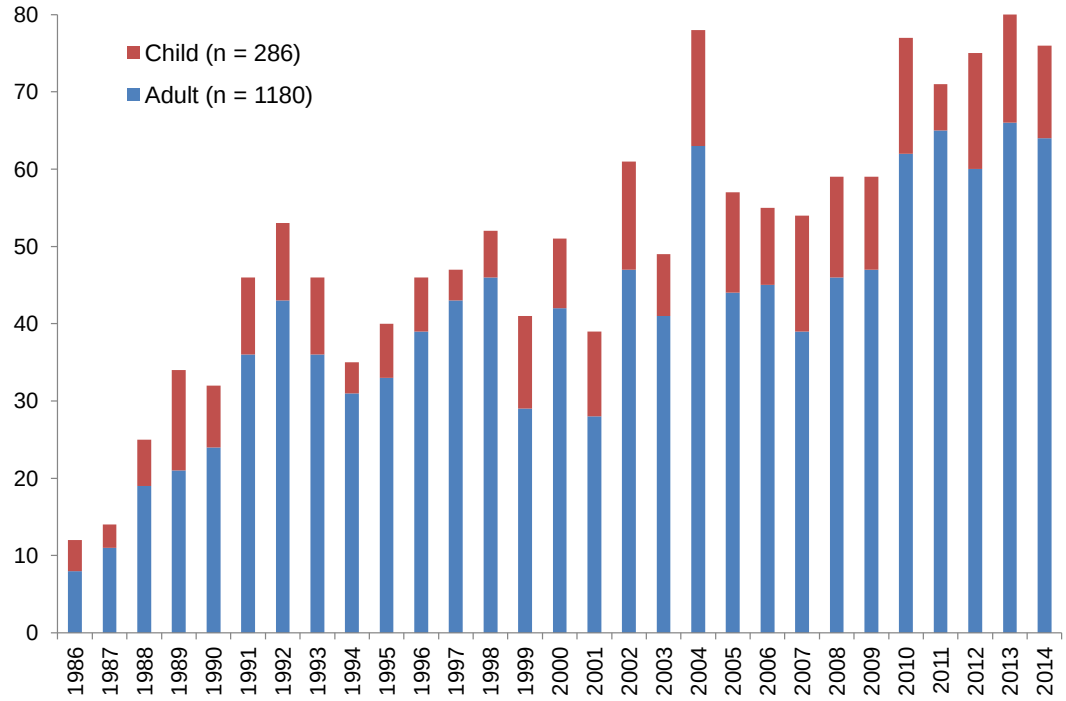
Australian National Liver Transplantation Unit



Data to 31 December 2014

the children's hospital at Westmead

The University of Sydney

The Australian National Liver Transplantation Unit, Royal Prince Alfred Hospital, Sydney, Australia is a combined facility of Sydney Local Health District, The University of Sydney and The Children's Hospital at Westmead

Contents

Preface

In 2014, 73 new and 3 secondary orthotopic liver transplant procedures were performed within the ANLTU (12 – The Children's Hospital at Westmead; 64 – Royal Prince Alfred Hospital). This included the ongoing usage of split liver allograft and the use of extended criteria donor liver allograft, which maximise the limited donor resources available.

The staff within the ANLTU would like to thank the members of the departments within Royal Prince Alfred Hospital and Sydney Local Health Network who have helped contribute to the success of the program in the past year. This includes Haematology, Biochemistry, other Laboratory services, Blood Bank, Department of Pathology, Department of Renal Medicine, Intensive Care Unit, Operating Room, Department of Psychiatry, Department of Cardiology, Department of Respiratory Medicine, Dietetic Department, Department of Social work, Department of Anaesthesia, the Casemix unit and all the other people who have not been specifically mentioned.

We would also like to thank the other departments within the Children's Hospital at Westmead, who have helped contribute to the success of the paediatric programme. These include the membership of Department of Anaesthesia, the Intensive Care Unit, Laboratory services staff, Department of Social Work, Department of Nutrition and other medical departments.

The staff of the Australian Red Cross Blood Service are also acknowledged for their assistance during the year.

Finally, without the generosity of the deceased organ donors and their families, liver transplantation would not be able to proceed at this level. Hence we give our thanks to them as well as to the team at Donate Life NSW, Kogarah.

Professor Geoff McCaughan
Dr Deborah Verran
Dr Michael Crawford
Pamela Dilworth
Gavin Lackey
Bessie Berberovic

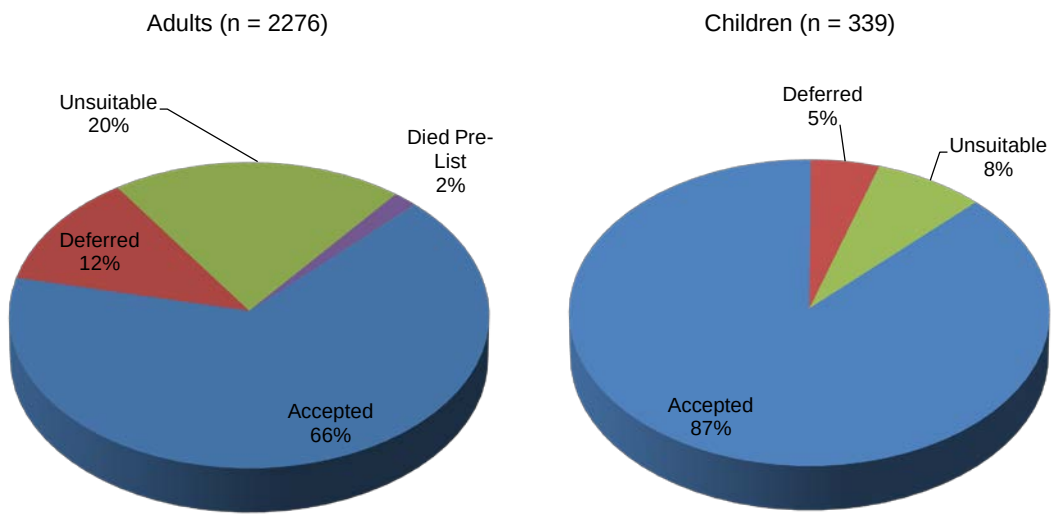
Summary

There are several key issues to report.

1. In 2014, 73 new and 3 secondary orthotopic liver transplant procedures were performed, 12 of which were Paediatric and 64 were Adult.
2. Between January 1986 to December 2014, 1466 liver transplants were performed on 1351 patients, of which 1104 and 247 recipients were adults and children, respectively.
3. The number of transplants per year continues to be related to the deceased donor rate.
4. In 2014, 20 patients (12%) on the waiting list were subsequently withdrawn due to advanced and/or extra-hepatic disease. Four (2%) patients improved whilst on the waiting list.
5. The movement of patients on and off the waiting list continues to be dynamic.
6. The average waiting time for adults in all blood groups remains variable depending on blood group.
7. The median deceased donor age has increased from 29 years (1986 – 1994) to 44 years (2005 – 2014). In 2014 there were nine deceased donors over the age of 70 years. This is the highest number of donors from this age group whose livers have been used for transplant.
8. The median age for adult recipients has increased from 45.4 years (1986 – 1994) to now stand at 51.9 years. The median age for child recipients has decreased from 4.4 years (1986 – 1994) and now stands at 2.0 years.
9. HCV infection has been an increasing primary and secondary indication for liver transplantation in adults. In the period 1986 – 1994 9% of adults had this diagnosis compared to 38% in 2005 – 2014. In 2014, 34% of adults transplanted had Chronic HCV.
10. Hepatocellular carcinoma has also become an increasingly common primary and secondary indication for liver transplantation, with 28% of the adult recipients having a diagnosis of HCC in the five year period 2010 – 2014.
11. The overall patient survival rate over the past 2 years was 98% at one year.

ASSESSMENT INFORMATION

Allocation of Patients Accepted for Assessment



Data to 31 December 2014

Patients Considered Unsuitable for Transplantation

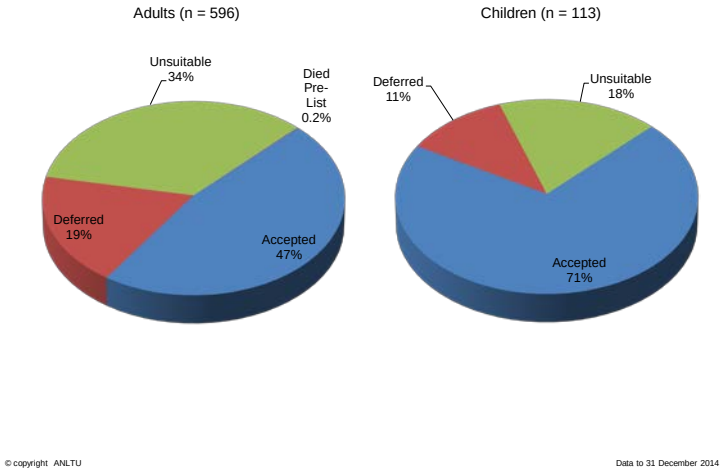
2276 Adults have been assessed since 1985

Reason	Adults	
Too Advanced + extra-hepatic disease	169	37%
Tumour Progression + Tumour (extra-hepatic spread)	74	15%
Good prognosis	65	14%
Psychological	59	13%
Alcohol	56	12%
Patient's (Parent's) wish	24	5%
Alternative therapy	7	2%
Age	5	1%
Condition improved	1	<1%
Logistics	1	<1%
Total	**461**	**100%**

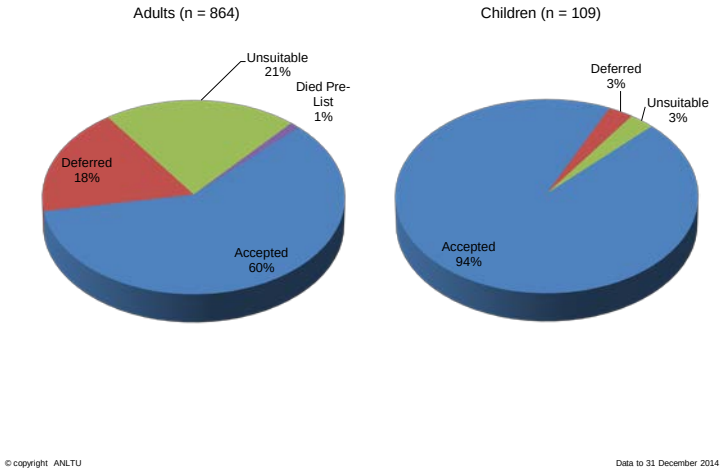
Data to 31 December 2014

Comparison Over Time of Patients Assessed

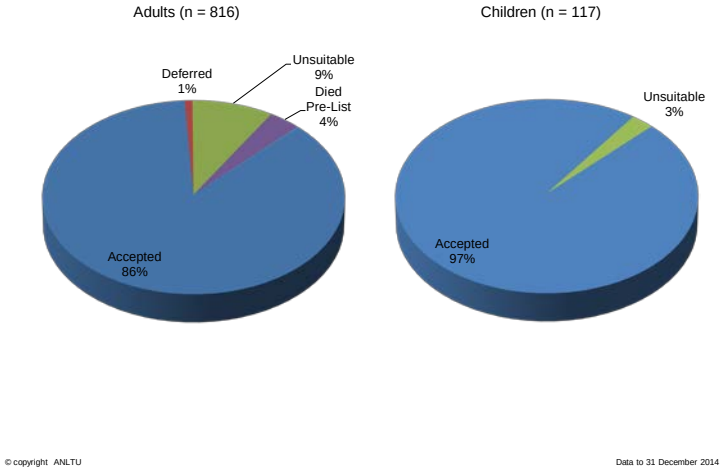
1985 - 1994



1995 - 2004



2005 - 2014



Adult patient acceptance rate has increased from 47% in the period of 1985 – 1994 to 86% in 2005 – 2014.

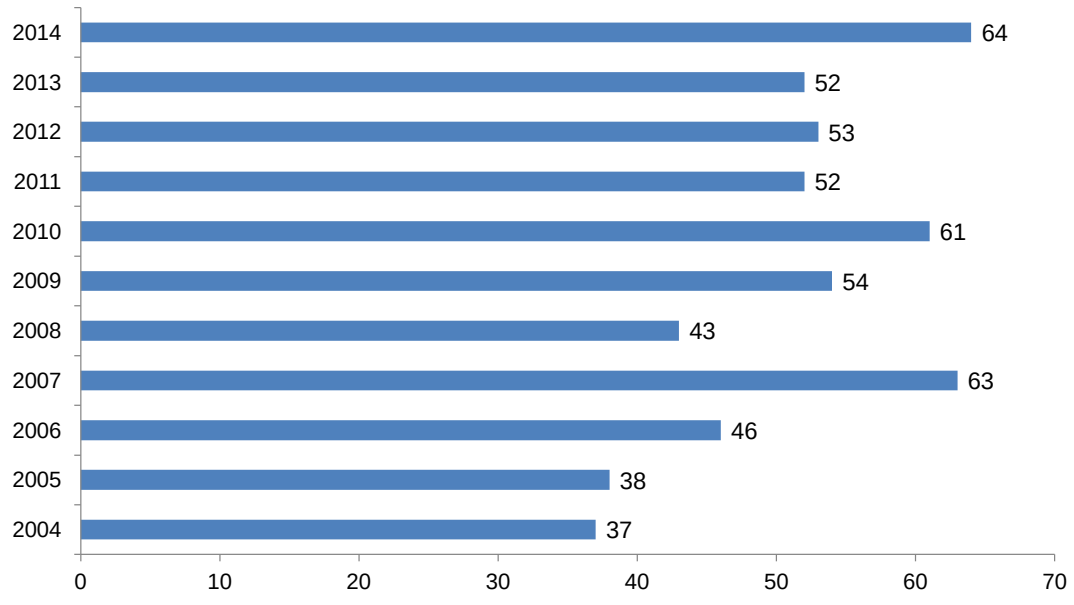
Child patient acceptance rate has increased from 71% in the period of 1985 – 1994 to 97% in 2005 – 2014.

Waiting List Activity

Year		Listed at Start of Year	New Listings	Total	Tx	Died Pre Tx	Withdrawn		Total Withdrawn/ Mortality	Improved	Listed at End of Year
							Tumour Progressed	Other			
2005	n	37	83	120	54	10	1	6	17	3	38
	%				45	8.3	0.8	5	14	2.5	
2006	n	38	83	121	55	6	3	0	9	6	46
	%				45	5	2.5	0	7.4	5	
2007	n	46	95	141	54	19	2	2	23	2	63
	%				38	13	1	1	16	1	
2008	n	63	76	139	59	25	2	5	32	5	43
	%				42	18	1	3.5	23	3.5	
2009	n	43	97	140	59	11	3	5	19	8	54
	%				42	8	2	3.5	13.6	5.7	
2010	n	54	98	152	77	6	4	2	12	2	61
	%				51	4	3	1	8	1	
2011	n	61	82	143	71	9	5	2	16	4	52
	%				50	6	3	1	11	3	
2012	n	52	104	156	75	15	2	9	26	2	53
	%				48	10	1.3	6	17	1.3	
2013	n	53	113	166	80	15	5	11	31	3	52
	%				48	9	3	7	19	2	
2014	n	52	112	164	76	5	1	14	20	4	64
	%				46	3	0.6	9	12	2	

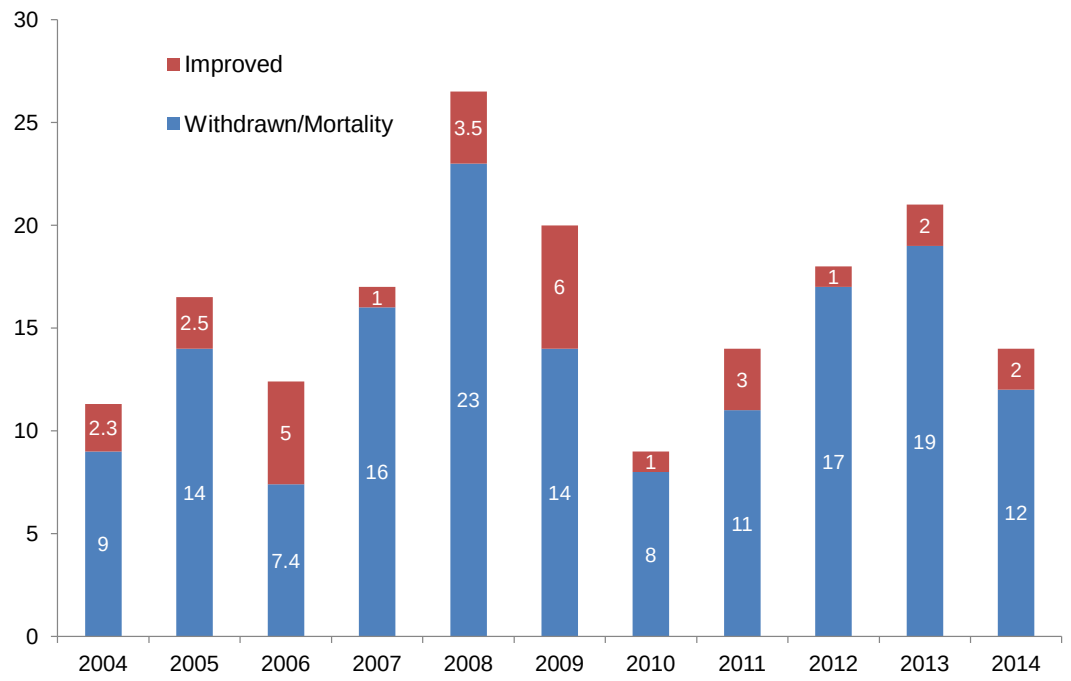
Data to 31 December 2014

Patients on Waiting List at the end of Calendar Year



Data to 31 December 2014

% Patients Withdrawn from Waiting List



Data to 31 December 2014

Urgent Listings 2014

Number of Patients Listed as Urgent	Cat 1	Cat 2	**Total**
Transplanted	4	5	**9**
Delisted	1	1	**2**
Total			**11**

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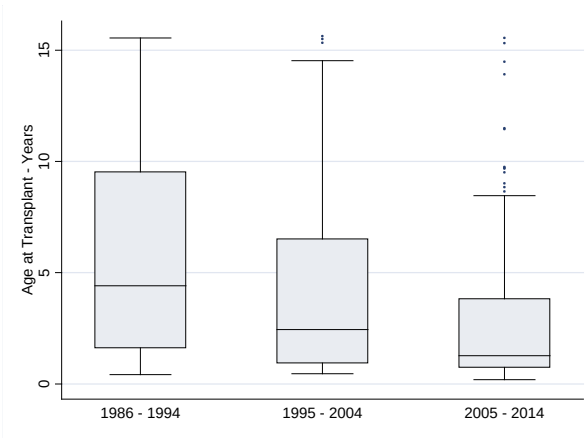
Data to 31 December 2014

Age of Transplant Recipients (Primary Grafts)

Children

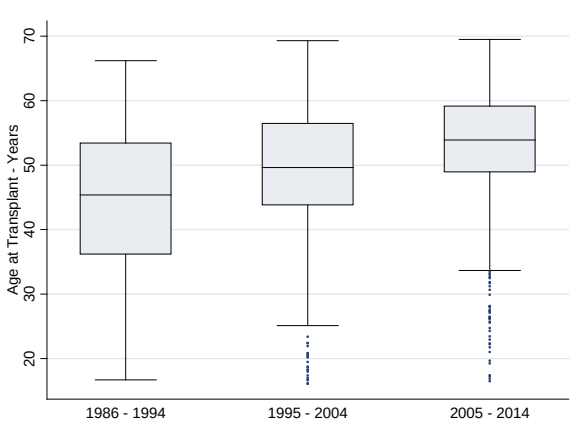
n	247
Median	2.0 years
Mean	4.1 years
Range	0.2 – 15.6 years



n	56	84	107
Median	4.4	2.5	1.3
Mean	5.7	4.3	3.1

Adults

n	1104
Median	51.4 years
Mean	49.2years
Range	16.1 – 69.5 years



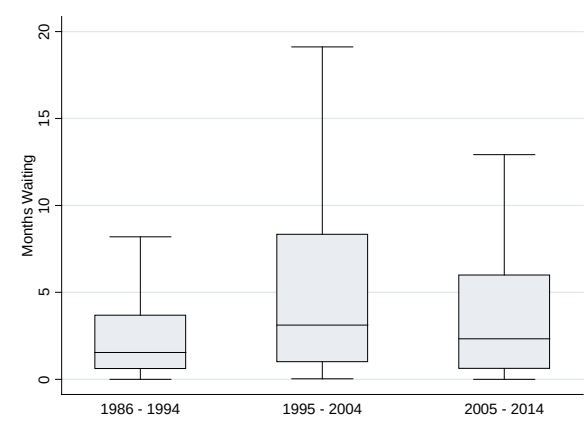
n	218	381	505
Median	45.4	49.6	53.9
Mean	43.8	48.5	49.2

Data to 31 December 2014

Waiting Time of Transplant Recipients (Primary Grafts)

Children

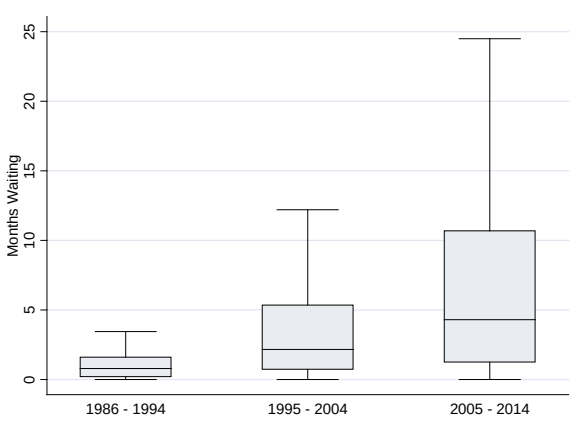
n	247
Median	2.33 months
Mean	5.24 months



n	56	84	107
Median	1.54	3.11	2.33
Mean	2.91	6.49	5.48

Adults

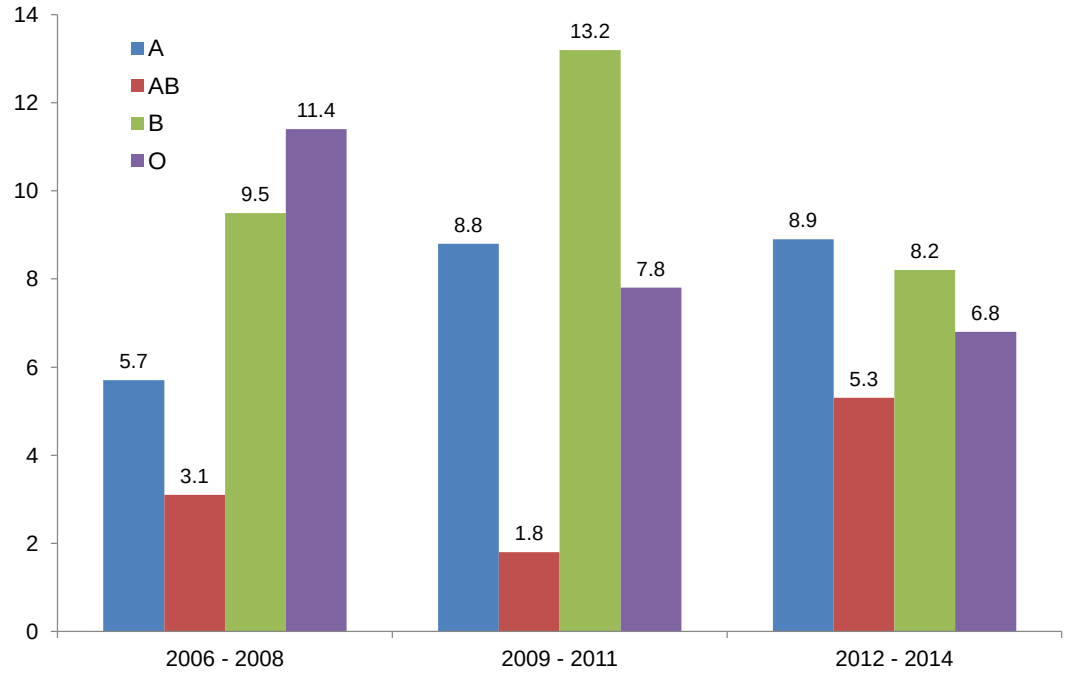
n	1104
Median	2.36 months
Mean	5.41 months



n	218	381	505
Median	0.79	2.16	4.30
Mean	1.27	4.46	7.91

Data to 31 December 2014

Adult Mean Months Waiting
Primary Liver Transplantation vs ABO (2006 – 2014)



Data to 31 December 2014

Adult Mean Months Waiting
Primary Liver Transplantation vs ABO (2006 – 2014)

	2006 – 2008	2009 – 2011	2012 – 2014	Overall
A	5.7	8.8	8.9	8.1
AB	3.1	1.8	5.3	3.4
B	9.5	13.2	8.2	9.7
O	11.4	7.8	6.8	8.4
Mean	8.4	8.7	7.8	8.2

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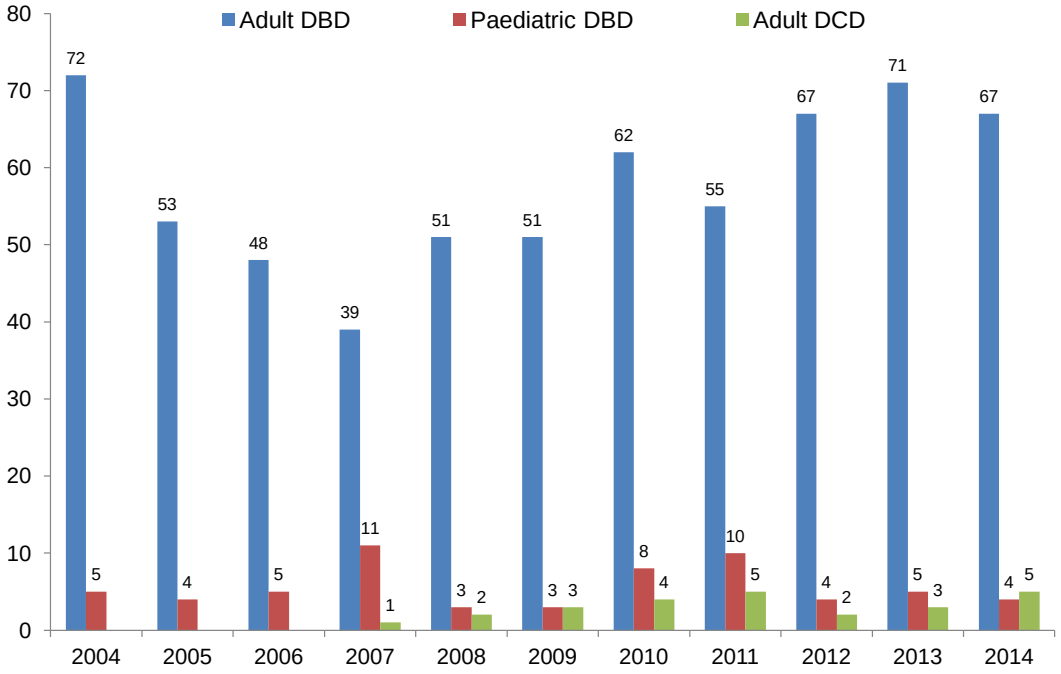
Data to 31 December 2014

DONOR INFORMATION

Deceased Adult and Paediatric Donor Organs Used by Year



Data to 31 December 2014

Since 2000, 89.7% of liver donors were adults (>=18yrs) and 10.3% were paediatric donors.

