Liver Transplantation

Australian National Liver Transplantation Unit

Data to 31 December 2012

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

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Preface

In 2012, 66 new, 8 secondary and 1 tertiary orthotopic liver transplant procedures were performed within the ANLTU (15 – The Children's Hospital at Westmead; 60 – 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.

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.

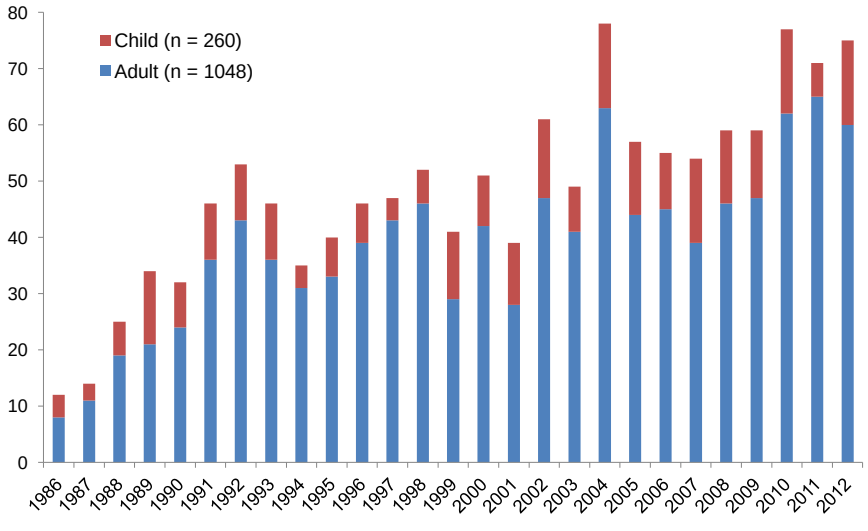
Professor Geoff McCaughan
Dr Deborah Verran
Dr Michael Crawford
Pamela Dilworth
Gavin Lackey
Bessie Berberovic

Summary

There are several key issues to report.

1. From January 1986 to December 2012, 1308 liver transplants were performed on 1204 patients, of which 980 and 224 recipients were adults and children, respectively.
2. The number of transplants per year continues to be related to the deceased donor rate.
3. In 2012, 26 patients (17%) on the waiting list were subsequently withdrawn due to advanced and/or extra-hepatic disease. Two (1%) patients improved whilst on the waiting list. During this period, there were 75 liver transplantation operative procedures of which 66 patients received primary grafts.
4. The movement of patients on and off the waiting list continues to be dynamic.
5. The average waiting time for adults in all blood groups remains variable depending on blood group.
6. The median deceased donor age has increased from 29 years (1986 – 1994) to 44 years (2005 to 2012. There is also an increasing number of Donation after Cardiac Death donor liver offers – 26 offers in 2012 of which two were used.
7. The median age for adult recipients has increased from 45.4 years (1986 – 1994) to now stand at 50.9 years. The median age for child recipients has decreased from 4.4 years (1986 – 1994) to now stand at 2.0 years.
8. HCV infection has been an increasing indication for liver transplantation in adults. In the period 1986 – 1995 10.6% of adults had this diagnosis compared to 40.7% in 2005 – 2012. In 2012, 50.9% of adults transplanted had Chronic HCV.
9. Hepatocellular carcinoma has also become an increasingly common indication for liver transplantation, with 34% of the adult recipients having a diagnosis of HCC in the five year period 2008 - 2012.
10. Adult Split Graft survival remains marginally higher than that of Adult Whole Graft survival, however this is not statistically significant.
11. The overall patient survival rate over the past 2 years was 93% at one year.

Australian National Liver Transplant Unit



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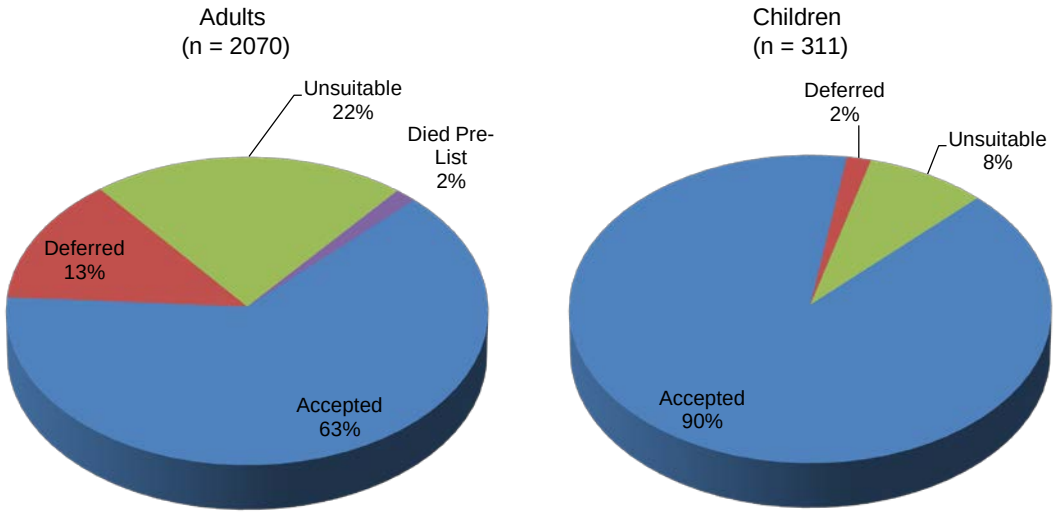
ASSESSMENT INFORMATION

Allocation of Patients Accepted for Assessment



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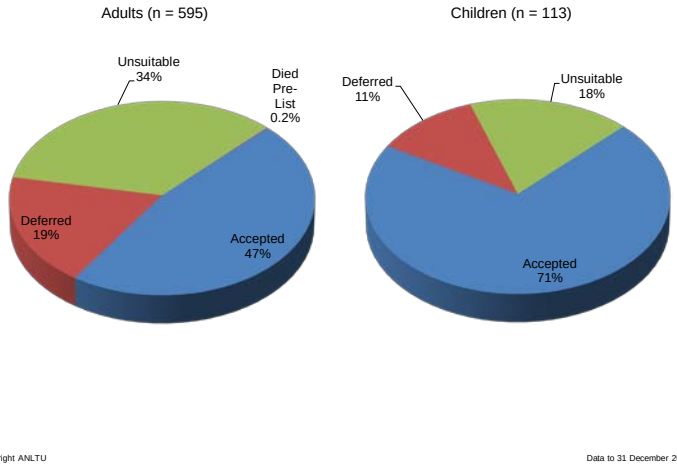
Adult Patients Considered Unsuitable for Transplantation (2070 Adults have been assessed since 1985)

Reason	Adults	
Too Advanced + extra-hepatic disease	163	36%
Tumour Progression + Tumour (extra-hepatic spread)	71	16%
Good Prognosis	65	14%
Psychological	59	13%
Alcohol	56	12%
Patient's wish	23	5%
Alternative therapy	7	2%
Age	5	1%
Logistics	1	0.2%
Total	450	22%