Deceased Donor Offers to NSW 2006 - 2014

Donor Type	State	2006 – 2008	2009 – 2011	2012	2013	2014	Total
DBD	ACT	9	18	9	5	9	50
	NSW	139	177	71	88	63	538
	NT	3	2	1	1	1	8
	NZ	13	10	3	1	5	32
	QLD	20	17	5	5	7	54
	SA	17	12	2	7	5	43
	TAS	6	1		1	1	9
	VIC	23	22	11	7	3	66
	WA	9	13	5	6	8	41
Total BDD Offers		239	272	107	121	102	841
BDD Used		137	170	64	68	66	505
DCD	ACT	3	8	1		1	13
	NSW	19	65	23	15	15	137
	QLD	0	0		1	1	2
	VIC	0	8		1		9
	SA/WA	0	0	2		3	5
Total DCD Offers		22	81	26	17	20	166
DCD Used		3	17	2	3	5	30
Total Offers		261	357	133	138	122	1011
Total Used		140	187	66	71	71	535

Data to 31 December 2014

DBD Donor Offers Declined 2014
36/102 (35.2%)

	Declined at Offer	Declined at Hepatectomy
Abnormal LFTs	4	
Cirrhosis		1
Donor arrest prior to retrieval	1	
Donor history *	3	
Donor malignancy - extrahepatic		1
High risk donor for tumour or infection		1
Impaired perfusion/ischaemia		2
Interstate donor not suitable for directed recipient (Urgent Case)	1	
Liver fibrosis		3
No suitable ABO compatible recipient	4	
Offer waived **	1	
Offer waived for urgent Tx elsewhere	4	
Steatosis		7
Other ***	2	1
TOTAL	**20**	**16**

Data to 31 December 2014

DBD Donor Offers Declined 2014
36/102 (35.2%)

*	Donor history	1	ITP risk of transmission, steatosis .
		2	ITP risk of transmission.
		3	Heavy drinker & smoker.
**	Offer waived	1	Offer accepted however during coordination interstate team requested to keep liver locally.
***	Other	1	Long downtime.
		2	Long ischaemic time for marginal donor.
		3	Biopsy showed chronic inflammation, low no of bile ducts, suspect undiagnosed bile duct disorder.

Data to 31 December 2014

DCD Donor Offers Declined 2014
14/17 (73.7%)

	Declined at Offer	Declined at Hepatectomy
Abnormal LFTs	1	
DCD did not proceed to hepatectomy		3
Donor history *	1	
Impaired perfusion/ischaemia		1
Liver fibrosis		1
Outside DCD acceptance criteria	2	
Steatosis		2
Unstable	1	
Other **	1	1
TOTAL	**6**	**8**

* Donor history 1 High risk hx for drugs and sexual activity

** Other 1 Interstate DCD, would need cut down, expect long CIT

2 Delayed time to perfusion

Data to 31 December 2014

Enquiries Declined 2014

	Declined at Enquiry
Donor age	1
Donor history *	3
High risk donor for tumour or infection	10
Interstate donor not suitable for directed recipient (Urgent Case)	2
No suitable recipient	2
Outside DCD acceptance criteria	5
Unstable	2
Other **	8
TOTAL	**35**

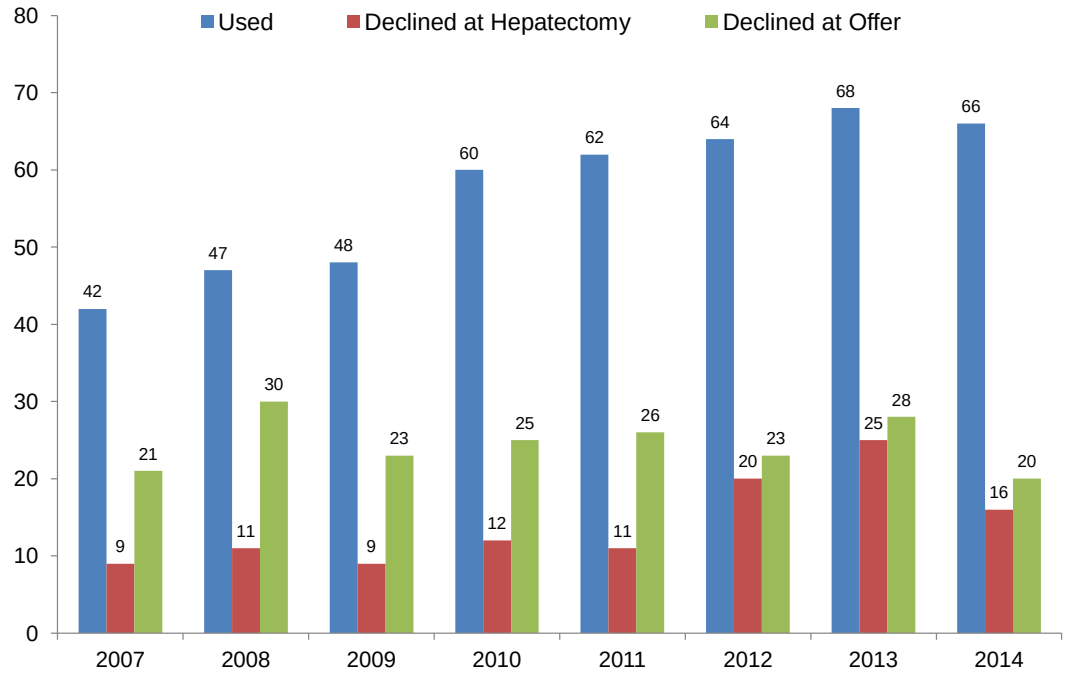
Data to 31 December 2014

Enquiries Declined 2014

*	Donor history	1	Hx Heavy smoker, HT, hypercholesterolaemia, strong FHx multiple cancers, elevated LFTs, expected long ischaemia. Provisional offer only.
		2	HCV pos donor. Lived in bush. Unknown medical and behavioural history.
		3	Small, ventilation issues since birth, diagnosed Alveolar Capillary Dysplasia, been on ECMO for 4 days, concern re adequacy of liver perfusion.
**	Other	1	Clotting disorder - had DVT & PE few days post toe sx.
		3	Asked for suitability of pursuing this donor when they were admitted to the ED. Would have been DBD, nil medical history. Never made to full referral, reason unclear.
		4	Elevated LFTs. Asked to observe trend. Never heard any further from DonateLife.
		5	Expect long cold ischaemic time and lack of vessels.
		6	Extensive history. Enquiry as to whether we would be interested if progressed. We were interested but did not proceed to donation.
		7	Long downtime (1.5hrs) and high transaminases (3000-6000). Genetic mutation. Seizures. Proceeded to donate heart/lungs/kidneys.
		8	Offer withdrawn- donor not pursued as low probability of dying within time frame.
		9	Treatment withdrawn on donor prior to referral. High risk donor- IVDU, bacterial sepsis from likely abdominal fistula, long down time, abnormal LFTs.

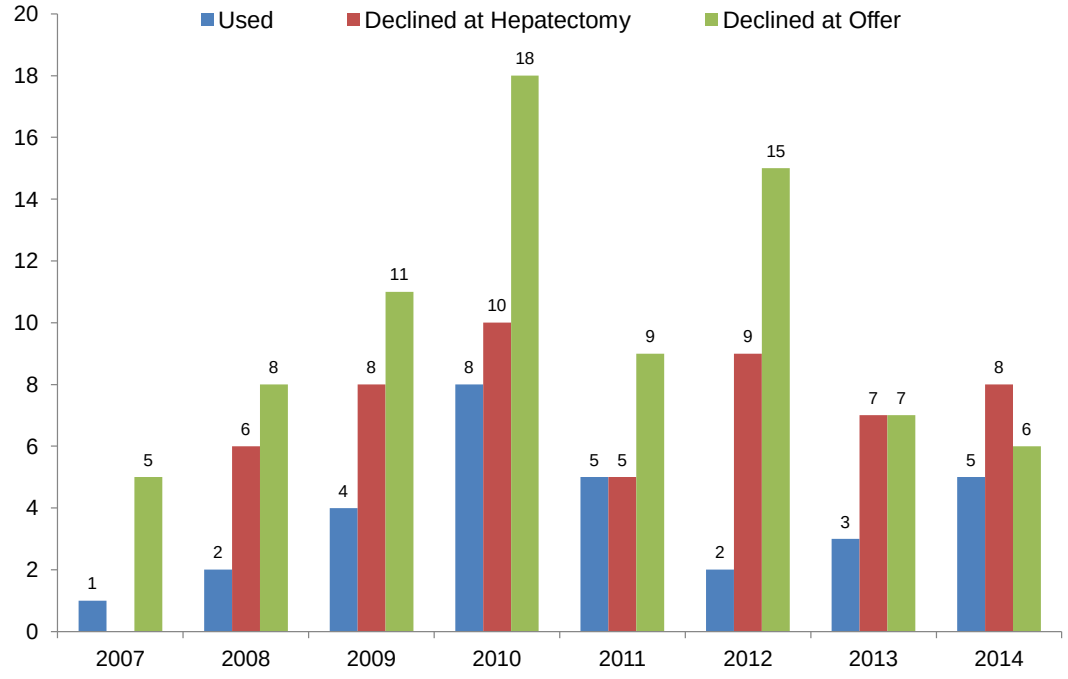
Data to 31 December 2014

DBD Donor Offers to NSW



Data to 31 December 2014

DCD Donor Offers to NSW



Data to 31 December 2014

Allocation of Accepted and Utilised Deceased Donor Livers

1st Recipient Allocation		Total
DBD	Highest prioritised patient suitable for this type of graft	43
	Size of graft not suitable for higher priority patient(s)	8
	No prioritised patient in this ABO suitable for Split Graft	4
	Higher priority patient(s) medically unfit	3
	No prioritised patient in this ABO suitable for ECD Graft	2
	No prioritised patient in this ABO suitable	1
	Positive donor virology	1
	Other *	3
DCD	Highest prioritised patient suitable for this type of graft	5
Total		70

2nd Recipient Allocation		Total
DBD	Highest prioritised patient suitable for this type of graft	5
	Size of graft not suitable for higher priority patient(s)	1
Total		**6**

* Other Required combined liver/kidney tx
Donor age – prefer closer age match for 19yo patient
Left lateral segment offered

Data to 31 December 2014

Living Donor Procedures – Paediatric and Adult

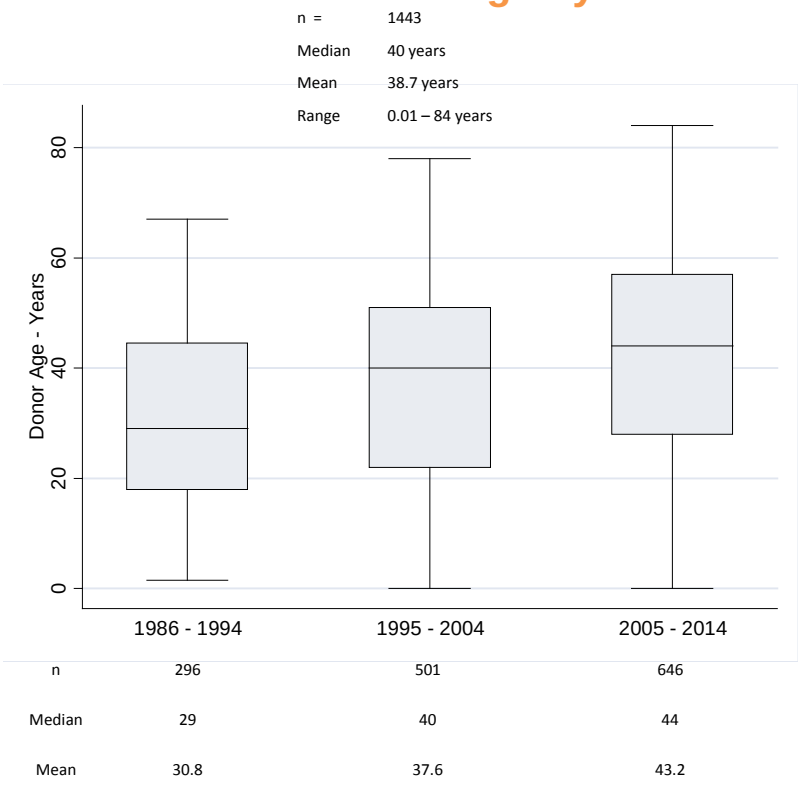
Year	1990	2002	2003	2004	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Type	LRD	LRD	LUD *	LRD	LRD	LRD	LRD	LRD	LRD	LUD **	LRD	LUD *		
Total	1	1	1	1	2	3	3	2	3	1	2	1	0	**21**

* The Living Unrelated Donor Procedures in 2003 and 2013 were adult domino transplants.

** The Living Unrelated Donor Procedure in 2011 was Husband to Wife.

Data to 31 December 2014

Deceased Donor Age by Era

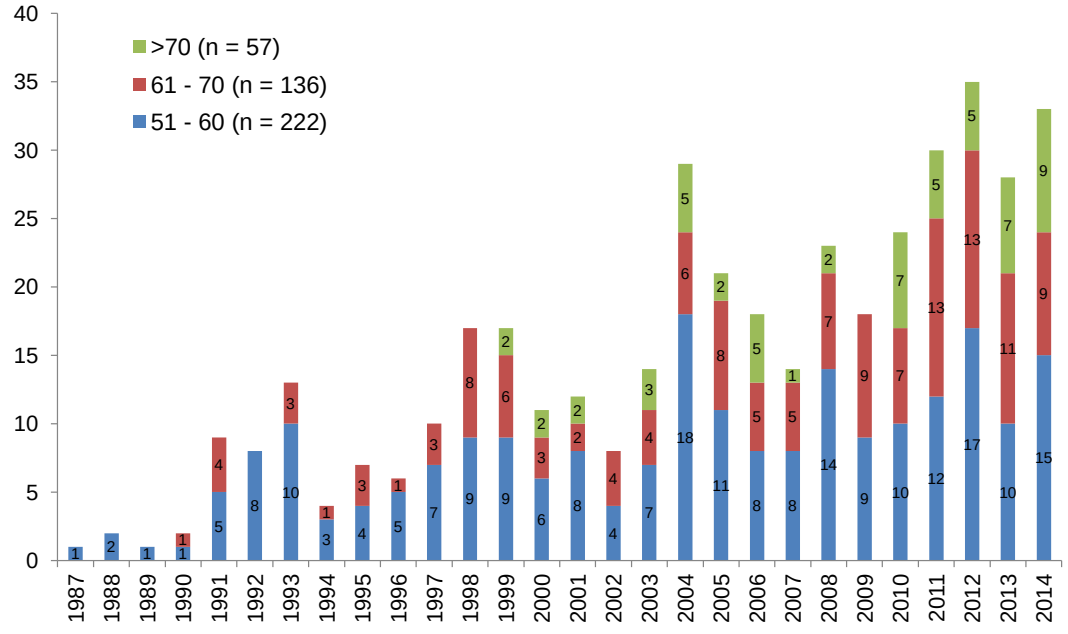


	1986 - 1994	1995 - 2004	2005 - 2014
n	296	501	646
Median	29	40	44
Mean	30.8	37.6	43.2

Data to 31 December 2014

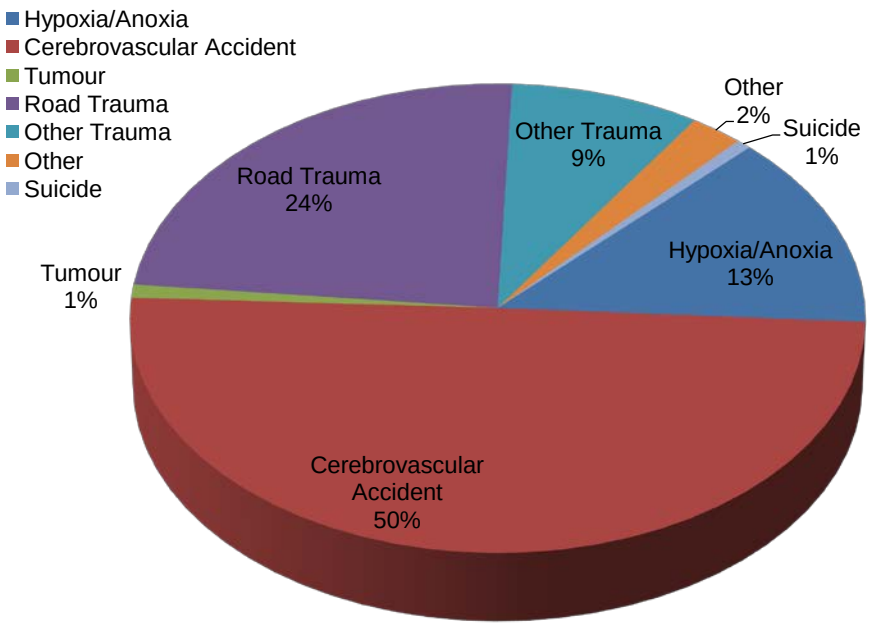
The donor age ranged from 0 to 84 years, with a mean value of 38.7 years.

Deceased Donors Over 50 Years (n = 415)



Data to 31 December 2014

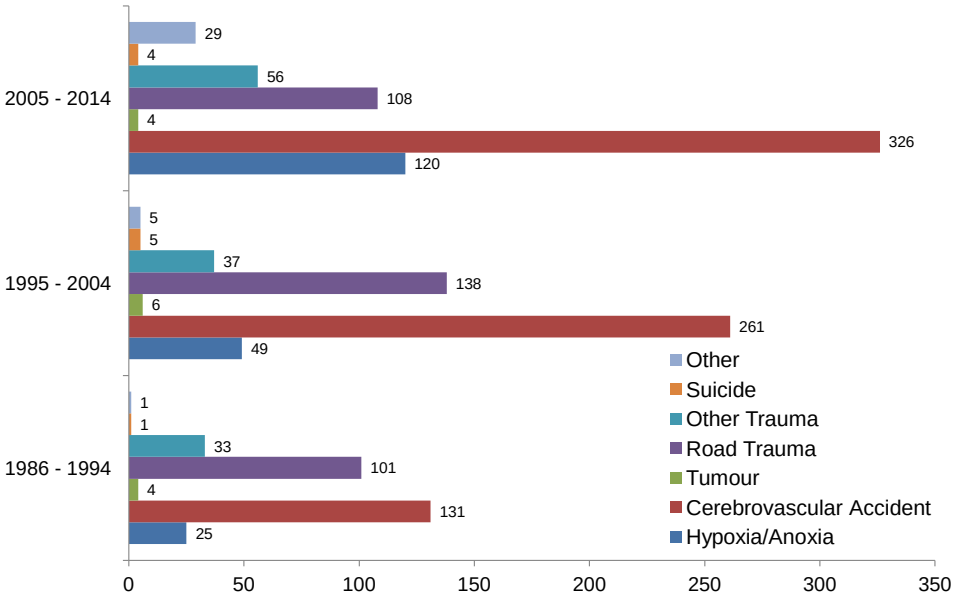
Deceased Donor Cause of Death (n = 1443)



Data to 31 December 2014

718 (50%) donors died due to cerebral haemorrhage, 473 (33%) died due to trauma.

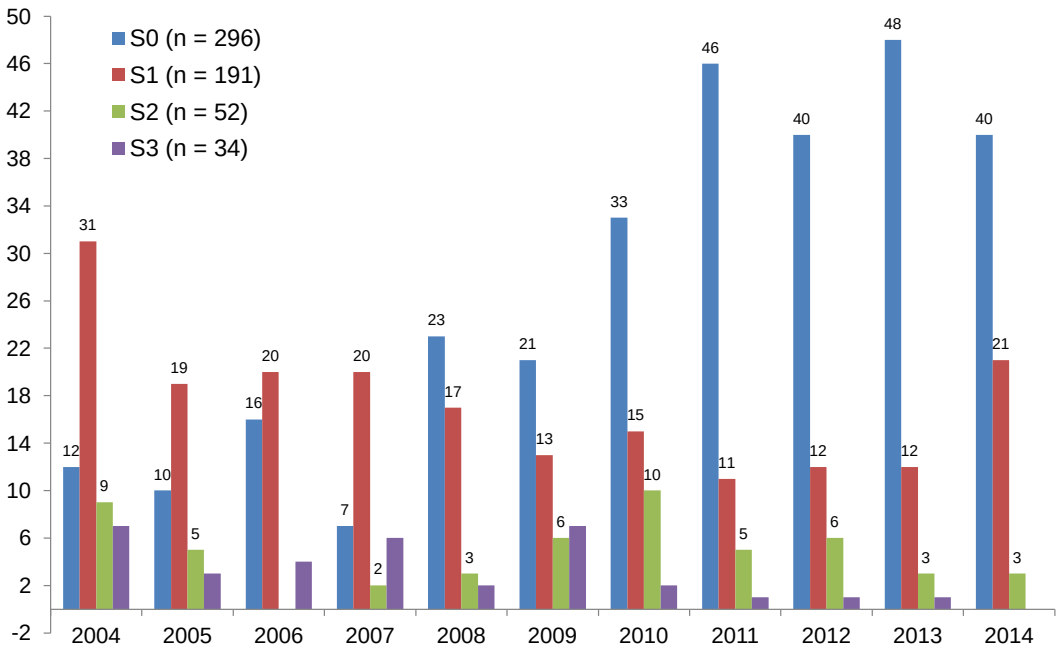
Deceased Donor Cause of Death by Era



Data to 31 December 2014

Deaths due to trauma were 44% (1986 – 1994), 36% (1995 – 2004) and 25% (2005 – 2014). In these same time periods, deaths due to cerebral causes were 45%, 51% and 50%.

Adult Graft Steatosis 2004 - 2014



Data to 31 December 2014

Steatosis Scoring:

S0 less than 5% steatosis in biopsy (either macro or micro)

S1 Ma/Mi 5 – 29% Macrovesicular steatosis on biopsy combined with varying degrees of Micro

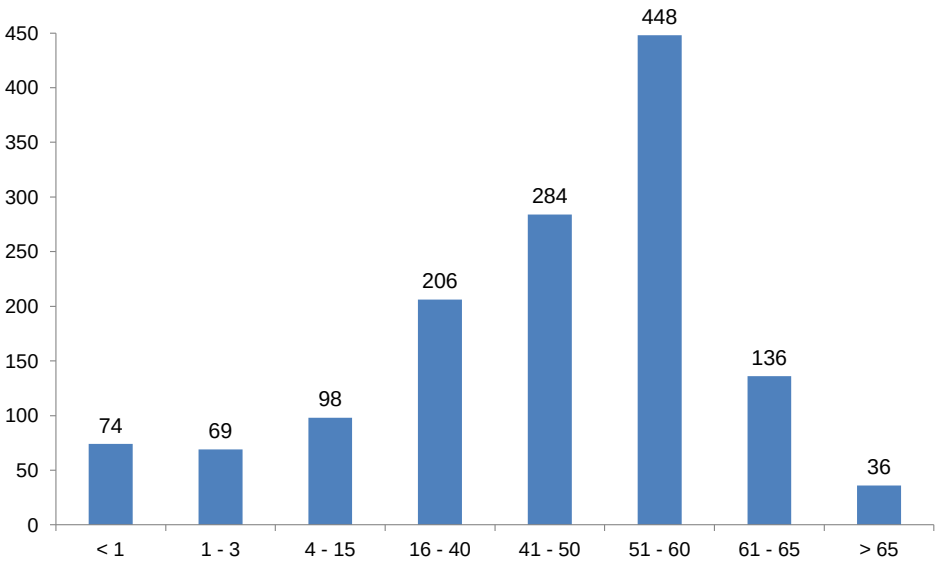
S2 Ma/Mi 30 < 60% Macrovesicular steatosis on biopsy combined with varying degrees of Micro

S3 Ma/Mi 60 +% Macrovesicular steatosis on biopsy combined with varying degrees of Micro

There are 56 cases (7.8%) where post reperfusion biopsy was not performed.

RECIPIENT DEMOGRAPHICS

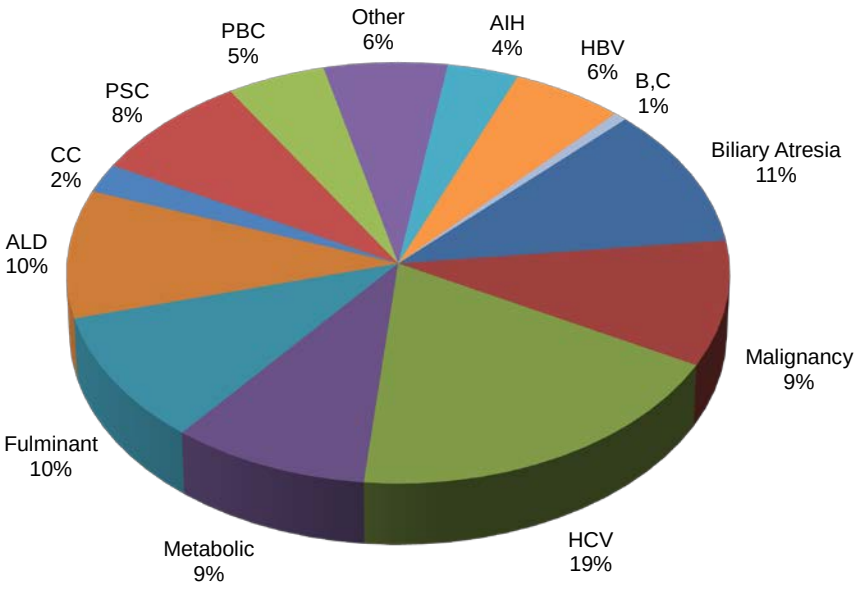
Breakdown of Patient Age at Primary Transplant (n = 1351)



 Data to 31 December 2014

The modal group was in the age range 51 – 60 years (33.1%).

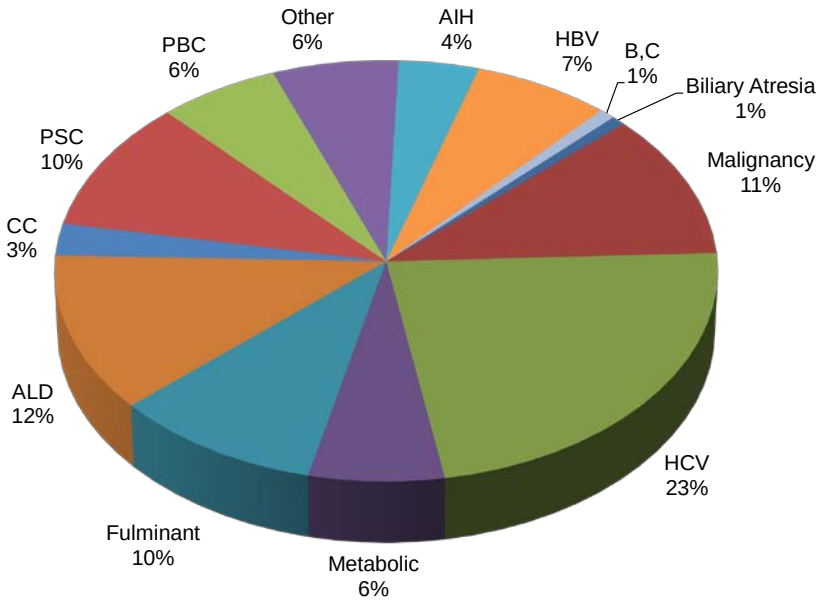
Primary Disease – All Patients (n = 1351)



 Data to 31 December 2014

The most common primary indications for transplantation are Chronic Hepatitis C (253, 19%), Biliary Atresia (145, 11%), Fulminant Liver Failure (135, 10%) and Alcoholic Disease (133, 10%).

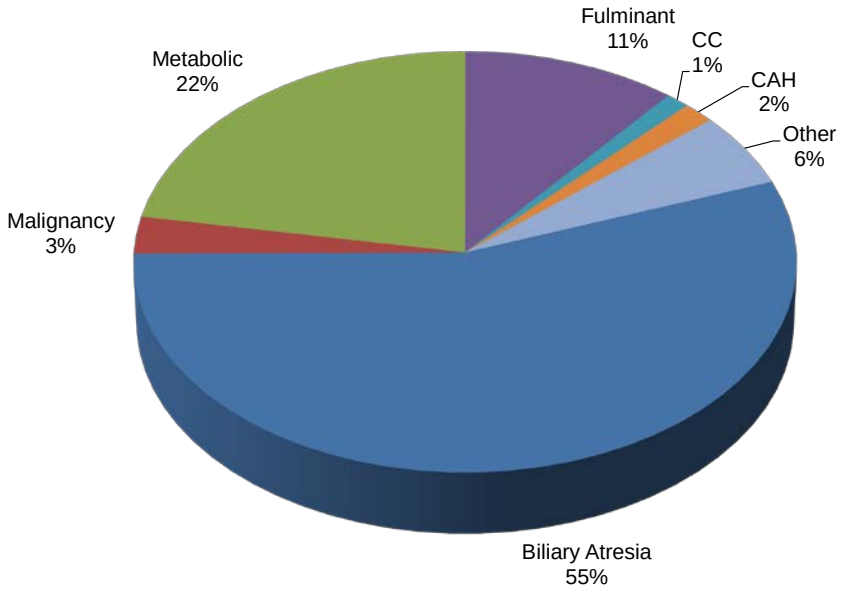
Primary Disease – Adults (n = 1104)



 Data to 31 December 2014

Hepatitis C was the most common indication of transplantation in adults (253, 23%), followed by Alcoholic Liver Disease (ALD 133, 12%), Malignancy (123, 11%), Primary Sclerosing Cholangitis (PSC 112, 10%), Fulminant Hepatic Failure (108, 10%), and Hepatitis B (77, 7%).

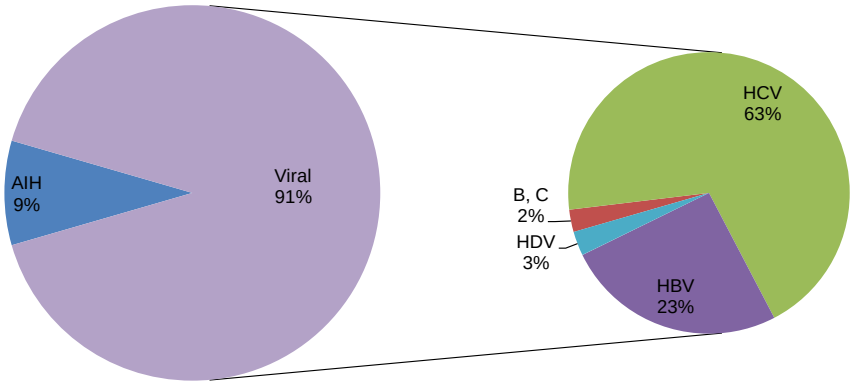
Primary Disease – Children (n = 247)



 Data to 31 December 2014

The most common indication for transplantation in children was Biliary Atresia (137, 55%), followed by Metabolic disease (55, 22%) and Fulminant Hepatic Failure (27, 18%).

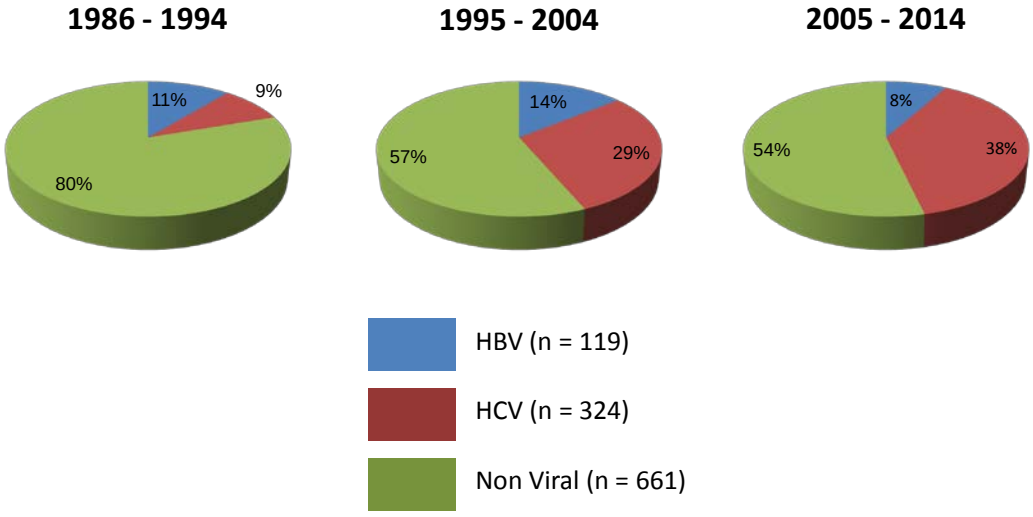
Chronic Viral and Auto-Immune Hepatitis
Primary and Secondary
n = 514 (46.6% of all Adults)



 Data to 31 December 2014

Auto-Immune Hepatitis (AIH) comprised 9% of cases, the remainder (91%) being viral in origin (CVH). Of the cases of viral hepatitis, the most common is Hepatitis C (HCV, 63%), followed by Hepatitis B (HBV, 23%) and HBV/HCV co-infection (2%).

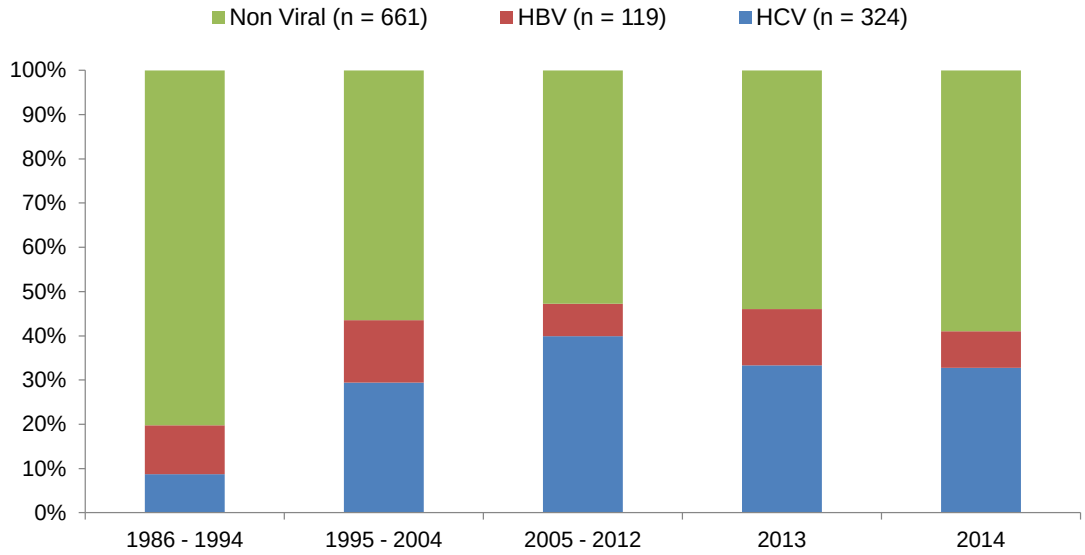
Chronic Viral (Primary and Secondary)
Adults by Era



 Data to 31 December 2014

The number of patients requiring transplantation due to HCV has steadily increased over the three time periods, whereas the number of patients requiring transplantation for HBV has now decreased.

% Adults with Chronic HBV or HCV (Primary and Secondary)



Data to 31 December 2014

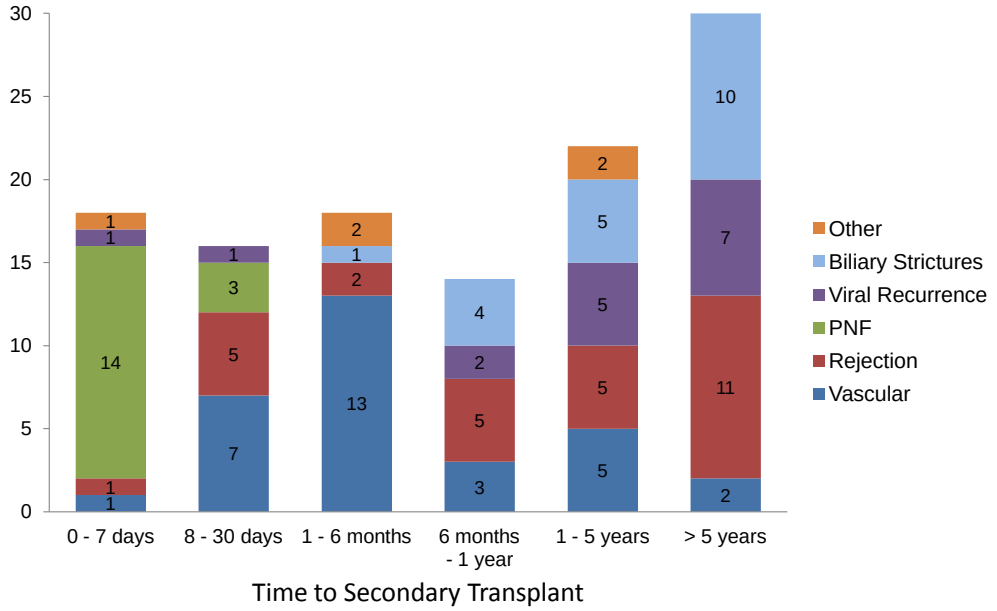
Chronic HCV infection comprises 29.3% of adults transplanted, and is expected to continue to rise in the future.

Fulminant Hepatic Failure As Primary Indication Treated by Liver Transplantation

Aetiology	No of Patients	No of Tx	Outcome	
			Alive	Dead
Idiopathic	51	56	32	19
Drug Induced	22	23	16	6
Wilson's Disease	14	16	12	2
Viral Hepatitis				
Hep B	30	31	19	11
Hep C	1	1	1	0
Hep A	3	3	0	3
Hep E	1	1	0	1
Autoimmune Hepatitis	3	4	1	2
Budd-Chiari	1	1	0	1
Other	9	9	8	1
Totals	135	145	89 (66% pts)	46 (34% pts)

Data to 31 December 2014

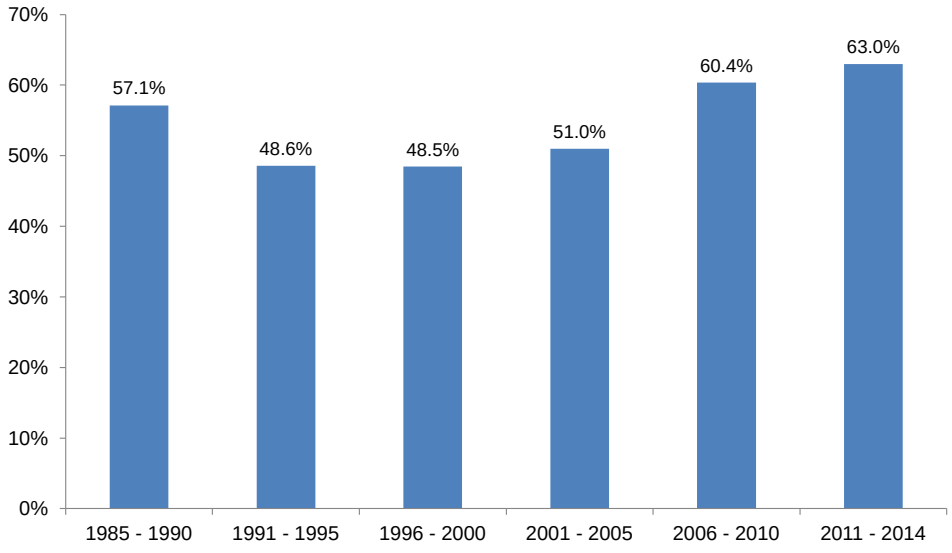
Indication for Secondary Transplantation (n = 122)



 Data to 31 December 2014

Primary non function (PNF) is the major indication for re-transplantation in the first 7 days. Rejection and vascular indications are prominent indications for re-transplantation in all other time periods.

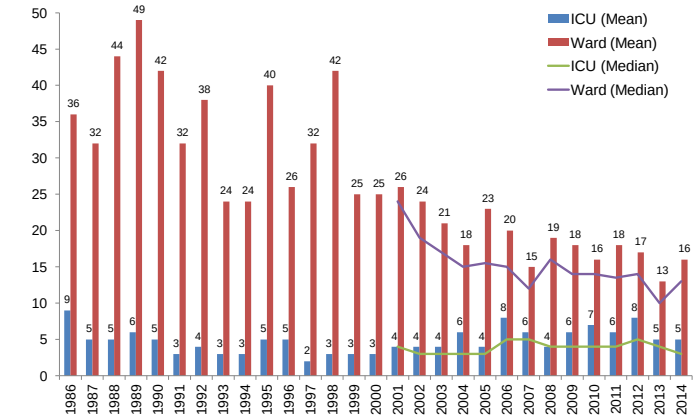
Percentage of Children Transplanted for Biliary Atresia (n = 137; 55.5% of all Children)



 Data to 31 December 2014

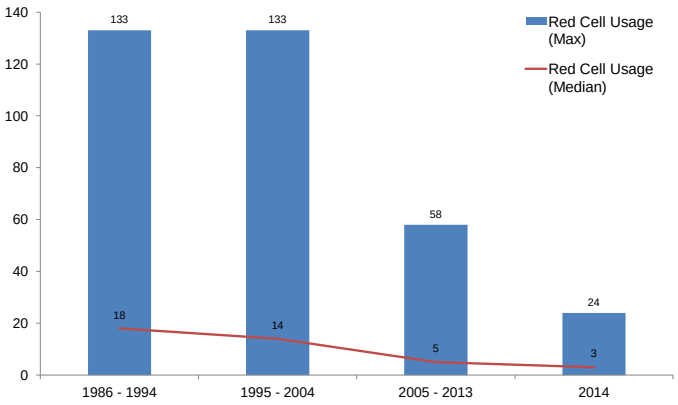
PERIOPERATIVE DATA

Hospital Stay (Mean & Median Days)
Adults Only



 Data to 31 December 2014

Red Cell Usage
(Units of Packed Cells)



 Data to 31 December 2014

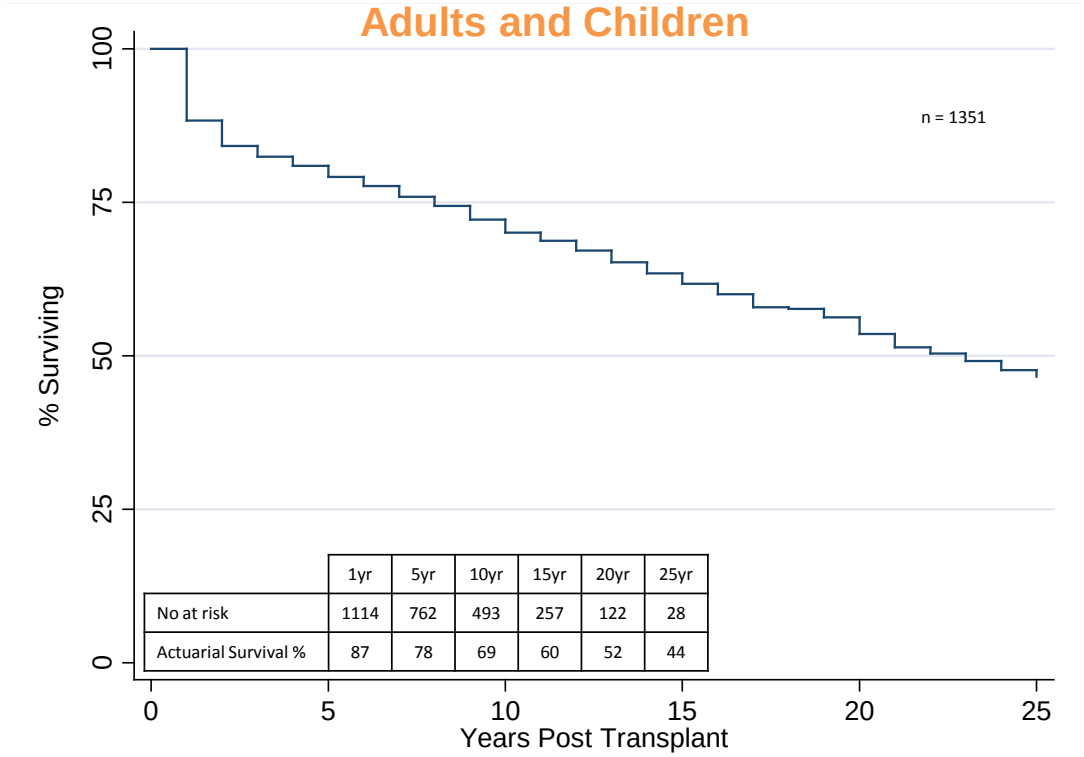
Graft Ischaemic Time, Operation Duration
And Red Cell Utilisation

	1986 – 1994	1995 – 2004	2005 – 2014
Mean Graft Ischaemic Time	9 hr 12 min	9 hr 16 min	8 hr 27 min
Mean Operation Time	7 hr 51 min	7 hr 43 min	7 hr 29 min
No. Of Packed Cells Utilised	1 – 133 Mean = 20.6; Median = 16	0 – 133 Mean = 16.0; Median = 12	0 – 58 Mean = 6.8; Median = 5

 Data to 31 December 2014

OUTCOME DATA

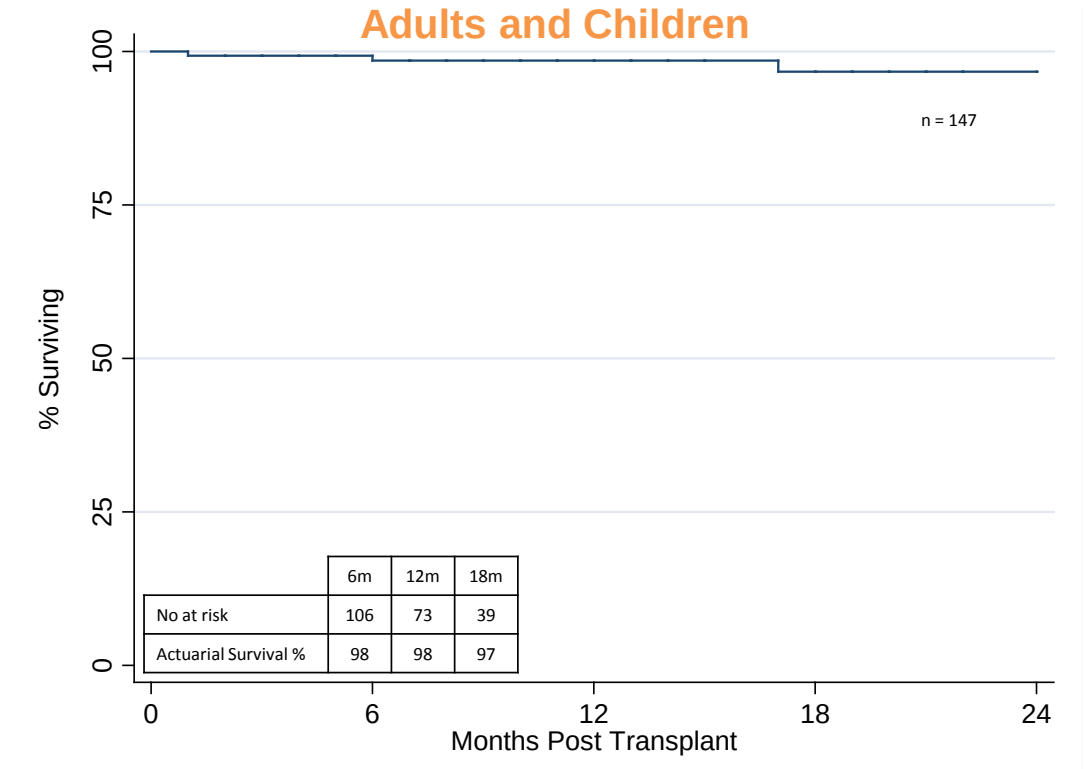
Overall Patient Survival 1986 - 2014
Adults and Children



	1yr	5yr	10yr	15yr	20yr	25yr
No at risk	1114	762	493	257	122	28
Actuarial Survival %	87	78	69	60	52	44

Data to 31 December 2014

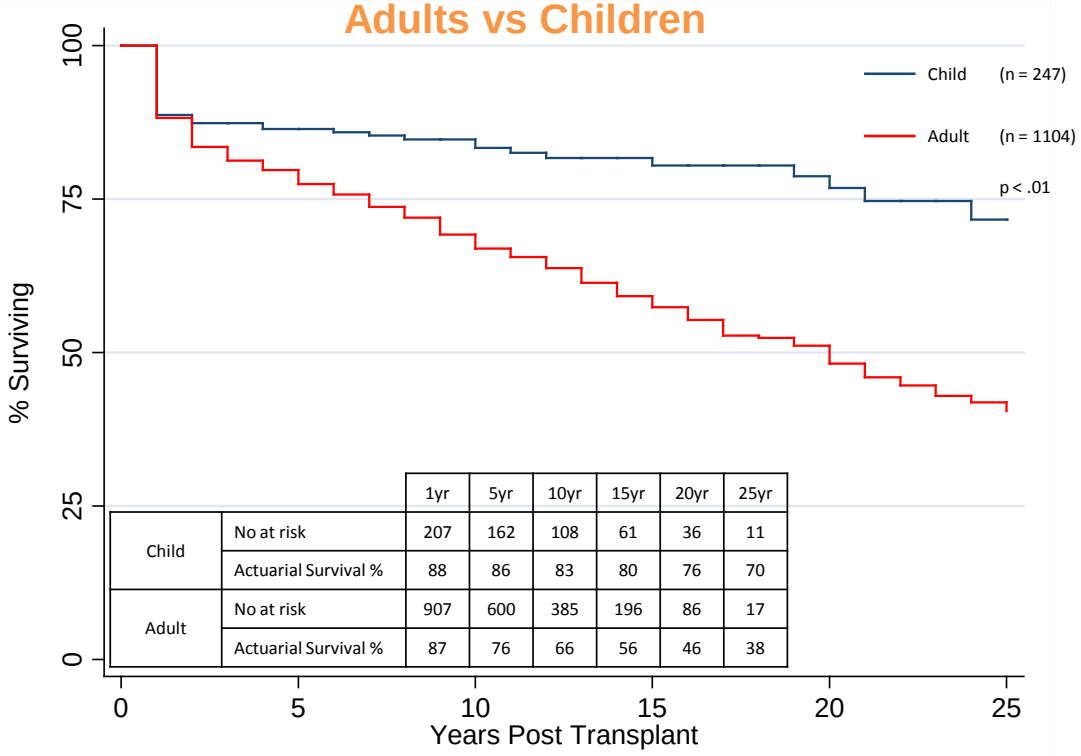
Patient Survival 2013 - 2014
Adults and Children



	6m	12m	18m
No at risk	106	73	39
Actuarial Survival %	98	98	97

Data to 31 December 2014

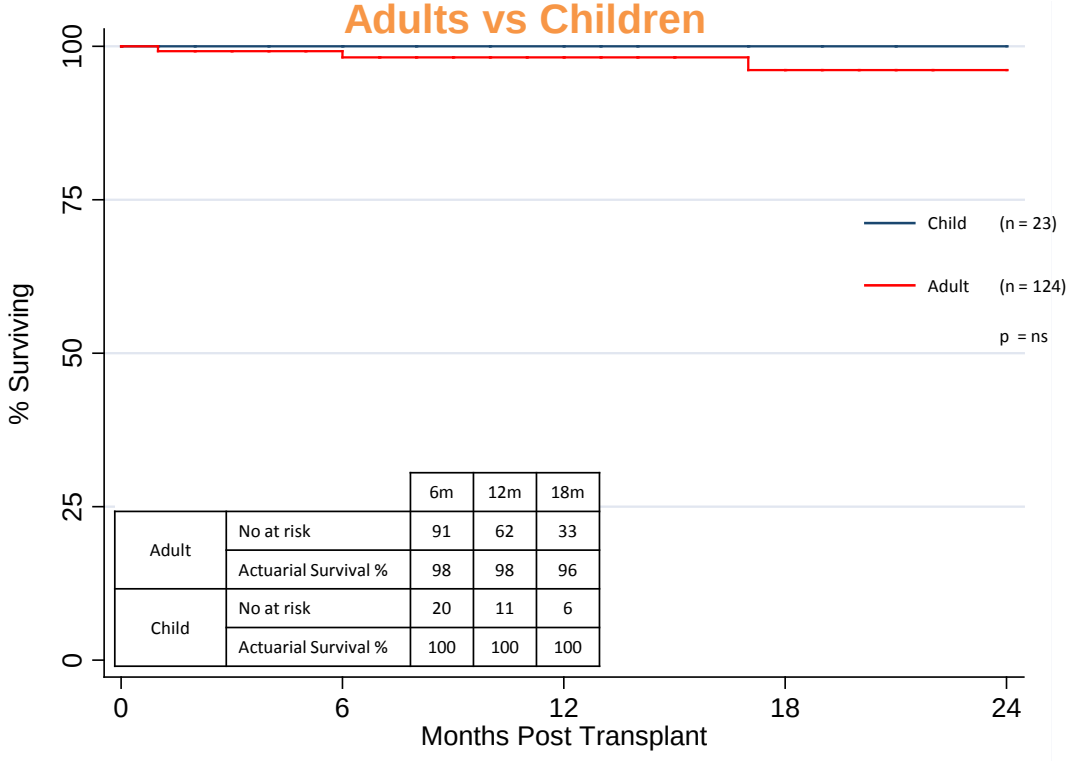
Patient Survival 1986 – 2014
Adults vs Children



		1yr	5yr	10yr	15yr	20yr	25yr
Child	No at risk	207	162	108	61	36	11
	Actuarial Survival %	88	86	83	80	76	70
Adult	No at risk	907	600	385	196	86	17
	Actuarial Survival %	87	76	66	56	46	38

Data to 31 December 2014

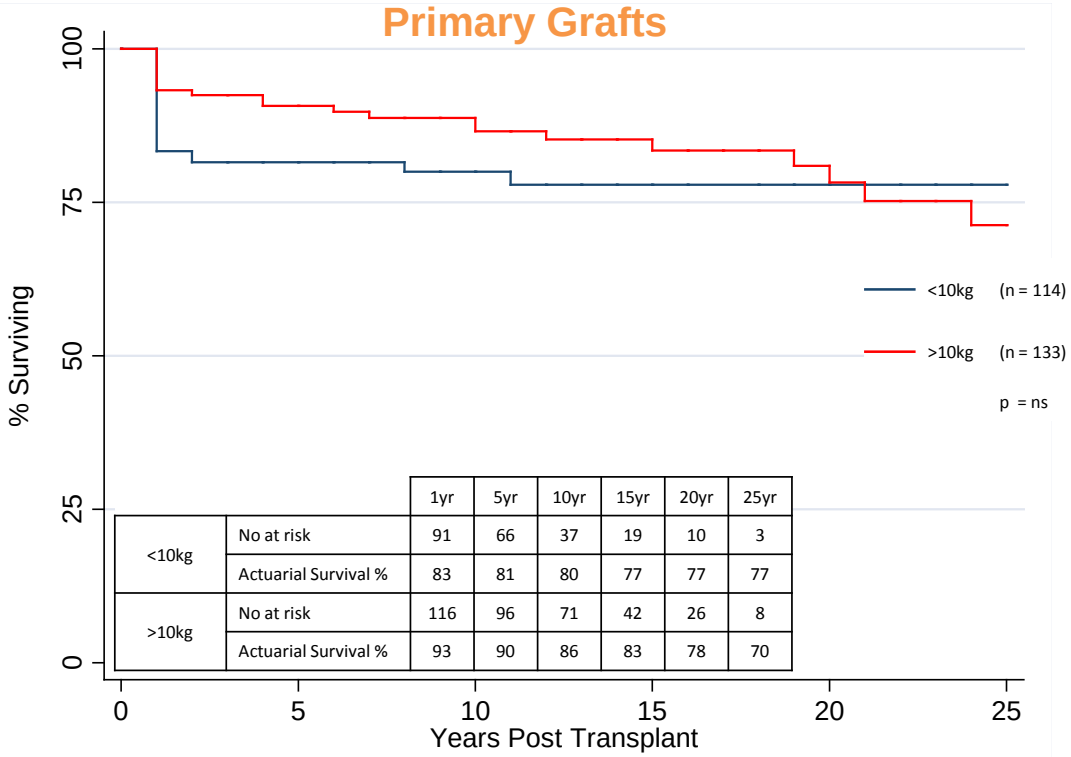
Patient Survival 2013 - 2014
Adults vs Children



		6m	12m	18m
Adult	No at risk	91	62	33
	Actuarial Survival %	98	98	96
Child	No at risk	20	11	6
	Actuarial Survival %	100	100	100

Data to 31 December 2014

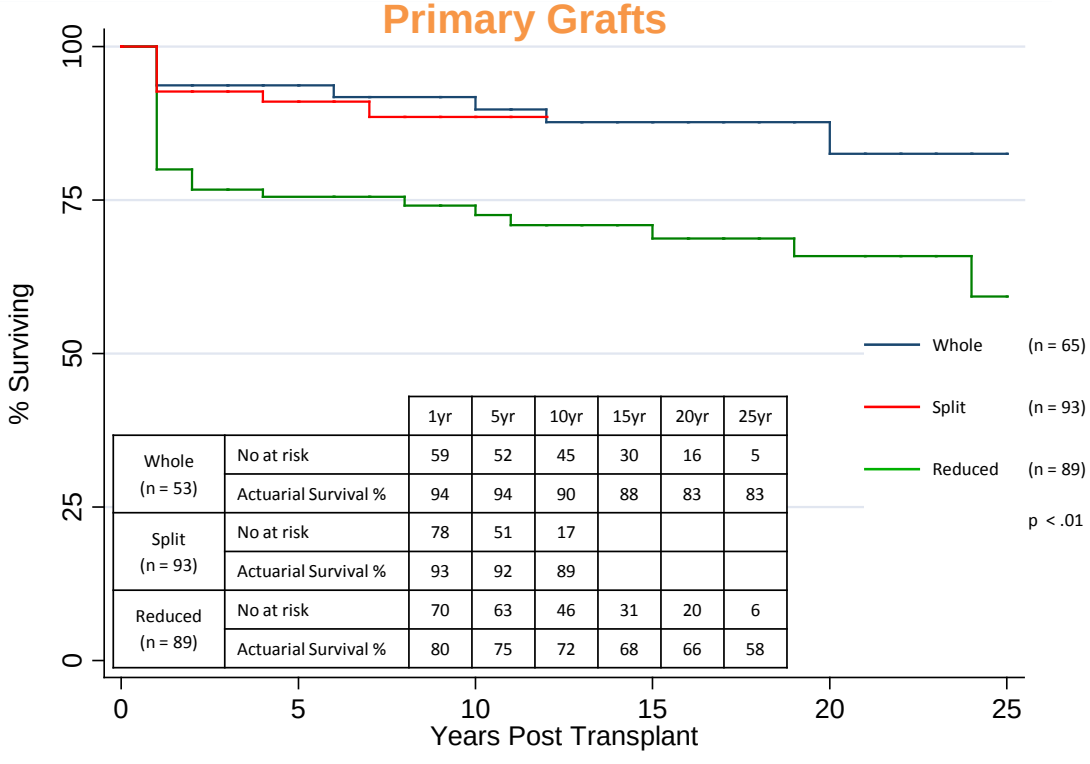
Children – Weight vs Outcome
Primary Grafts



		1yr	5yr	10yr	15yr	20yr	25yr
<10kg	No at risk	91	66	37	19	10	3
	Actuarial Survival %	83	81	80	77	77	77
>10kg	No at risk	116	96	71	42	26	8
	Actuarial Survival %	93	90	86	83	78	70

Data to 31 December 2014

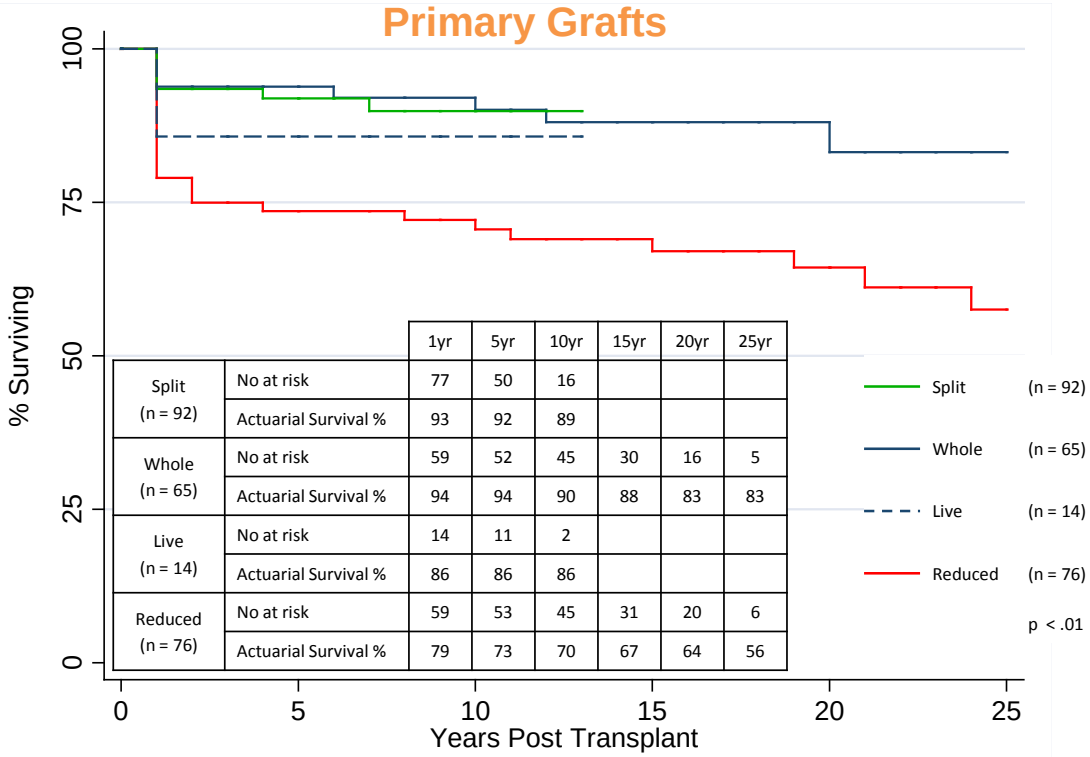
Children – Type of Transplant vs Outcome
Primary Grafts



		1yr	5yr	10yr	15yr	20yr	25yr
Whole (n = 53)	No at risk	59	52	45	30	16	5
	Actuarial Survival %	94	94	90	88	83	83
Split (n = 93)	No at risk	78	51	17			
	Actuarial Survival %	93	92	89			
Reduced (n = 89)	No at risk	70	63	46	31	20	6
	Actuarial Survival %	80	75	72	68	66	58

Data to 31 December 2014

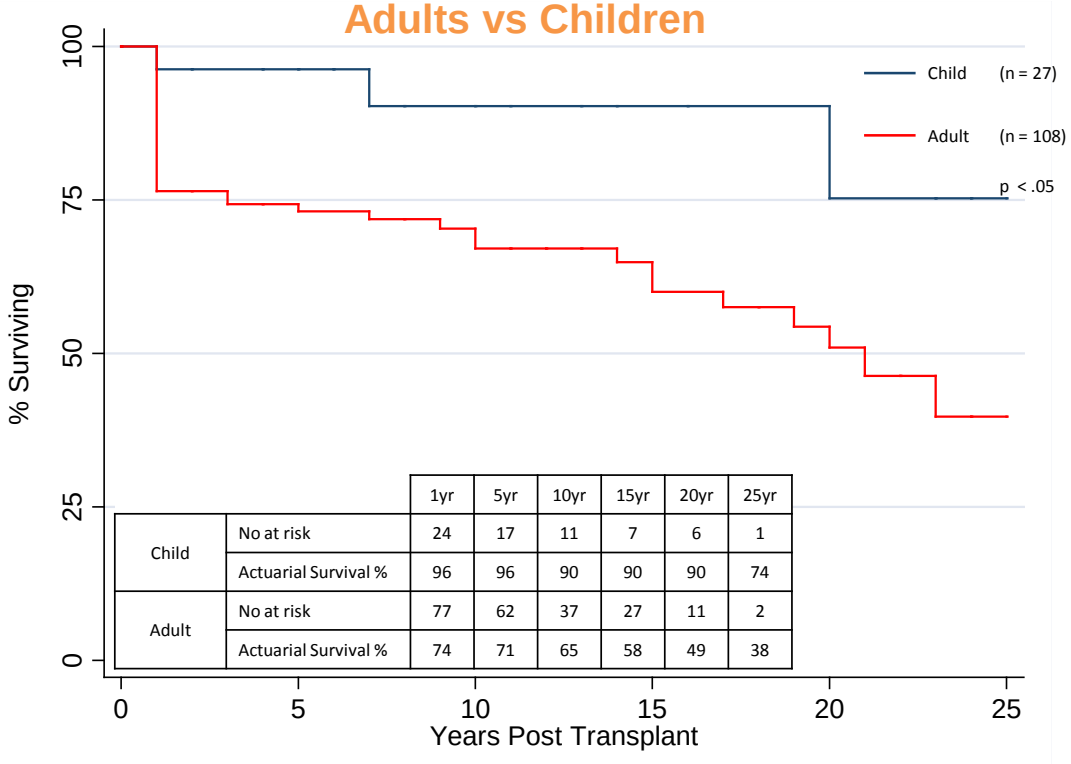
Children – Donor Type
Primary Grafts



		1yr	5yr	10yr	15yr	20yr	25yr
Split (n = 92)	No at risk	77	50	16			
	Actuarial Survival %	93	92	89			
Whole (n = 65)	No at risk	59	52	45	30	16	5
	Actuarial Survival %	94	94	90	88	83	83
Live (n = 14)	No at risk	14	11	2			
	Actuarial Survival %	86	86	86			
Reduced (n = 76)	No at risk	59	53	45	31	20	6
	Actuarial Survival %	79	73	70	67	64	56

Data to 31 December 2014

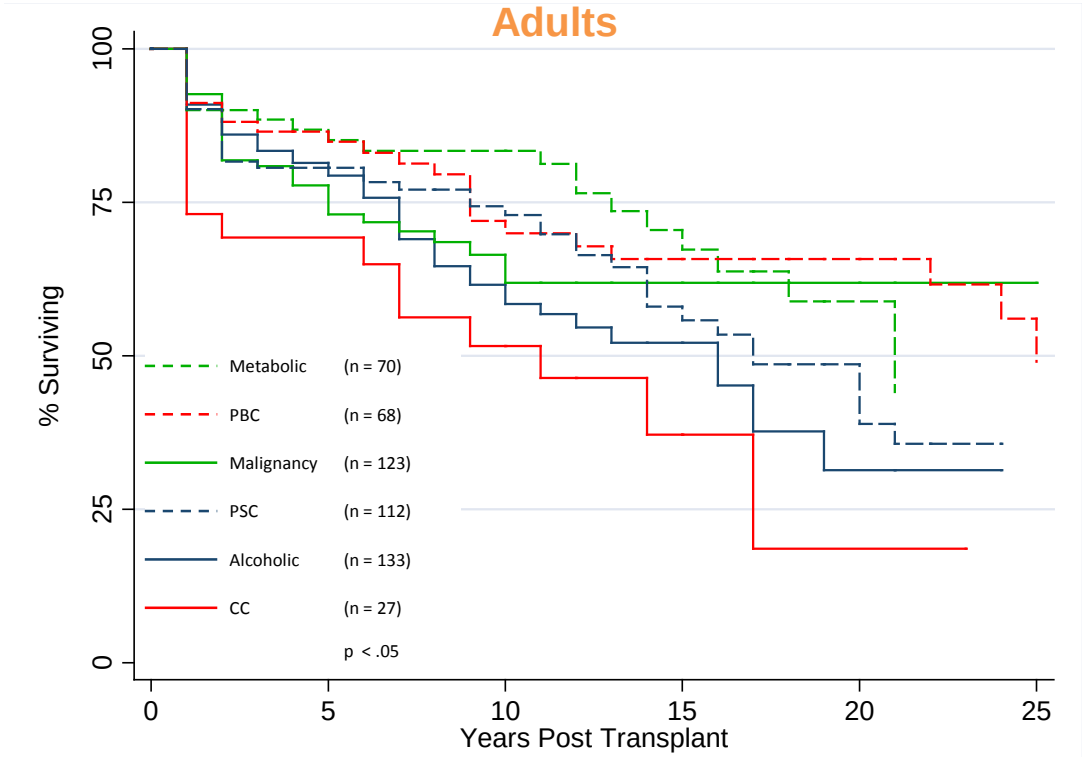
Fulminant Disease vs Outcome
Adults vs Children



		1yr	5yr	10yr	15yr	20yr	25yr
Child	No at risk	24	17	11	7	6	1
	Actuarial Survival %	96	96	90	90	90	74
Adult	No at risk	77	62	37	27	11	2
	Actuarial Survival %	74	71	65	58	49	38

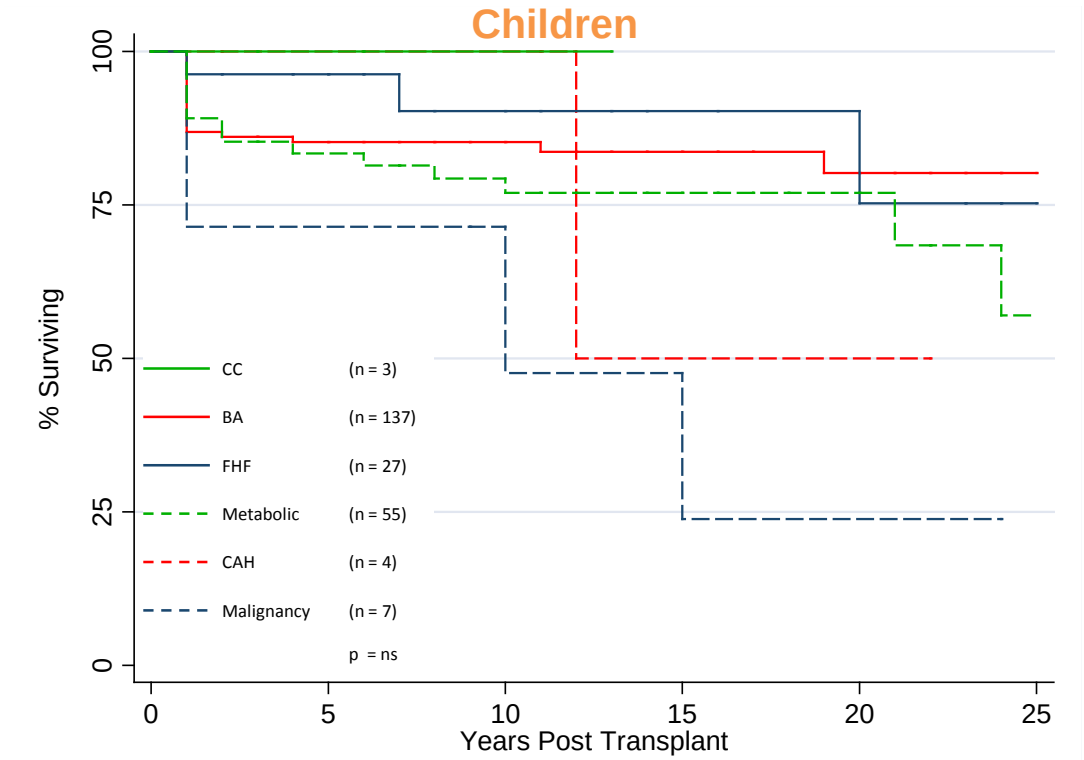
Data to 31 December 2014

Primary Disease vs Outcome
Adults



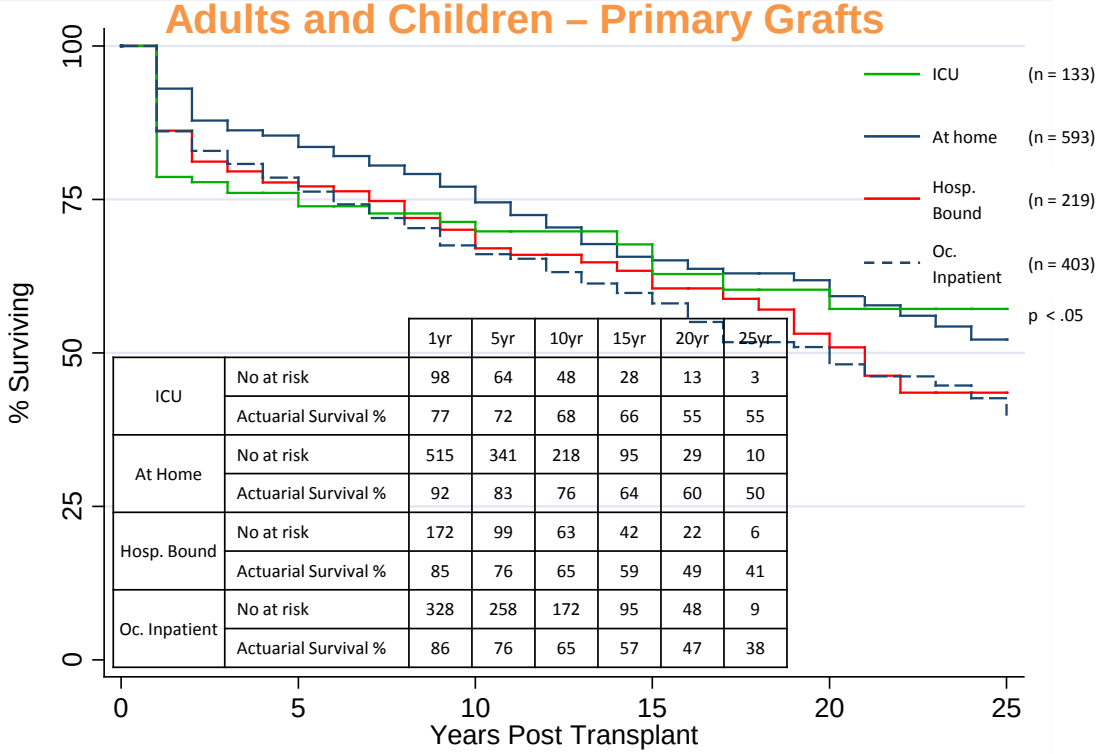
Data to 31 December 2014

Primary Disease vs Outcome
Children



Data to 31 December 2014

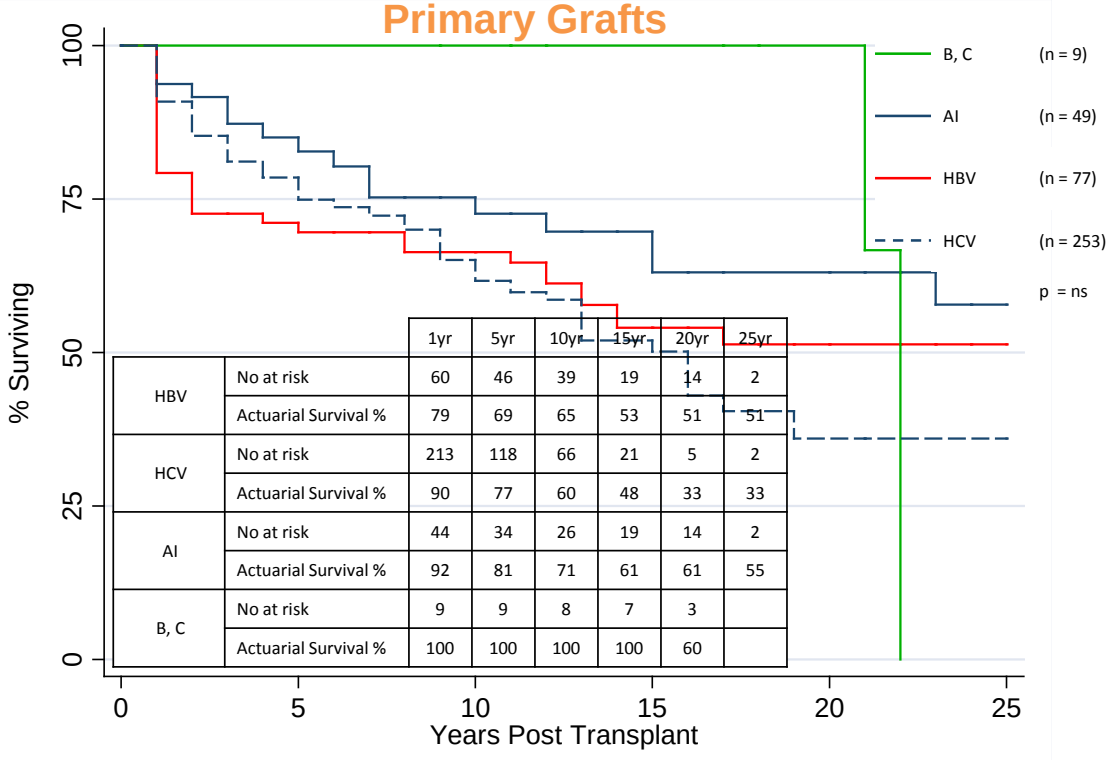
Status vs Outcome
Adults and Children – Primary Grafts



		1yr	5yr	10yr	15yr	20yr	25yr
ICU	No at risk	98	64	48	28	13	3
	Actuarial Survival %	77	72	68	66	55	55
At Home	No at risk	515	341	218	95	29	10
	Actuarial Survival %	92	83	76	64	60	50
Hosp. Bound	No at risk	172	99	63	42	22	6
	Actuarial Survival %	85	76	65	59	49	41
Oc. Inpatient	No at risk	328	258	172	95	48	9
	Actuarial Survival %	86	76	65	57	47	38

Data to 31 December 2014

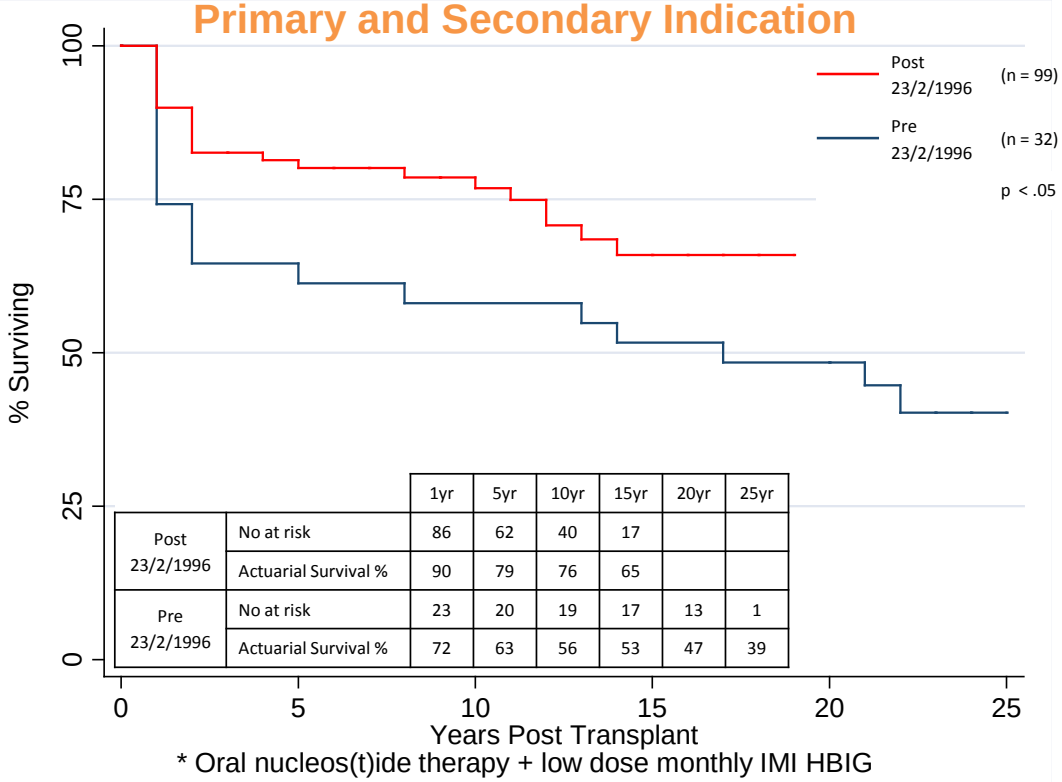
Chronic Viral, Autoimmune Disease vs Outcome
Primary Grafts



		1yr	5yr	10yr	15yr	20yr	25yr
HBV	No at risk	60	46	39	19	14	2
	Actuarial Survival %	79	69	65	53	51	51
HCV	No at risk	213	118	66	21	5	2
	Actuarial Survival %	90	77	60	48	33	33
AI	No at risk	44	34	26	19	14	2
	Actuarial Survival %	92	81	71	61	61	55
B, C	No at risk	9	9	8	7	3	
	Actuarial Survival %	100	100	100	100	60	

Data to 31 December 2014

Chronic HBV Before and After Prophylaxis Protocol*
Primary and Secondary Indication

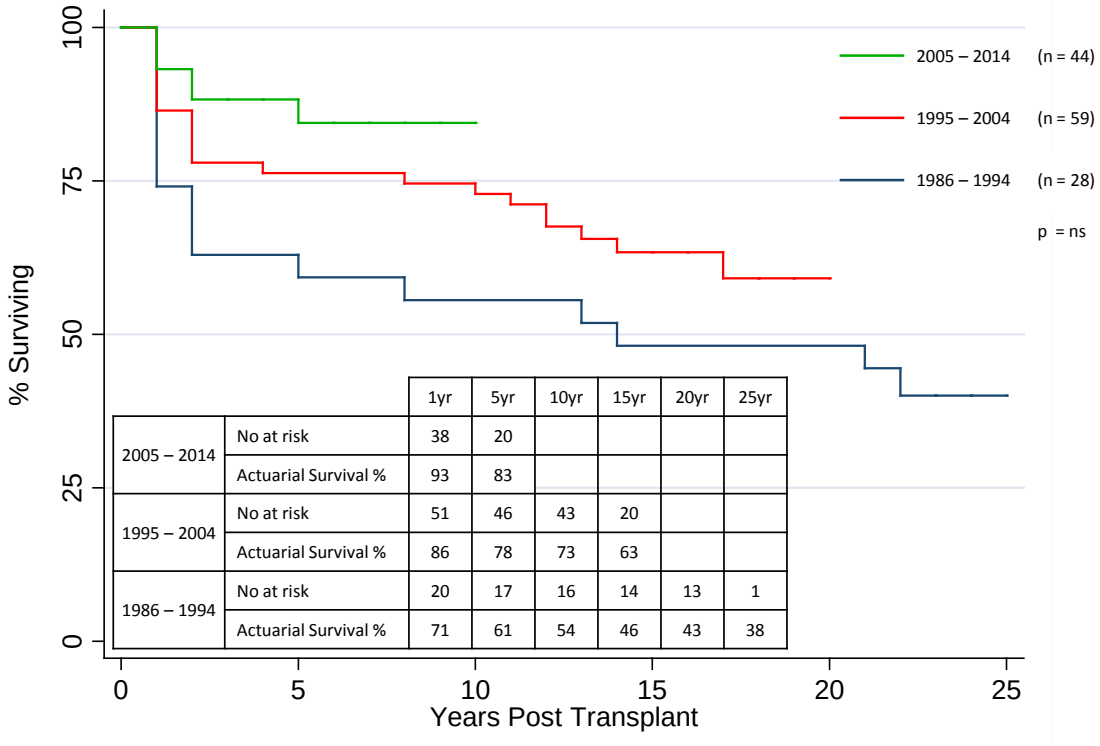


		1yr	5yr	10yr	15yr	20yr	25yr
Post 23/2/1996	No at risk	86	62	40	17		
	Actuarial Survival %	90	79	76	65		
Pre 23/2/1996	No at risk	23	20	19	17	13	1
	Actuarial Survival %	72	63	56	53	47	39

* Oral nucleos(t)ide therapy + low dose monthly IMI HBIG

Data to 31 December 2014

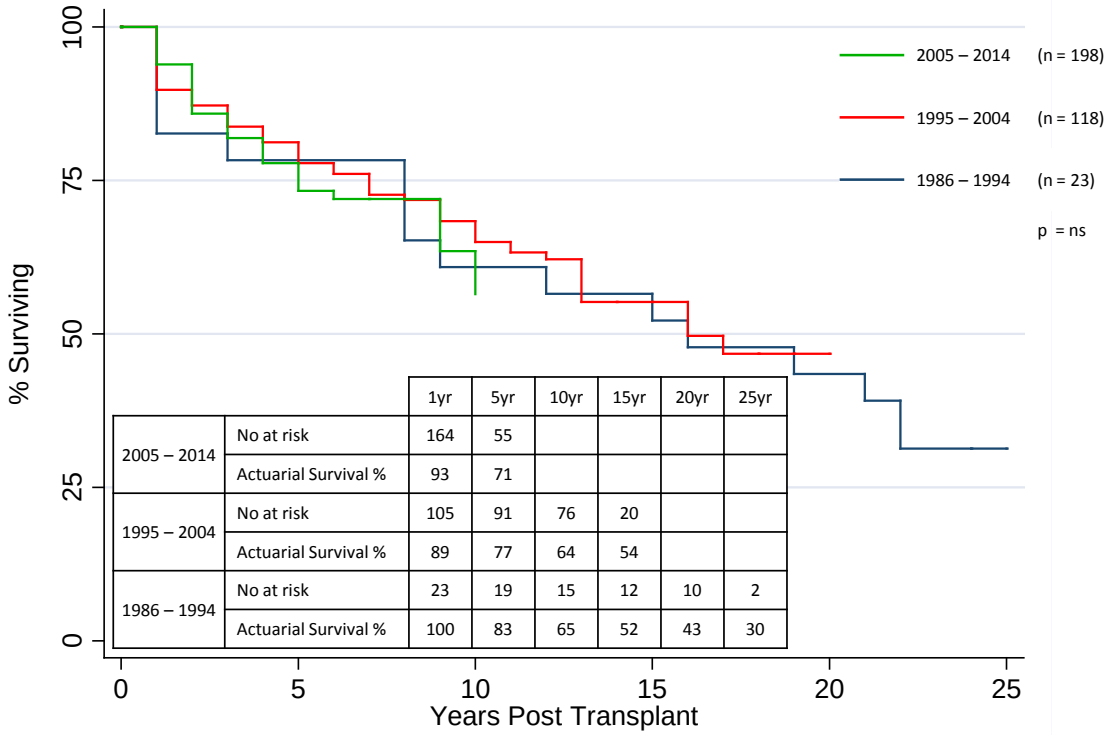
Chronic HBV (Primary and Secondary) vs Era



		1yr	5yr	10yr	15yr	20yr	25yr
2005 – 2014	No at risk	38	20				
	Actuarial Survival %	93	83				
1995 – 2004	No at risk	51	46	43	20		
	Actuarial Survival %	86	78	73	63		
1986 – 1994	No at risk	20	17	16	14	13	1
	Actuarial Survival %	71	61	54	46	43	38

Data to 31 December 2014

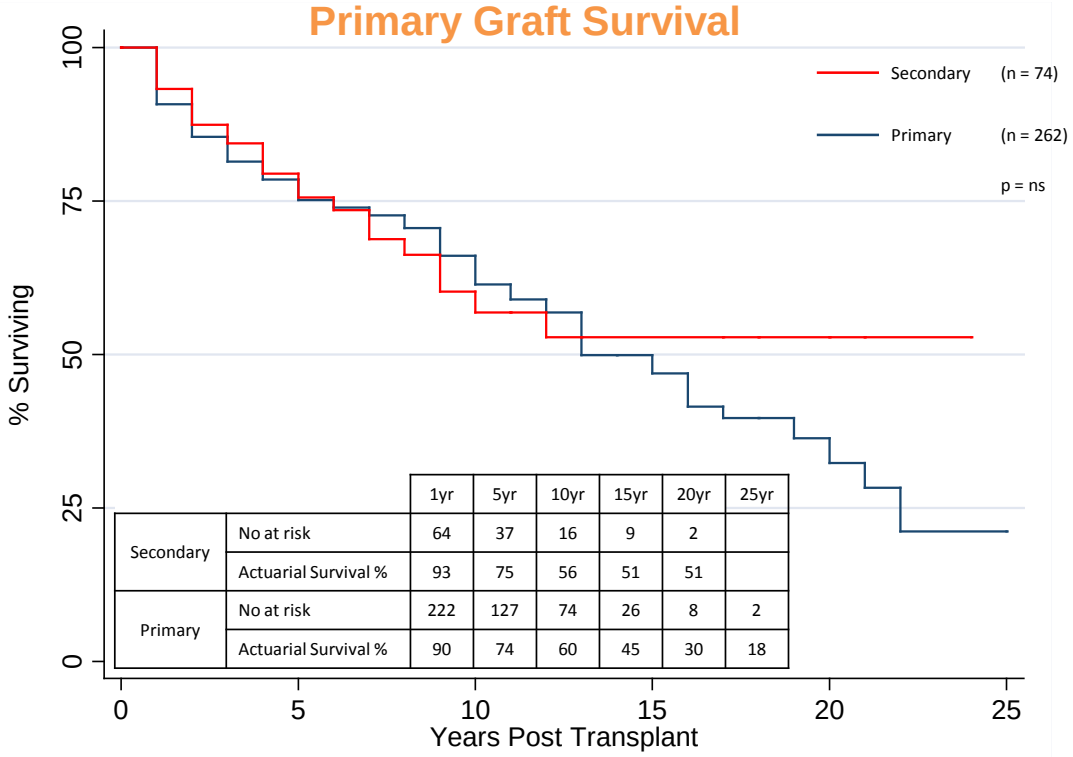
Chronic HCV (Primary and Secondary) vs Era



		1yr	5yr	10yr	15yr	20yr	25yr
2005 – 2014	No at risk	164	55				
	Actuarial Survival %	93	71				
1995 – 2004	No at risk	105	91	76	20		
	Actuarial Survival %	89	77	64	54		
1986 – 1994	No at risk	23	19	15	12	10	2
	Actuarial Survival %	100	83	65	52	43	30

Data to 31 December 2014

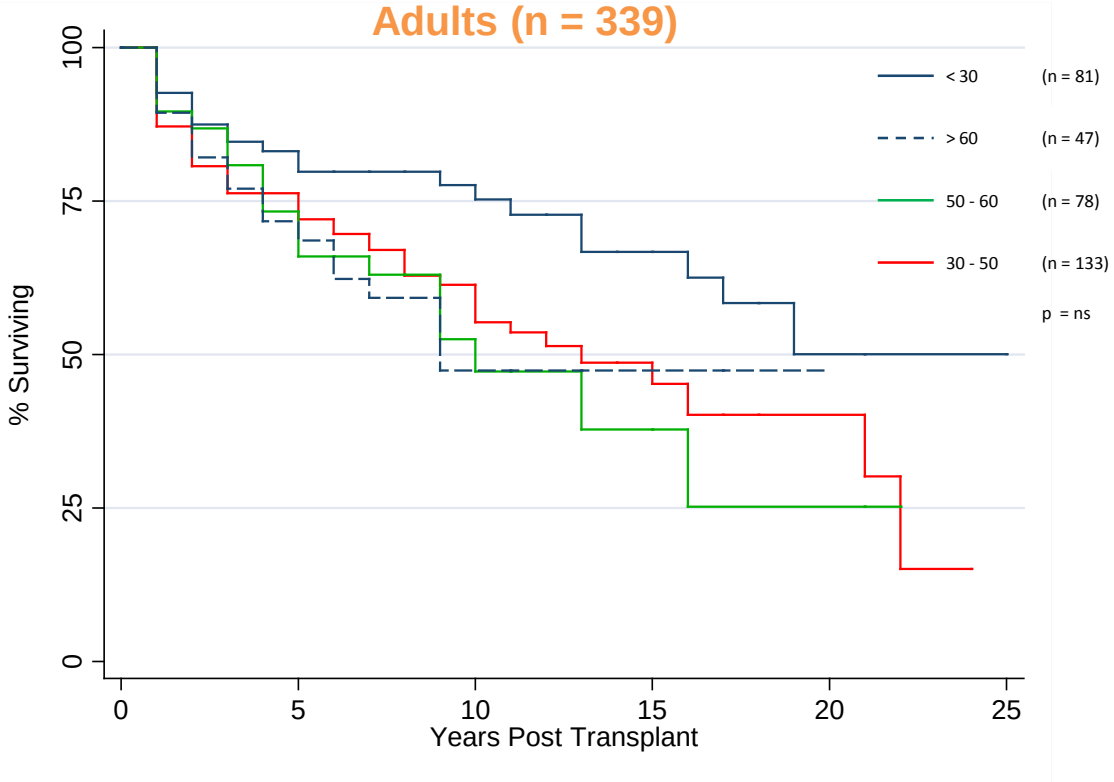
Chronic HCV Primary vs Secondary Indication Primary Graft Survival



		1yr	5yr	10yr	15yr	20yr	25yr
Secondary	No at risk	64	37	16	9	2	
	Actuarial Survival %	93	75	56	51	51	
Primary	No at risk	222	127	74	26	8	2
	Actuarial Survival %	90	74	60	45	30	18

Data to 31 December 2014

HCV vs Donor Age vs Primary Graft Outcome
Adults (n = 339)



Data to 31 December 2014

HCV vs Donor Age vs Primary Graft Outcome
Adults (n = 339)

		1yr	5yr	10yr	15yr	20yr	25yr
>60 (n = 47)	No at risk	37	22	11	3		
	Actuarial Survival %	88	67	47	47		
<30 (n = 81)	No at risk	72	45	30	16	4	2
	Actuarial Survival %	92	79	74	65	47	47
50 - 60 (n = 78)	No at risk	64	27	8	3	2	
	Actuarial Survival %	88	64	45	36	24	
30 - 50 (n = 133)	No at risk	108	61	34	9	4	
	Actuarial Survival %	86	71	54	43	38	

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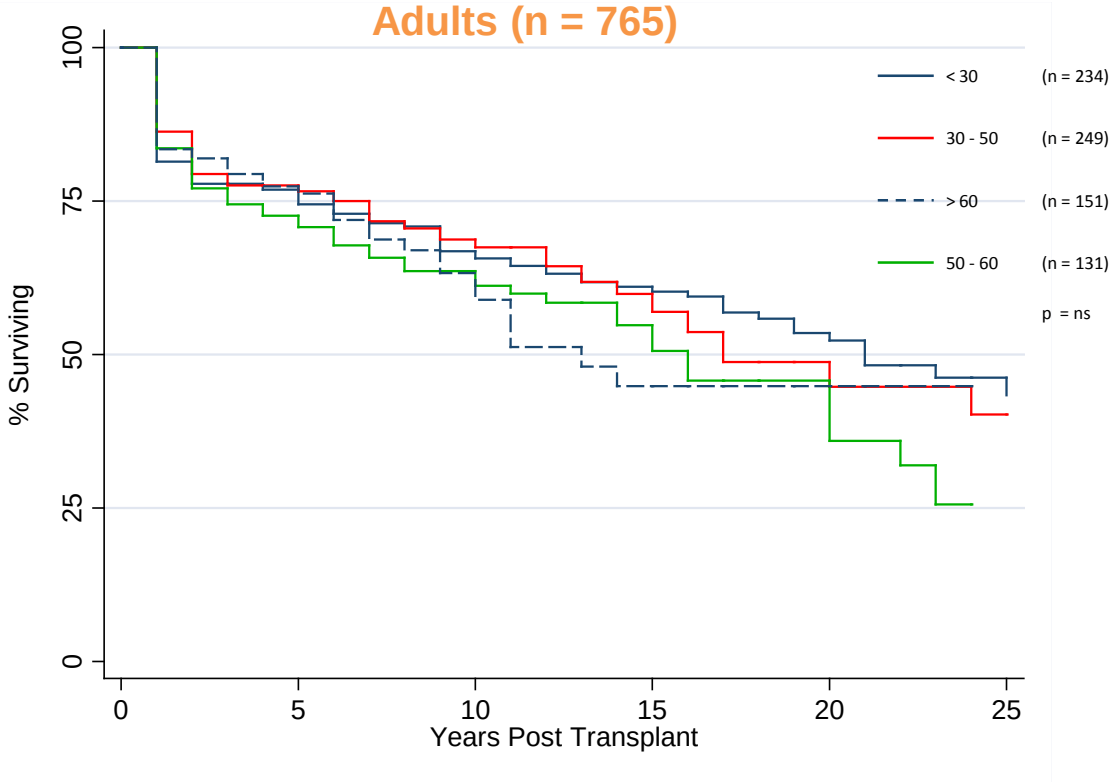
Data to 31 December 2014

Non HCV vs Donor Age vs Primary Graft Outcome Adults (n = 765)



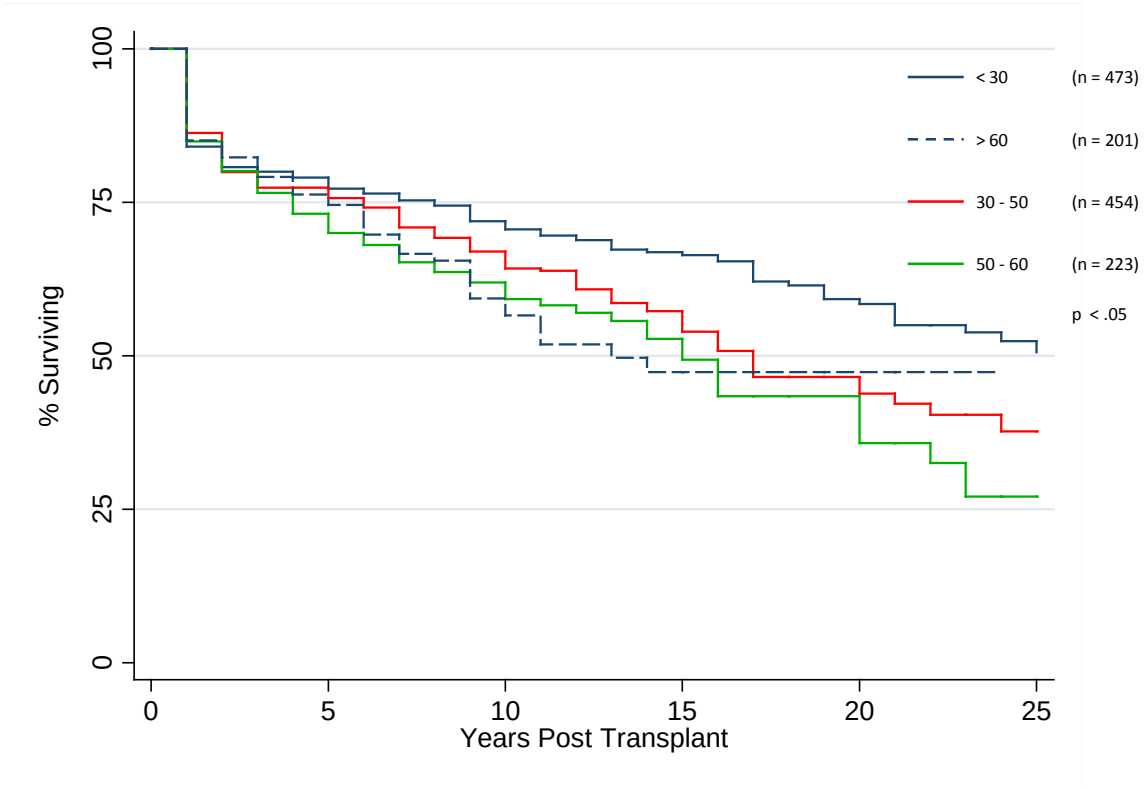
Data to 31 December 2014

Non HCV vs Donor Age vs Primary Graft Outcome Adults (n = 765)

		1yr	5yr	10yr	15yr	20yr	25yr
<30 (n = 234)	No at risk	182	148	108	73	39	9
	Actuarial Survival %	80	73	64	59	51	41
30 - 50 (n = 249)	No at risk	200	145	99	52	18	5
	Actuarial Survival %	86	76	66	56	43	39
>60 (n = 151)	No at risk	113	53	23	10	3	
	Actuarial Survival %	83	75	57	43	43	
50 - 60 (n = 131)	No at risk	102	71	48	21	14	
	Actuarial Survival %	81	69	59	48	43	

Data to 31 December 2014

Donor Age vs Primary Graft Outcome



Data to 31 December 2014

Donor Age vs Primary Graft Outcome

		1yr	5yr	10yr	15yr	20yr	25yr
<30 (n = 473)	No at risk	377	290	206	131	68	18
	Actuarial Survival %	83	76	70	65	57	49
30 - 50 (n = 454)	No at risk	366	246	152	69	27	7
	Actuarial Survival %	86	75	63	52	42	36
50 - 60 (n = 223)	No at risk	176	107	59	25	12	
	Actuarial Survival %	83	68	60	47	33	
>60 (n = 201)	No at risk	153	77	36	15	4	
	Actuarial Survival %	84	73	55	45	45	

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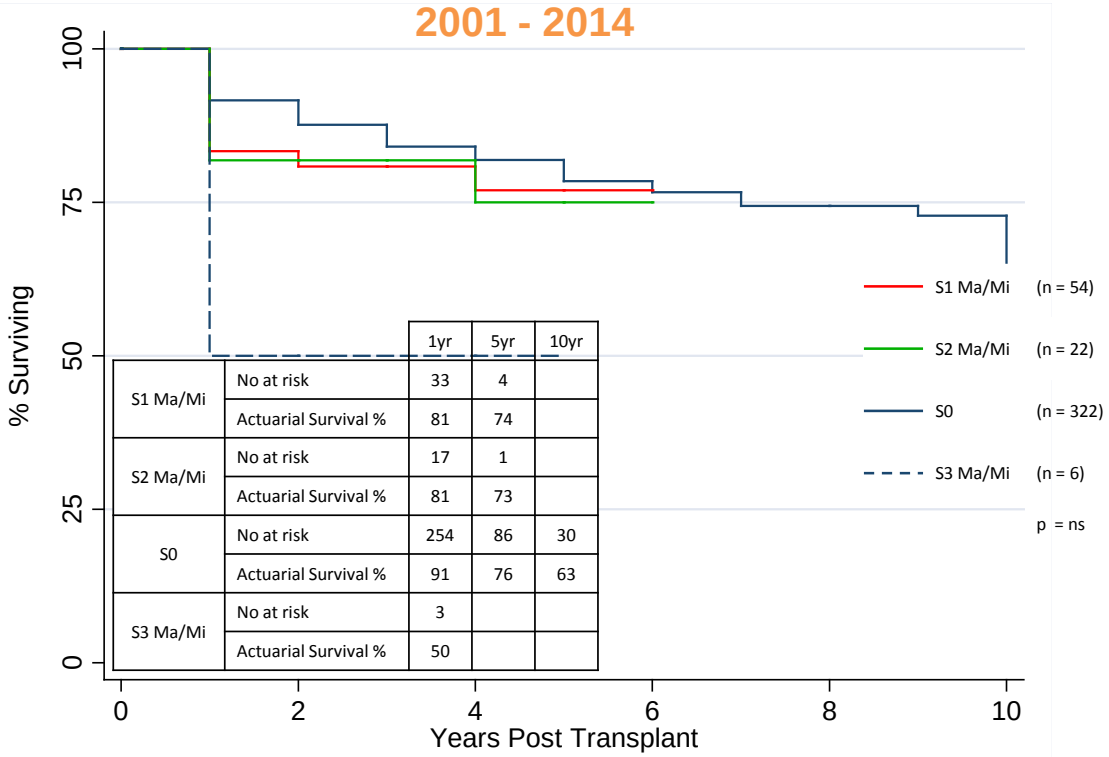
Data to 31 December 2014

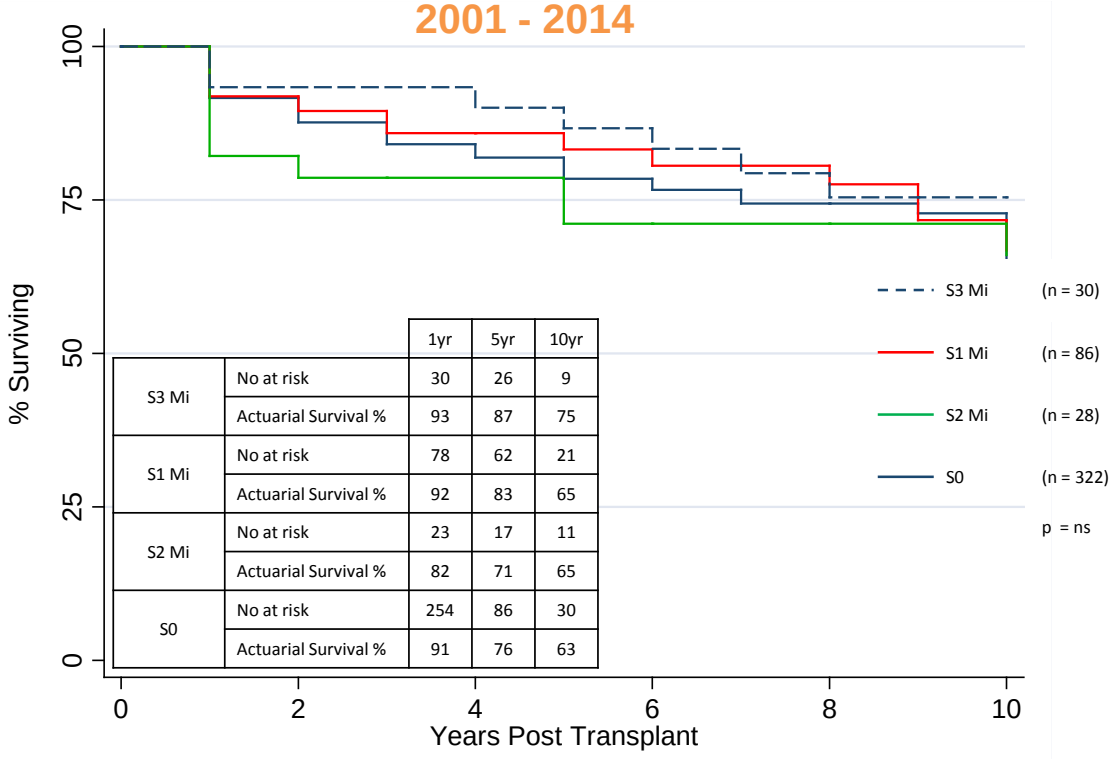
Macro Steatosis vs Primary Graft Outcome (Adults) 2001 - 2014



		1yr	5yr	10yr
S1 Ma/Mi	No at risk	33	4	
	Actuarial Survival %	81	74	
S2 Ma/Mi	No at risk	17	1	
	Actuarial Survival %	81	73	
S0	No at risk	254	86	30
	Actuarial Survival %	91	76	63
S3 Ma/Mi	No at risk	3		
	Actuarial Survival %	50		

Data to 31 December 2014

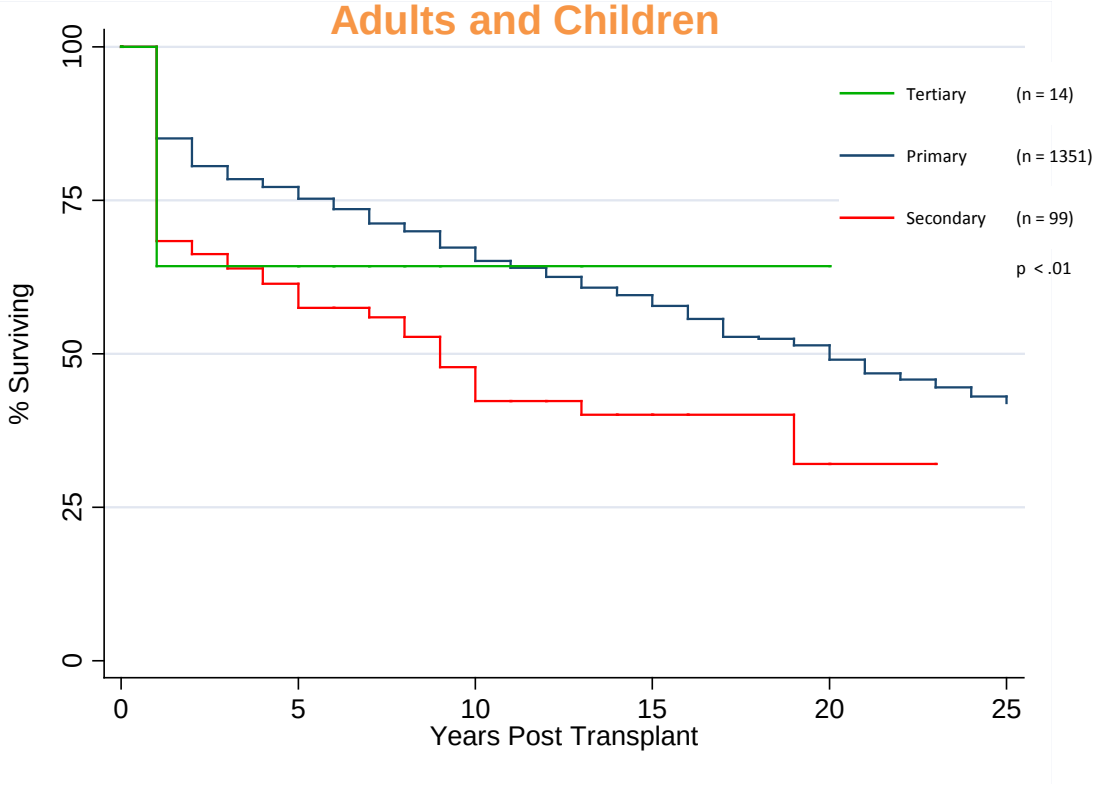
Micro Steatosis vs Primary Graft Outcome (Adults) 2001 - 2014



		1yr	5yr	10yr
S3 Mi	No at risk	30	26	9
	Actuarial Survival %	93	87	75
S1 Mi	No at risk	78	62	21
	Actuarial Survival %	92	83	65
S2 Mi	No at risk	23	17	11
	Actuarial Survival %	82	71	65
S0	No at risk	254	86	30
	Actuarial Survival %	91	76	63

Data to 31 December 2014

Graft Survival by Graft No
Adults and Children



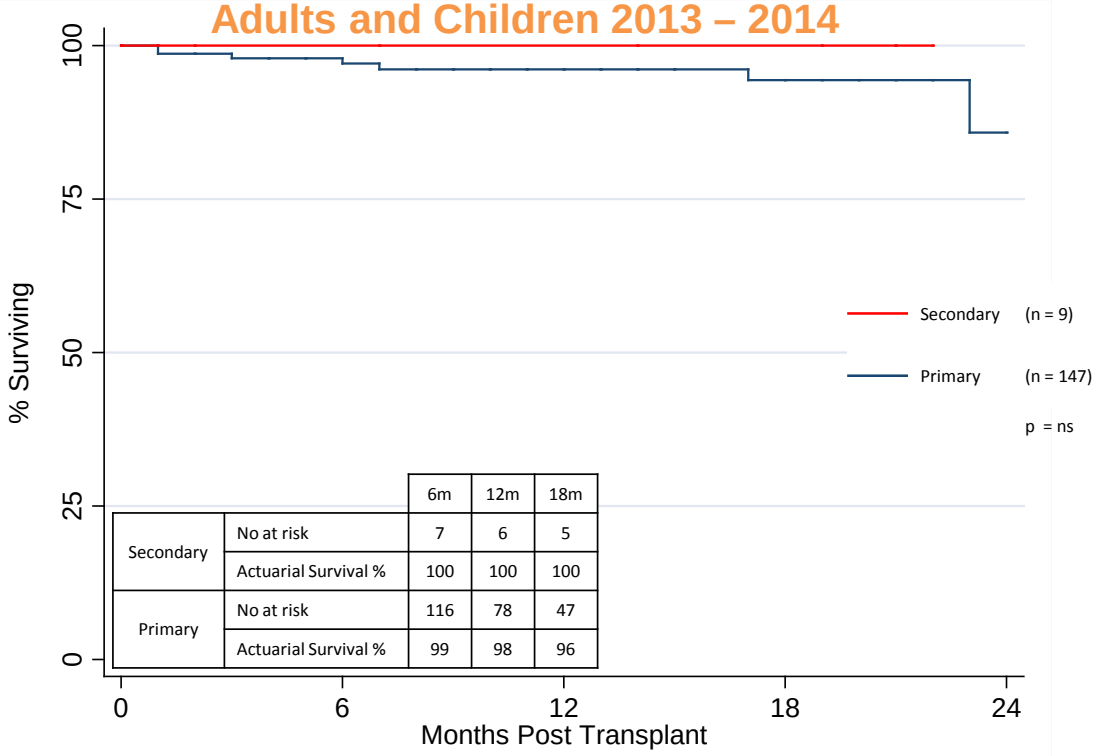
Data to 31 December 2014

Graft Survival by Graft No
Adults and Children

		1yr	5yr	10yr	15yr	20yr	25yr
Tertiary (n = 14)	No at risk	14	8	3	2		
	Actuarial Survival %	64	64	64	64		
Primary (n = 1351)	No at risk	1072	720	452	240	111	25
	Actuarial Survival %	84	76	64	56	47	41
Secondary (n = 99)	No at risk	64	41	22	12	6	1
	Actuarial Survival %	67	56	41	39	30	30

Data to 31 December 2014

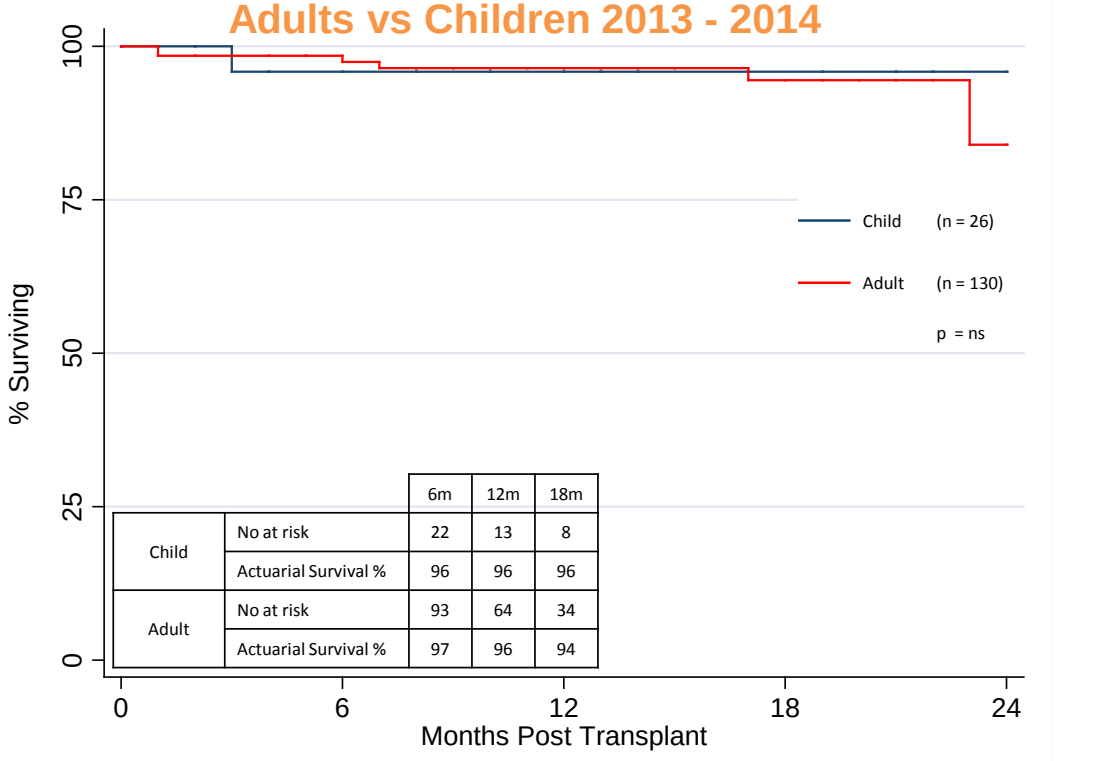
Graft Survival by Graft No
Adults and Children 2013 – 2014



		6m	12m	18m
Secondary	No at risk	7	6	5
	Actuarial Survival %	100	100	100
Primary	No at risk	116	78	47
	Actuarial Survival %	99	98	96

Data to 31 December 2014

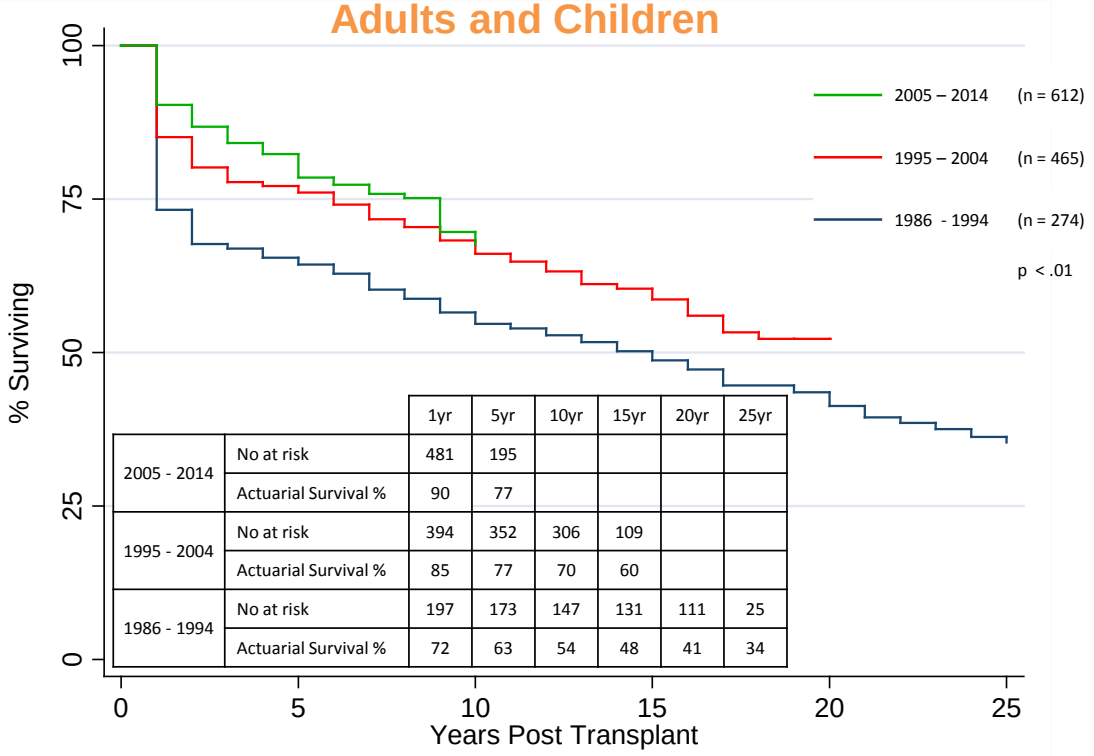
Graft Survival
Adults vs Children 2013 - 2014



		6m	12m	18m
Child	No at risk	22	13	8
	Actuarial Survival %	96	96	96
Adult	No at risk	93	64	34
	Actuarial Survival %	97	96	94

Data to 31 December 2014

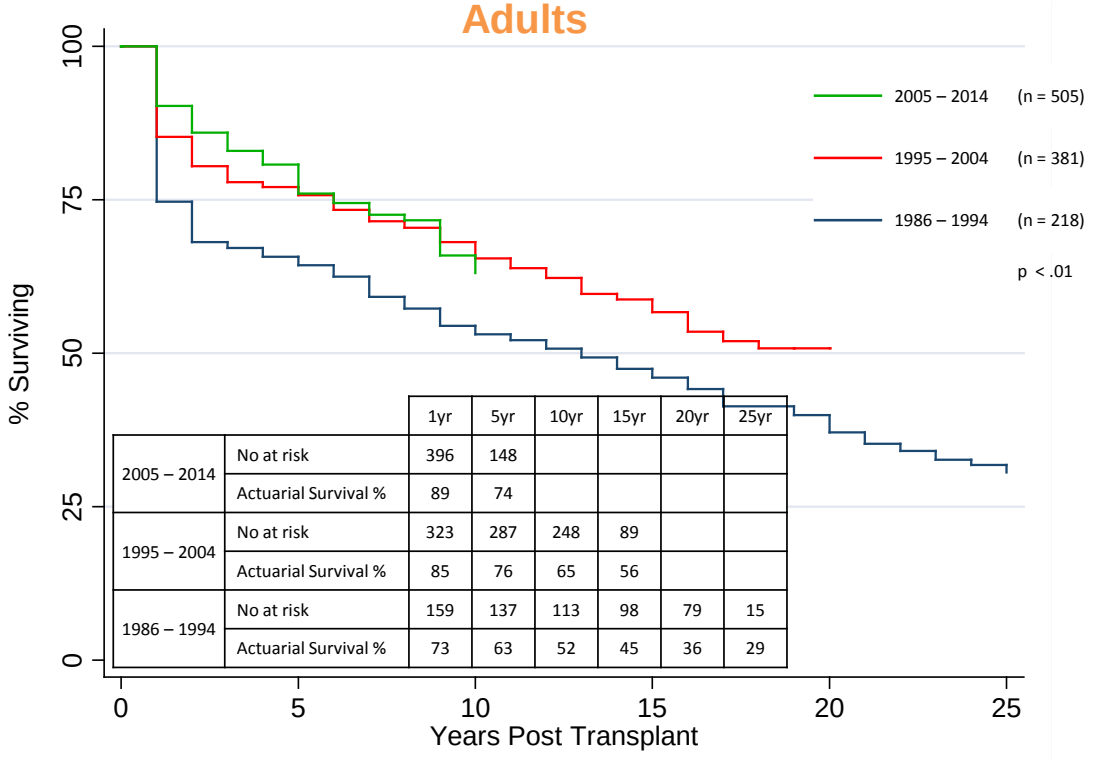
Primary Graft Survival by Era
Adults and Children



		1yr	5yr	10yr	15yr	20yr	25yr
2005 - 2014	No at risk	481	195				
	Actuarial Survival %	90	77				
1995 - 2004	No at risk	394	352	306	109		
	Actuarial Survival %	85	77	70	60		
1986 - 1994	No at risk	197	173	147	131	111	25
	Actuarial Survival %	72	63	54	48	41	34

Data to 31 December 2014

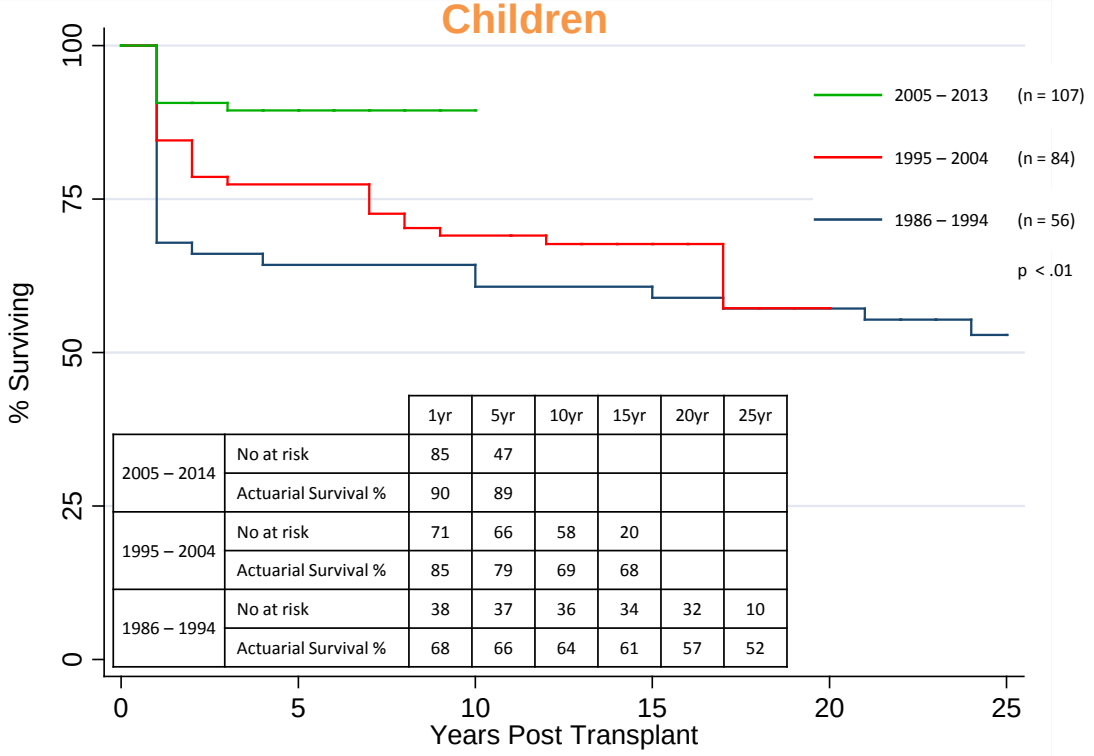
Primary Graft Survival by Era
Adults



		1yr	5yr	10yr	15yr	20yr	25yr
2005 – 2014	No at risk	396	148				
	Actuarial Survival %	89	74				
1995 – 2004	No at risk	323	287	248	89		
	Actuarial Survival %	85	76	65	56		
1986 – 1994	No at risk	159	137	113	98	79	15
	Actuarial Survival %	73	63	52	45	36	29

Data to 31 December 2014

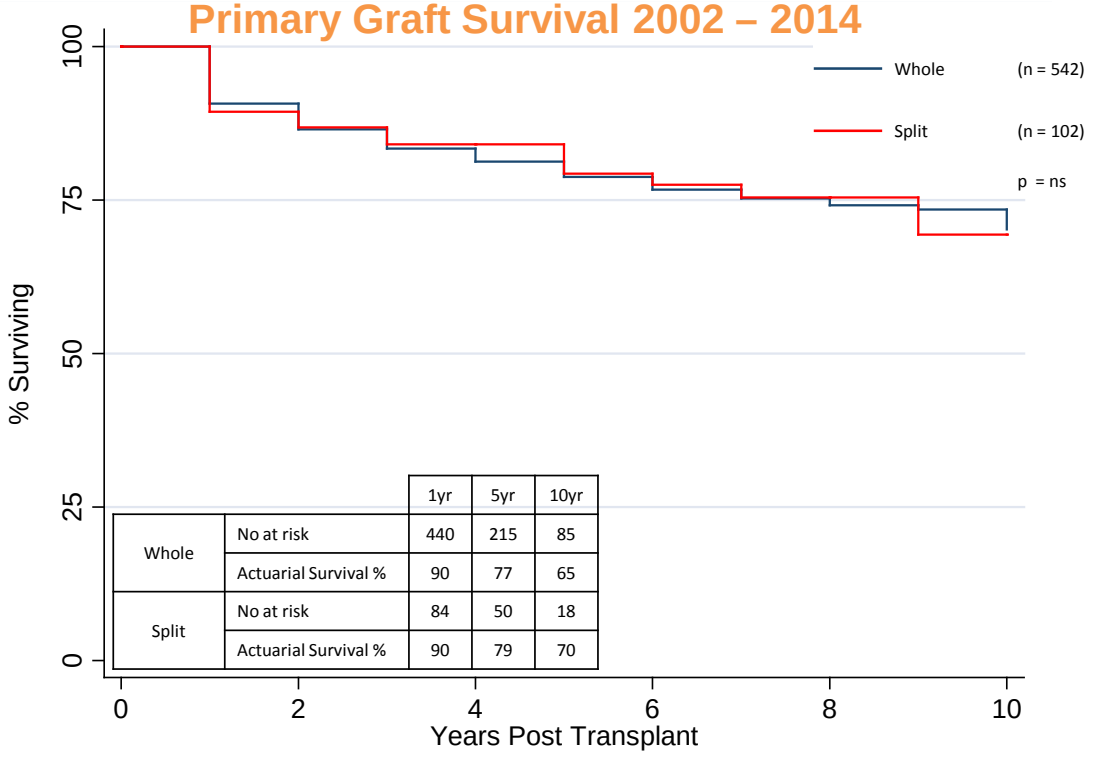
Primary Graft Survival by Era
Children



		1yr	5yr	10yr	15yr	20yr	25yr
2005 – 2014	No at risk	85	47				
	Actuarial Survival %	90	89				
1995 – 2004	No at risk	71	66	58	20		
	Actuarial Survival %	85	79	69	68		
1986 – 1994	No at risk	38	37	36	34	32	10
	Actuarial Survival %	68	66	64	61	57	52

Data to 31 December 2014

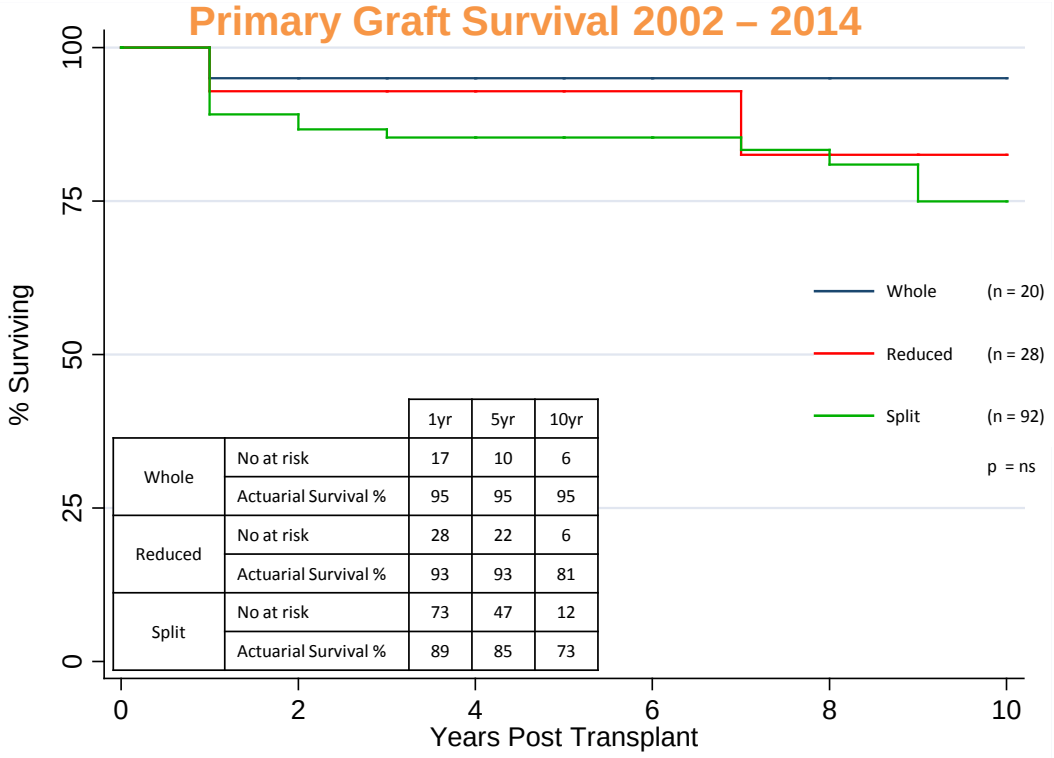
Split vs Whole Grafts (Adults)
Primary Graft Survival 2002 – 2014



		1yr	5yr	10yr
Whole	No at risk	440	215	85
	Actuarial Survival %	90	77	65
Split	No at risk	84	50	18
	Actuarial Survival %	90	79	70

Data to 31 December 2014

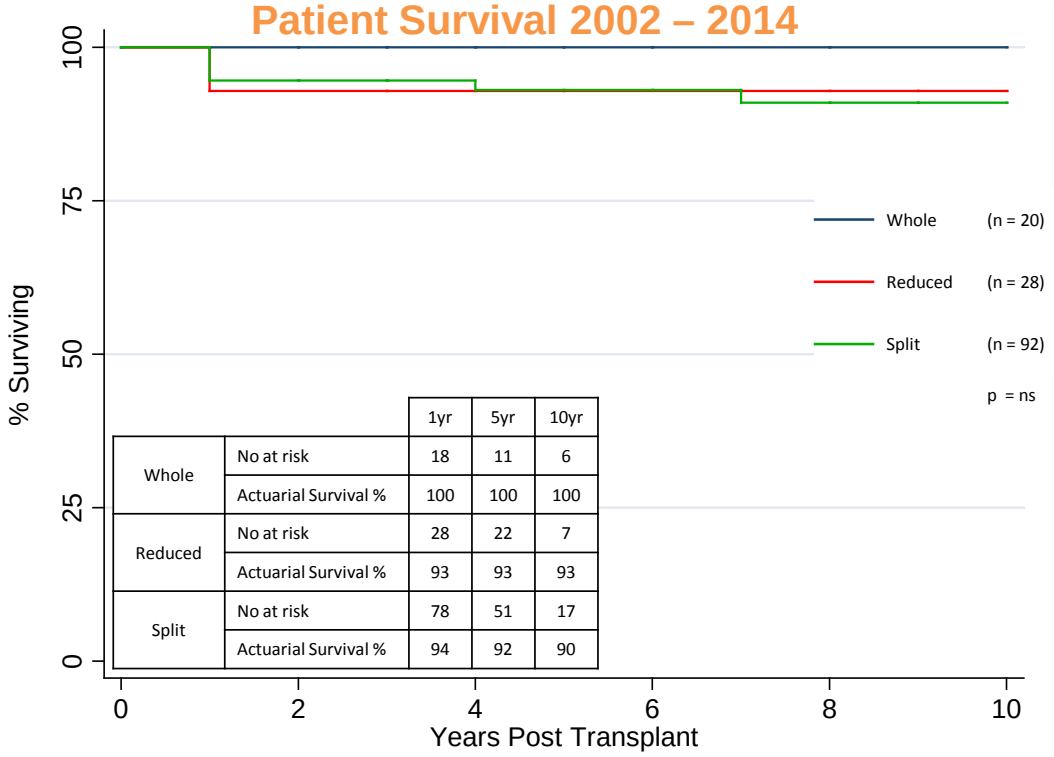
Split vs Reduced vs Whole Grafts (Children)
Primary Graft Survival 2002 – 2014



		1yr	5yr	10yr
Whole	No at risk	17	10	6
	Actuarial Survival %	95	95	95
Reduced	No at risk	28	22	6
	Actuarial Survival %	93	93	81
Split	No at risk	73	47	12
	Actuarial Survival %	89	85	73

Data to 31 December 2014

Split vs Reduced vs Whole Grafts (Children)
Patient Survival 2002 – 2014



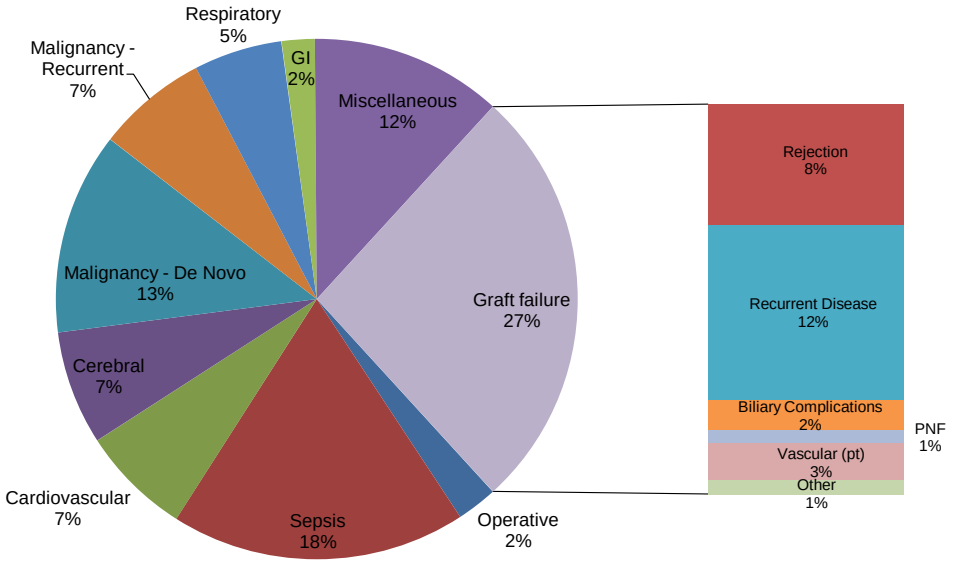
		1yr	5yr	10yr
Whole	No at risk	18	11	6
	Actuarial Survival %	100	100	100
Reduced	No at risk	28	22	7
	Actuarial Survival %	93	93	93
Split	No at risk	78	51	17
	Actuarial Survival %	94	92	90

Data to 31 December 2014

Cause of Death

Graft Failure		116 (26.5%)
	Rejection: Chronic	26
	Rejection: Acute	10
	Recurrent disease	
	Hepatitis C	36
	Hepatitis B	10
	Vascular	11
	Biliary Complications	9
	PNF	4
	NASH	2
	Other	8
Sepsis		80 (18.3%)
Malignancy		85 (19.4%)
	Recurrent disease	30
	De Novo	54
	Transferred from donor	1
Cerebral		31 (7.1%)
Cardiovascular		30 (6.8%)
Respiratory		24 (5.5%)
Multi-organ Failure		11 (2.5%)
Operative		11 (2.5%)
Vascular		11 (2.5%)
Gastrointestinal		9 (2.1%)
GVHD		4 (0.9%)
Renal Failure		4 (0.9%)
Other		22 (5.0%)
TOTAL		438 (32.4% of all patients)

Cause of Death (n = 438)



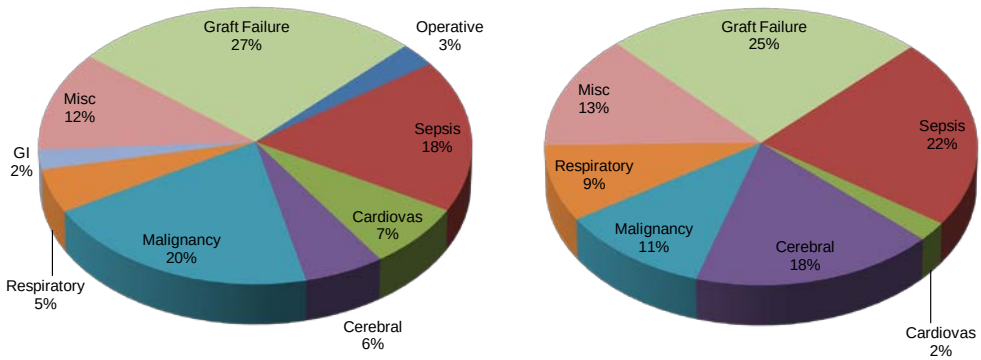
 Data to 31 December 2014

438 patients, or 32.4% of all patients transplanted, have died. Of these, 80 (18.3%) have died due to sepsis and 116 (26.5%) from graft failure.

Of the 116 cases of death due to graft failure, 36 (31.0%) patients lost grafts due to rejection, 52 (44.8%) from recurrent disease and 4 (3.4%) from primary non function (PNF).

Cause of Death (n = 438)

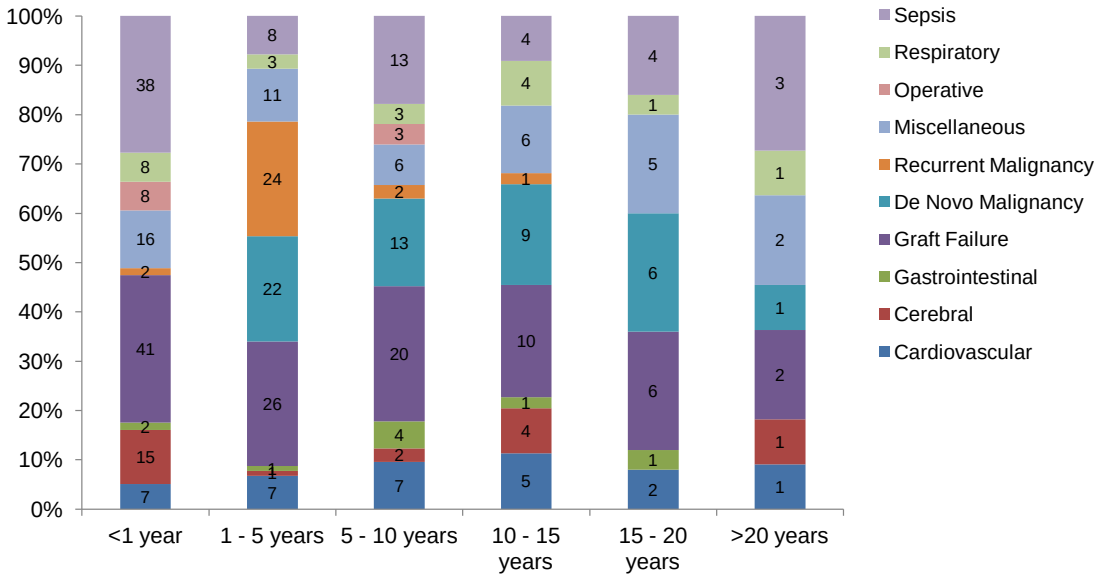
Adults (n = 393) Children (n = 45)



 Data to 31 December 2014

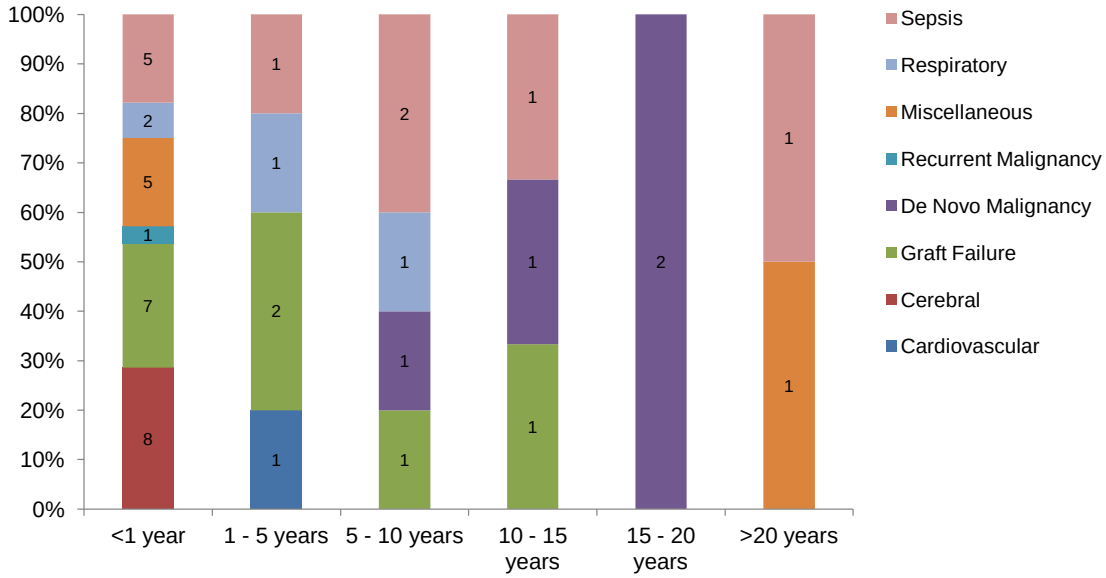
The majority of adult deaths were due to Graft Failure (105 or 26.8%), Malignancy (80 or 20.4%) and Sepsis (70 or 17.9%). The majority of child deaths were due to Graft Failure (11 or 24.4%), Sepsis (10 or 22.2%) and Cerebrovascular accident (8 or 17.8%).

Cause of Death by Time - Adults (n = 393; 35.6% of adults)



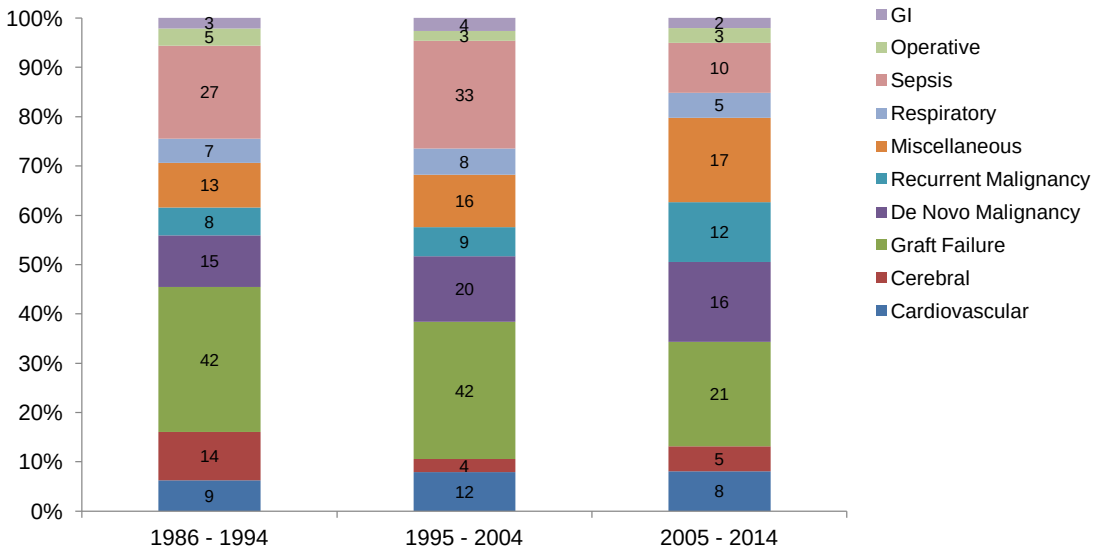
Data to 31 December 2014

Cause of Death by Time - Children (n = 45; 18.2% of children)



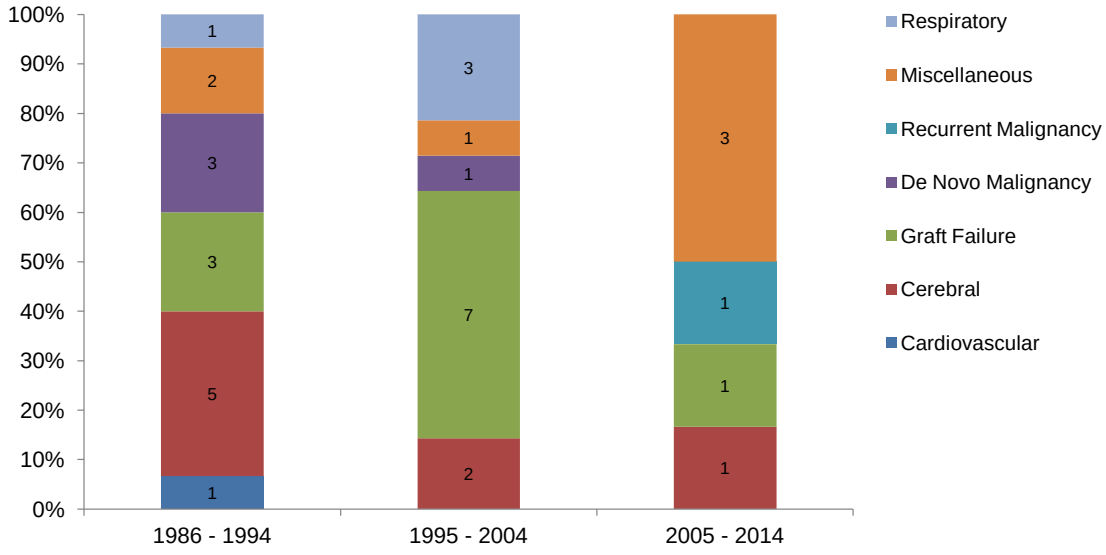
Data to 31 December 2014

Cause of Death by Transplant Era - Adults (n = 393; 35.6% of adults)



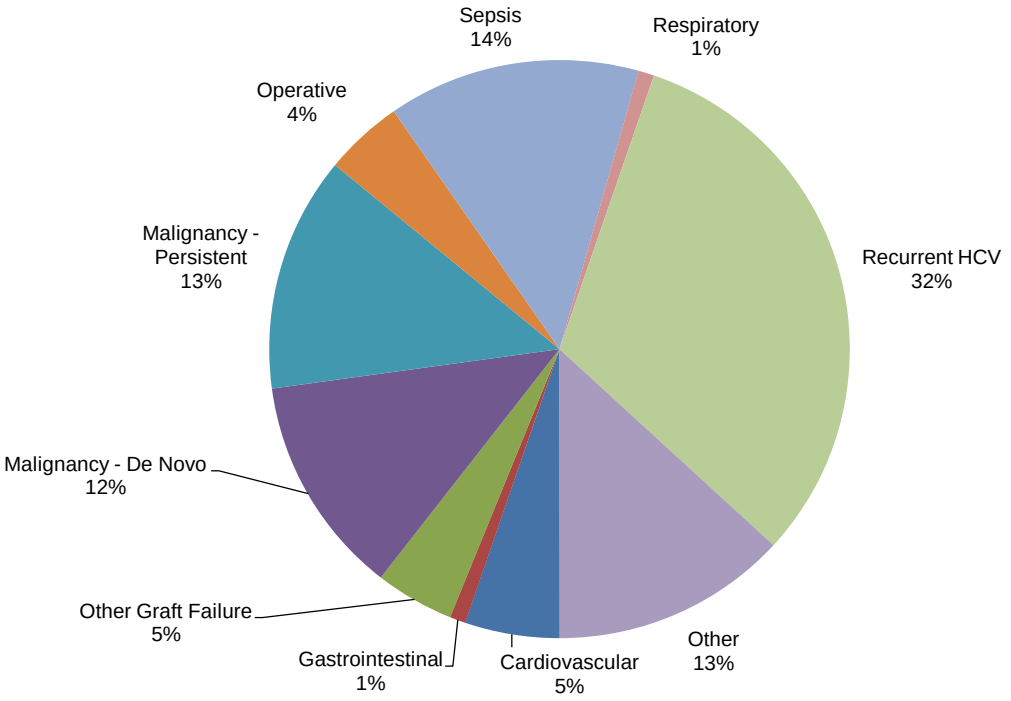
Data to 31 December 2014

Cause of Death by Transplant Era - Children (n = 45; 18.2% of children)



Data to 31 December 2014

Cause of Death – HCV Recipients (n = 114)

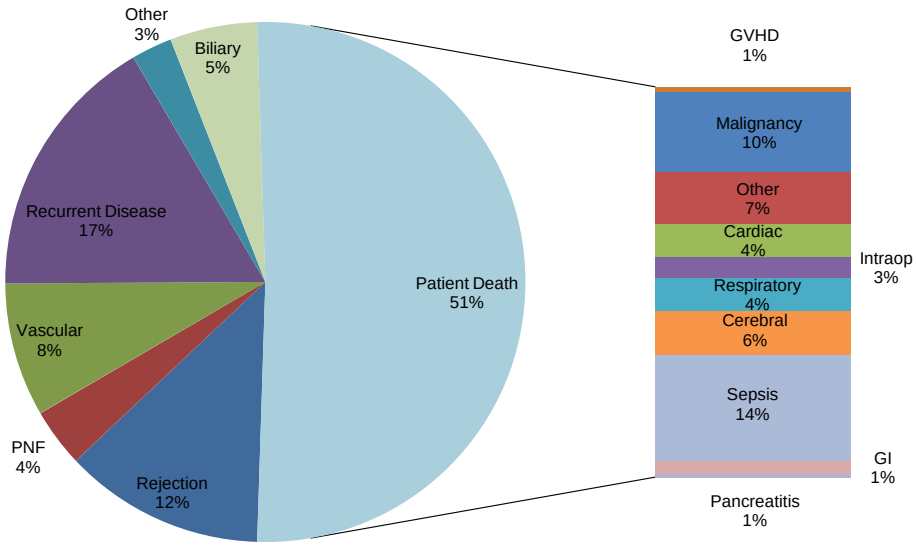


Data to 31 December 2014

Cause of Graft Failure

Rejection		69 (12.5%)
	Acute	15
	Chronic	47
	ABO incompatibility	6
	Subacute	1
Vascular complications		46 (8.3%)
	Hepatic artery thrombosis	36
	Portal vein thrombosis	4
	Graft infarction	1
	Dissection in donor	1
	Graft compression	1
	Hepatic vein stenosis	1
	Rupture	1
	Vena Cava obstruction	1
Recurrent disease		92 (16.7%)
	Hep C	44
	Malignancy	26
	Hep B	13
	NASH	3
	PSC	4
	Alcohol	1
	Cryptogenic cirrhosis	
Primary non function		20 (3.6%)
	Graft infarction	7
	Severe steatosis	2
	Antibody mediated rejection	1
	Arterial thrombosis	1
	Blood loss	1
	HA occlusion	1
	Preservation injury	1
	Profound hypotension	1
	Vena	1
	Other	4
Patient deaths		282 (51.0%)
	Sepsis	72
	Malignancy	58
	Cerebral	32
	Cardiovascular	24
	Respiratory failure	24
	Intraoperative	15
	GI haemorrhage	8
	GVHD	4
	Pancreatitis	3
	Other	42
Biliary complications		30 (5.4%)
	Biliary strictures	21
	Other	9
Other		14 (2.5%)
TOTAL		553 (37.7%) of all grafts

Cause of Graft Failure (n = 553)



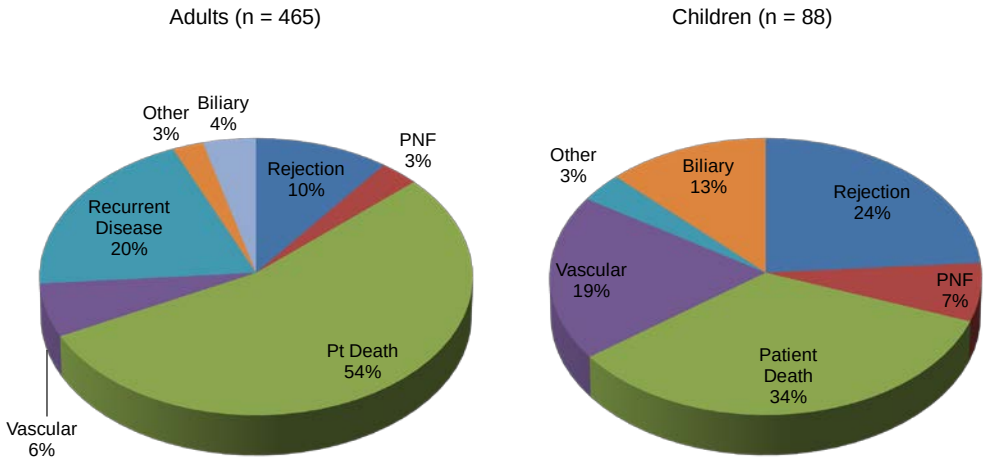
 Data to 31 December 2014

553 of 1464 grafts (37.7%) have failed.

282 grafts (51.0%) were lost due to patient deaths, due to disease recurrence and 69 (12.5%) due to rejection 92 (16.7%).

Sepsis was the most significant cause of patient death (77 patients), followed by malignancy (58 patients) and cerebral catastrophe (32 patients).

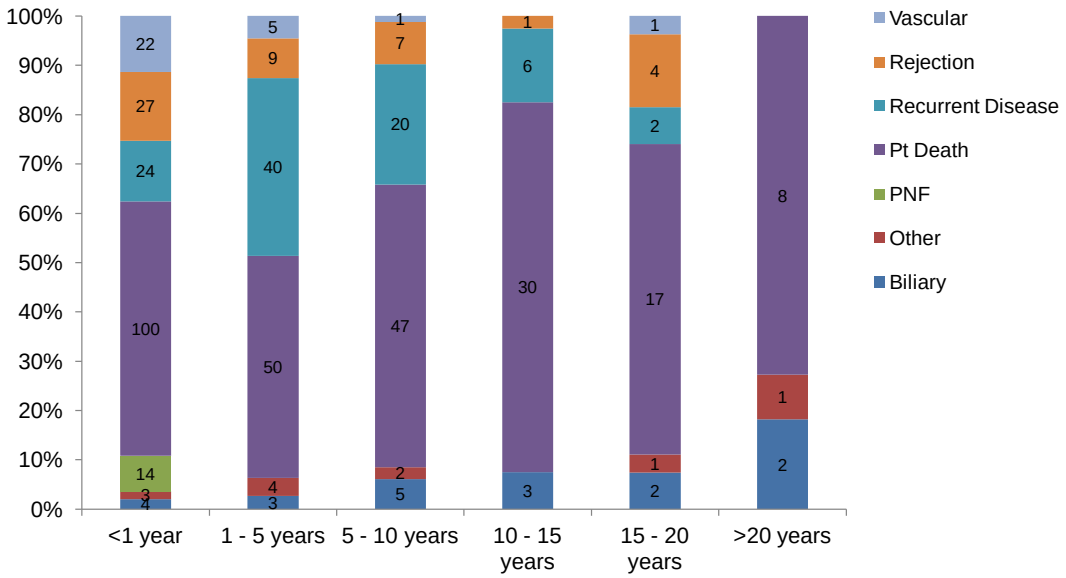
Cause of Graft Failure (n = 553)



 Data to 31 December 2014

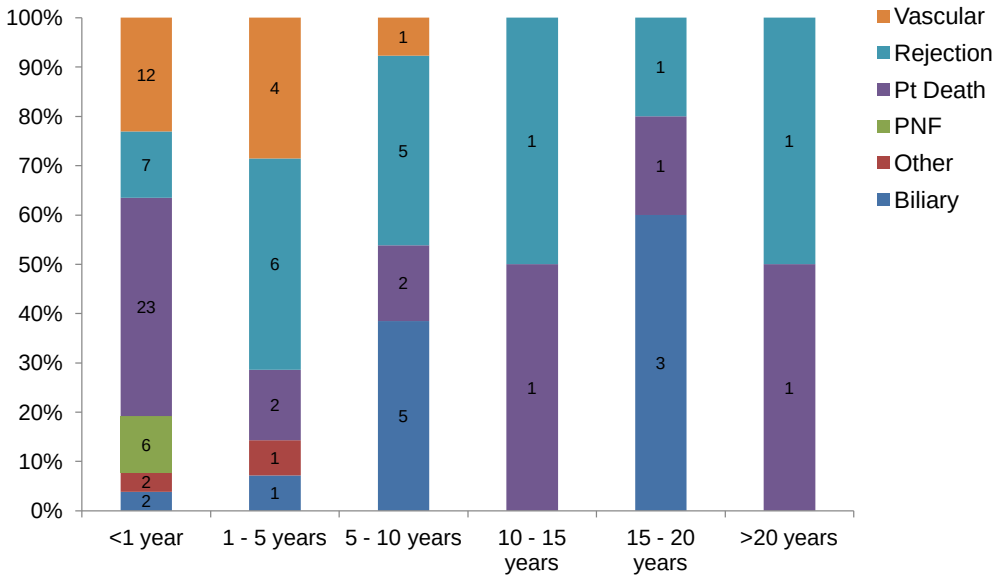
Patient death was the most significant cause of graft failure, followed by rejection.

Cause of Graft Failure by Time - Adults (n = 465; 39.4% of adult grafts)



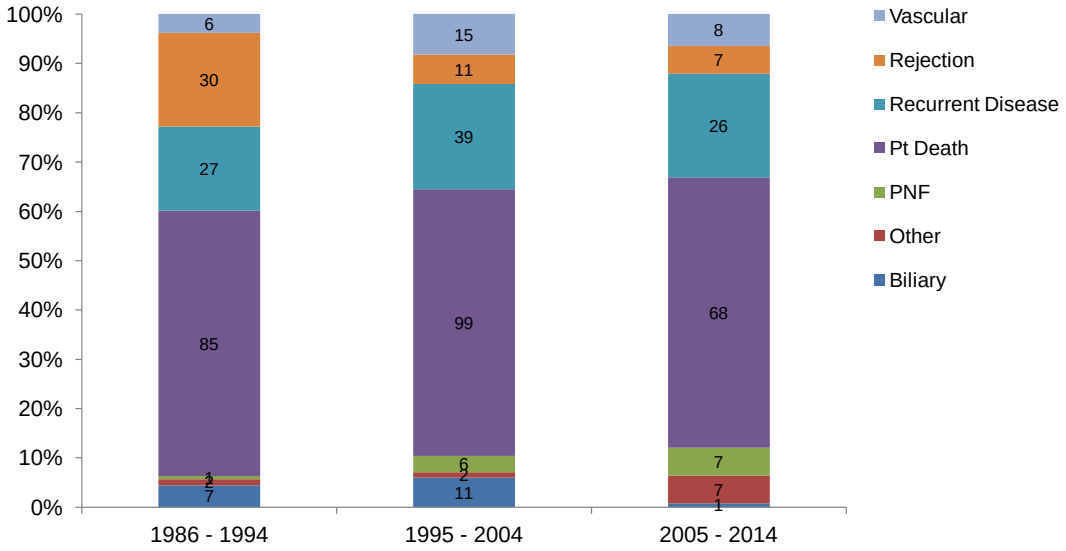
Data to 31 December 2014

Cause of Graft Failure by Time - Children (n = 88; 30.3% of child grafts)



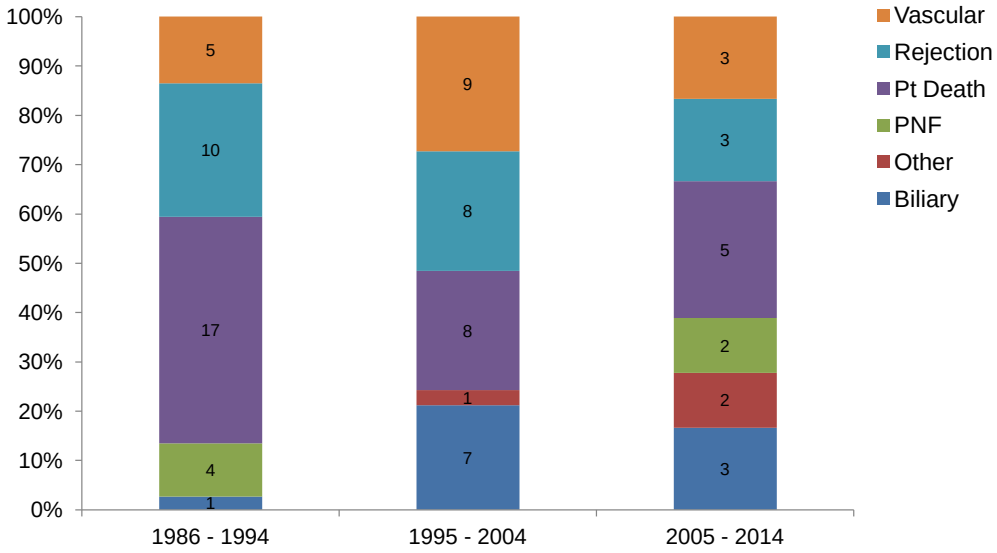
Data to 31 December 2014

Cause of Graft Failure by Transplant Era - Adults (n = 465; 39.4% of adult grafts)



Data to 31 December 2014

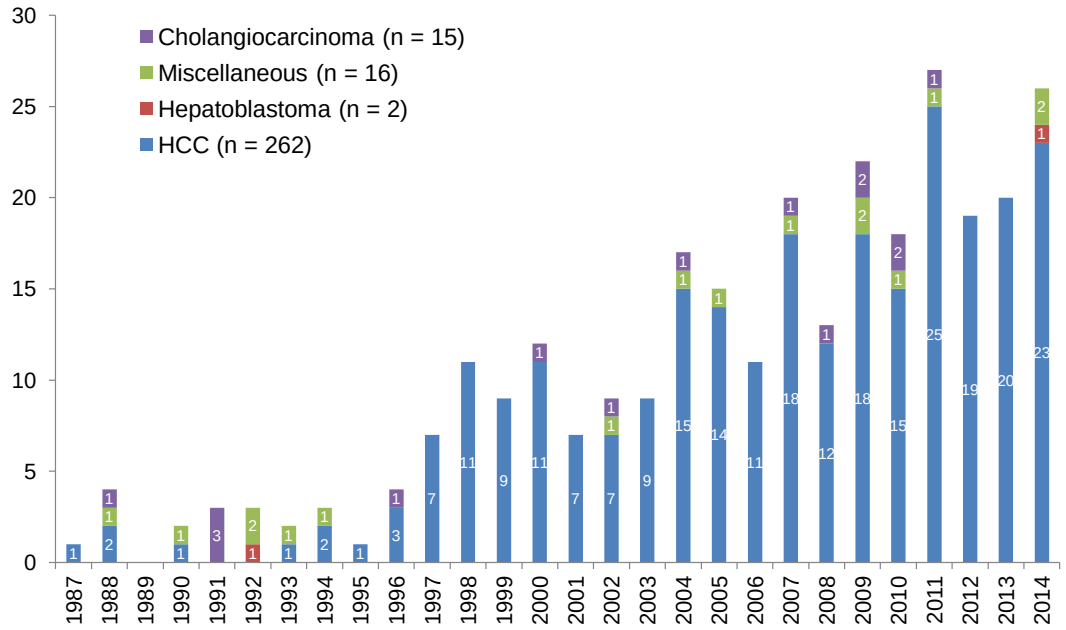
Cause of Graft Failure by Transplant Era - Children (n = 88; 30.3% of child grafts)



Data to 31 December 2014

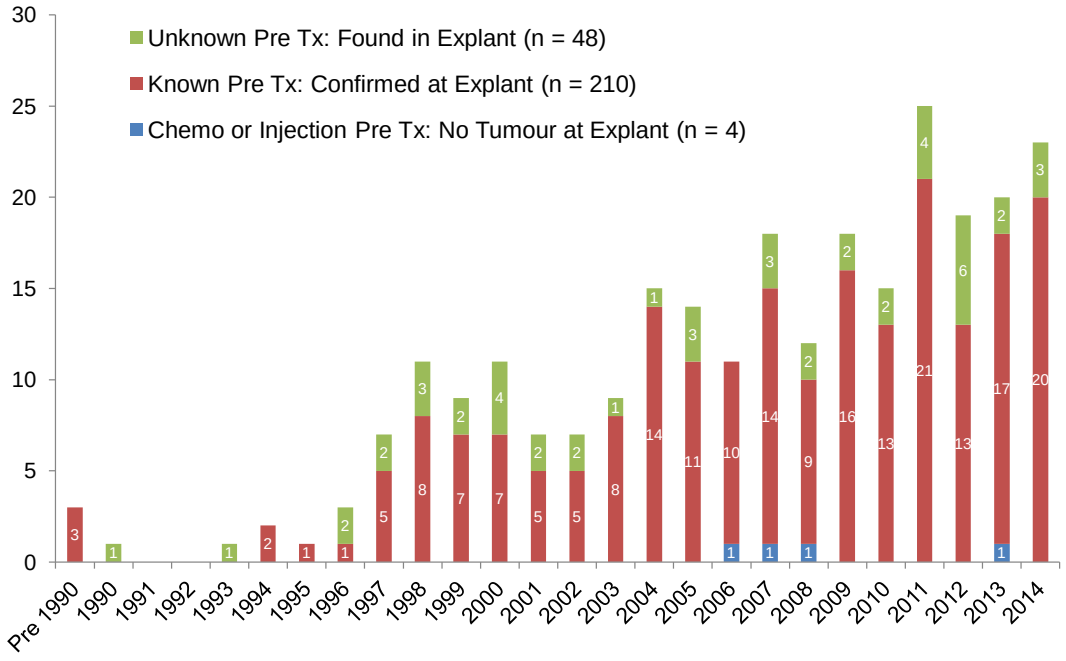
CANCER AND TRANSPLANTATION

Malignancy at Transplantation
(n = 286 Pts/295 Ca; 21.1% of patients)



Data to 31 December 2014

HCC at Transplantation
(n = 262)



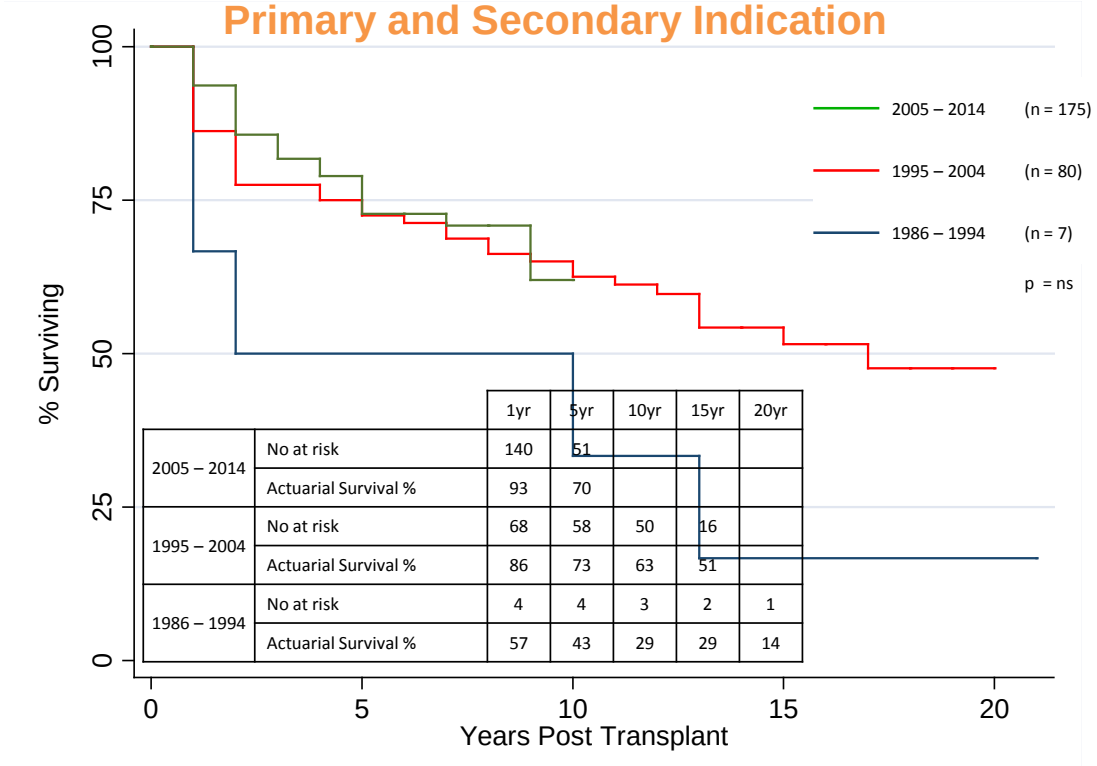
Data to 31 December 2014

Cancer in Liver Transplant Recipients
1986 - 2014

At Transplant (1278 patients)	Patients (n,%)
Liver cancer as primary diagnosis	130 10%
Liver cancer as secondary diagnosis	156 11 %
No. of Patients with a cancer diagnosis at transplant	286 21%
Post Transplant	
Recurrent liver cancer	33 2% of all pts, 12% of cancer at tx pts
De novo non-skin cancer	113 8% of all pts, 40% of cancer at tx pts
De novo skin cancer	203 15% of all pts, 72% of cancer at tx pts
No. of Patients with a post transplant cancer	349 26% of all pts
Patients with multiple cancers	189 14% of all pts
Pre transplant cancer developed de novo cancer	58 20% of cancer at tx pts
Transferred from donor	3
Developed non-skin cancer within 90 days	1

Data to 31 December 2014

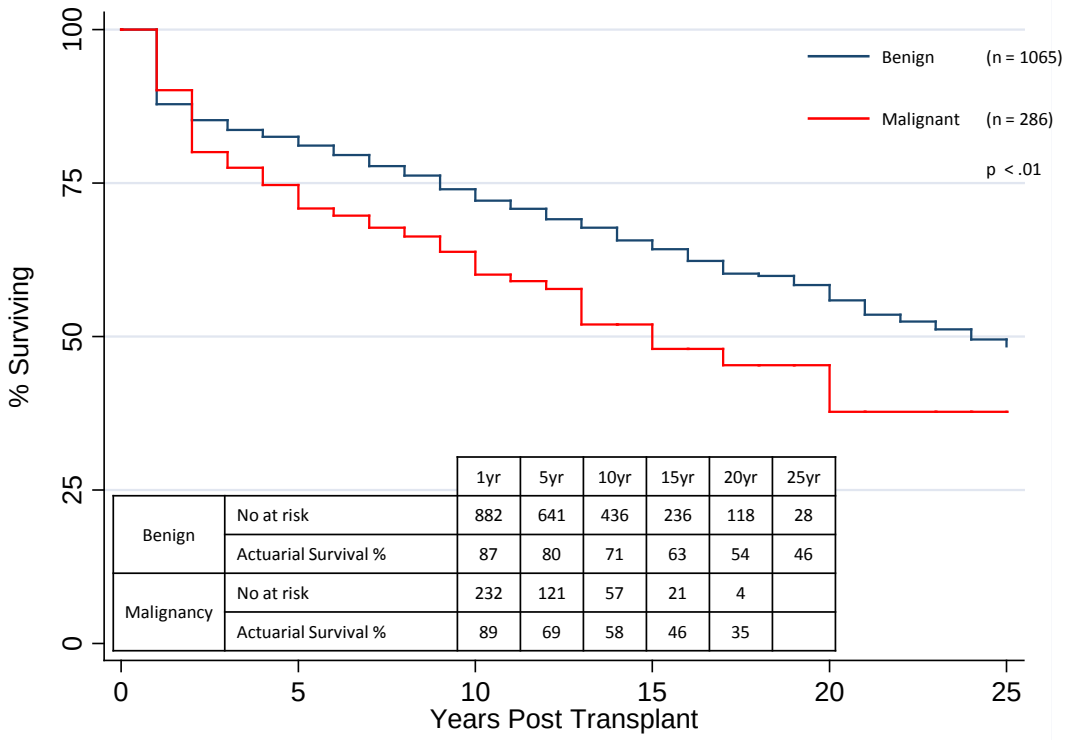
HCC vs Era
Primary and Secondary Indication



		1yr	5yr	10yr	15yr	20yr
2005 – 2014	No at risk	140	51			
	Actuarial Survival %	93	70			
1995 – 2004	No at risk	68	58	50	16	
	Actuarial Survival %	86	73	63	51	
1986 – 1994	No at risk	4	4	3	2	1
	Actuarial Survival %	57	43	29	29	14

Data to 31 December 2014

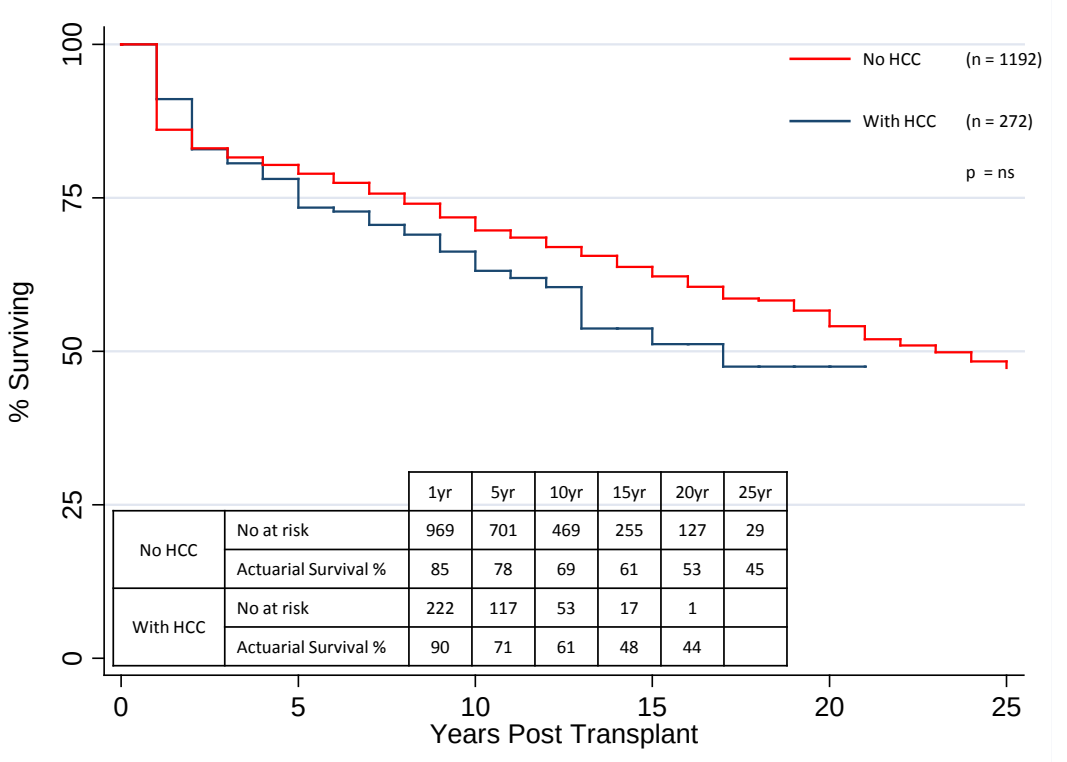
Benign Disease vs Malignancy



		1yr	5yr	10yr	15yr	20yr	25yr
Benign	No at risk	882	641	436	236	118	28
	Actuarial Survival %	87	80	71	63	54	46
Malignancy	No at risk	232	121	57	21	4	
	Actuarial Survival %	89	69	58	46	35	

Data to 31 December 2014

Primary and Secondary HCC vs No HCC



		1yr	5yr	10yr	15yr	20yr	25yr
No HCC	No at risk	969	701	469	255	127	29
	Actuarial Survival %	85	78	69	61	53	45
With HCC	No at risk	222	117	53	17	1	
	Actuarial Survival %	90	71	61	48	44	

Data to 31 December 2014

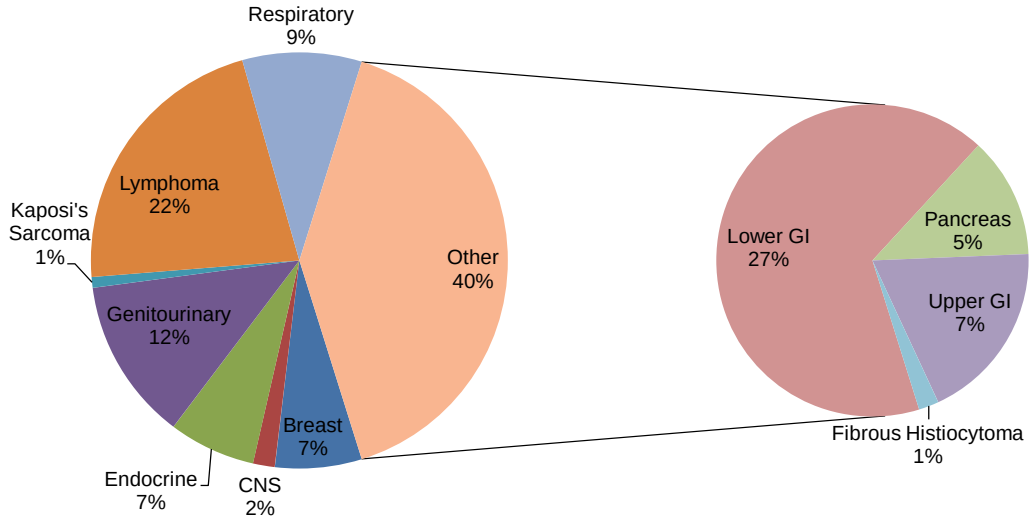
De Novo Cancer (Excluding Skin)
n = 107 Pts, 119 Ca; 8.7% pts transplanted

	No	Male	Female	Age of patients (years)	Time to diagnosis (months)	Died of This Cancer		Died Other
Alimentary	47	37	10	13 - 78 (m = 59)	6 - 266 (m = 76)	23	49%	8
Lymphoma (including PTLD)	26	16	10	1.5 - 70 (m = 44)	4 - 281 (m = 87)	7	27%	6
Genitourinary	15	12	3	21 - 74 (m = 59)	2 - 229 (m = 83)	2	13%	4
Respiratory	11	9	2	29 - 68 (m = 61)	7 - 193 (m = 36)	8	73%	0
Breast	8	0	8	30 - 60 (m = 44)	50 - 240 (m = 115)	6	75%	1
Endocrine	8	2	6	36 - 70 (m = 48)	14 - 144 (m = 56)	2	25%	0
CNS	2	1	1	66 - 75 (m = 70)	14 - 93 (m = 53)	2	100%	0
Fibrous Histiocytoma	1	0	1	62	120	0		0
Kaposi's	1	1	0	32	48	0		1
Total	**119**	**78**	**41**	**1.5 - 78 (m = 56)**	**2 - 281 (m = 78)**	**50**	**42%**	**20**

NB: m = median

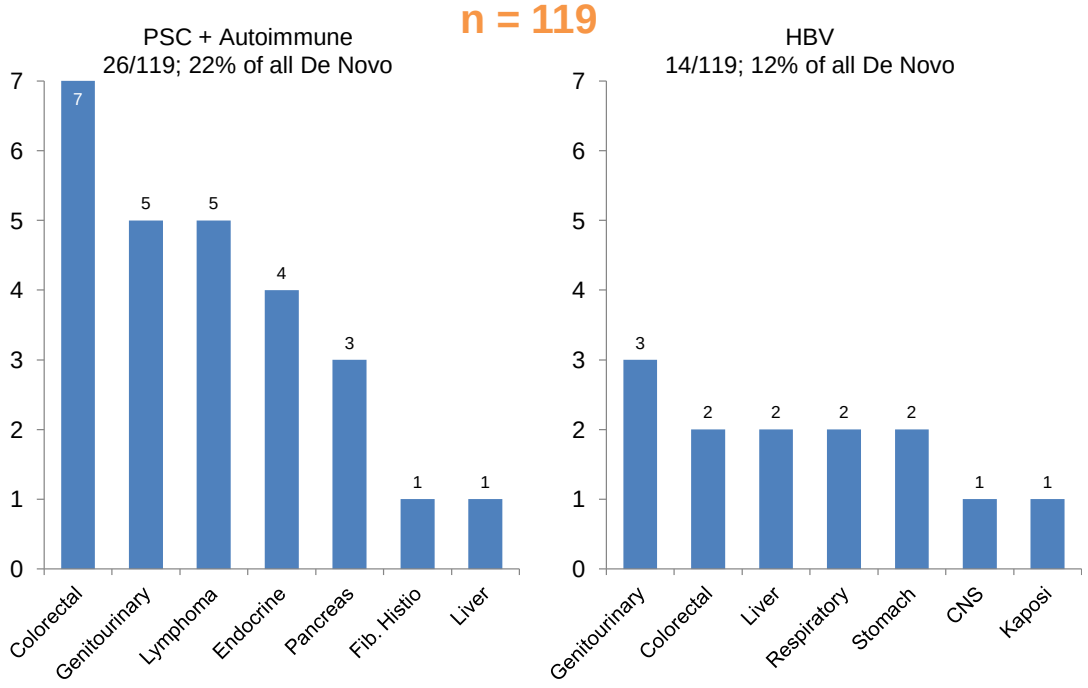
Data to 31 December 2014

De Novo Cancer (Excluding Skin)
n = 107 Pts, 119 Ca; 8.7% pts transplanted



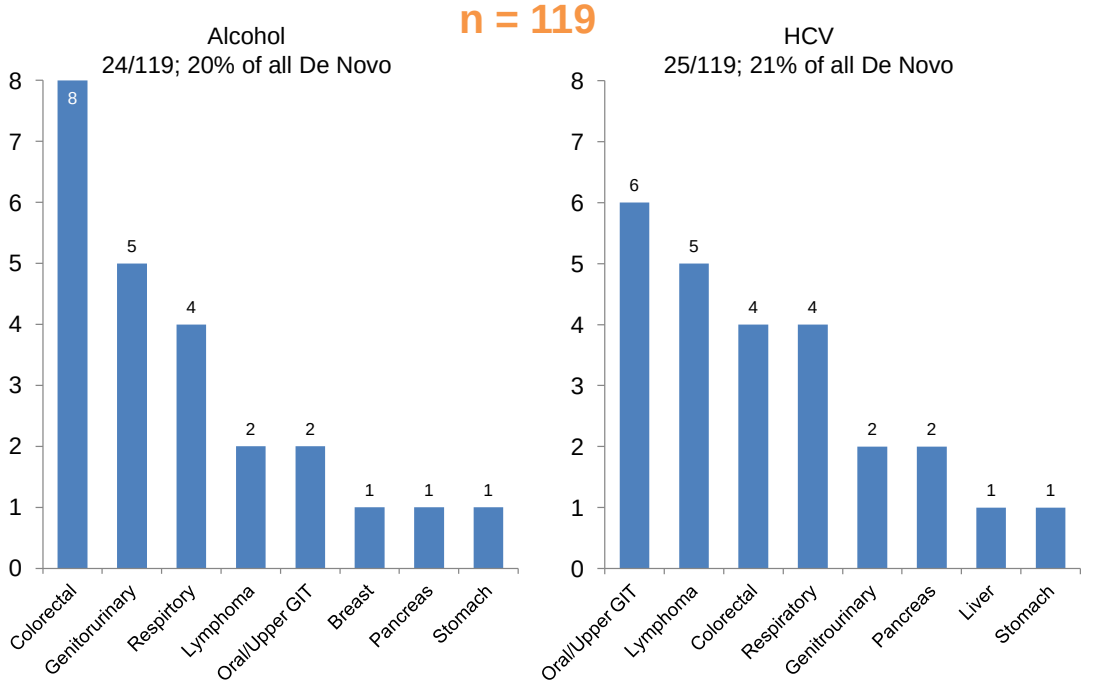
Data to 31 December 2014

Pre Transplant Liver Disease and De Novo Cancer (Excluding Skin) n = 119



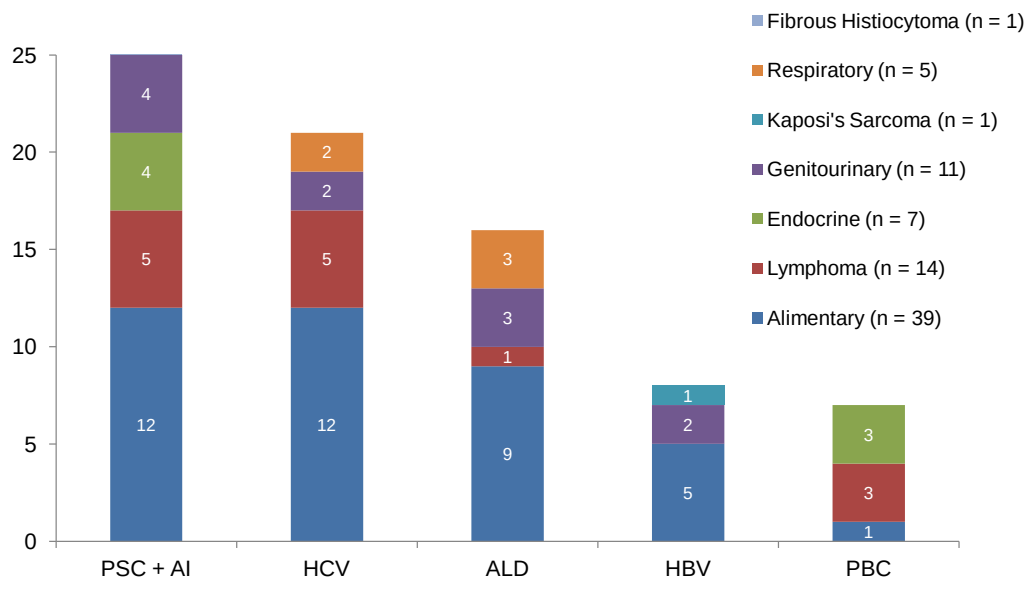
Data to 31 December 2014

Pre Transplant Liver Disease and De Novo Cancer (Excluding Skin) n = 119



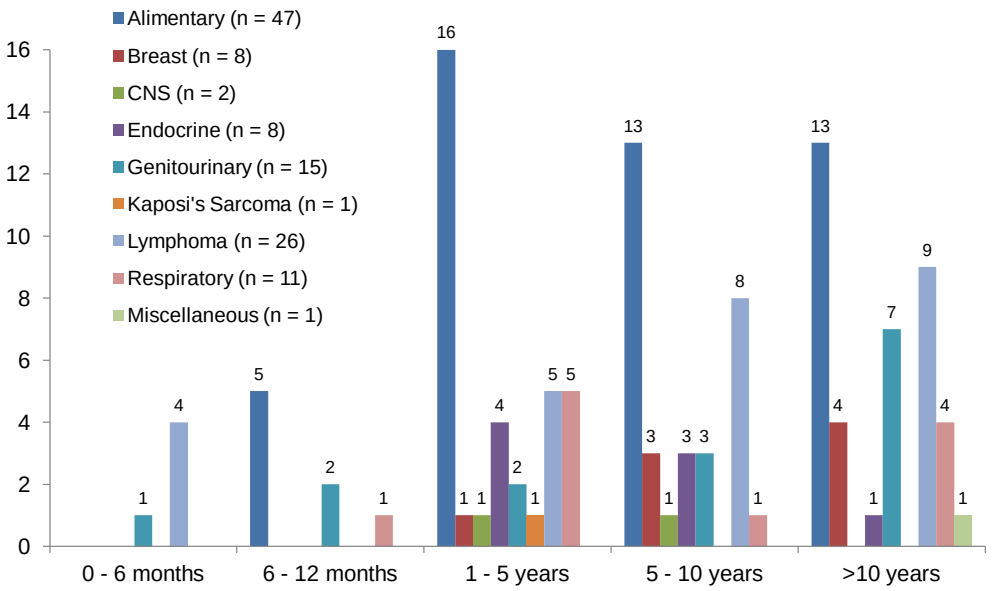
Data to 31 December 2014

Primary Liver Disease and De Novo Cancer (Excluding Skin)



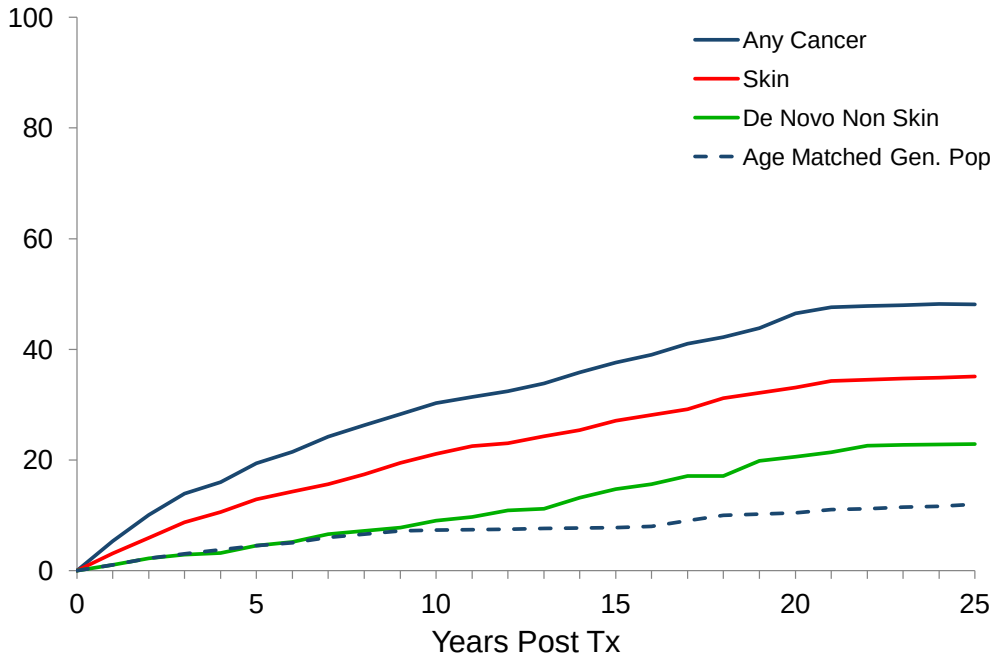
Data to 31 December 2014

Time to Diagnosis De Novo Cancer (Excluding Skin)



Data to 31 December 2014

Cumulative Risk of Diagnosis of Cancer Following Liver Transplantation 1986 – 2014



Data to 31 December 2014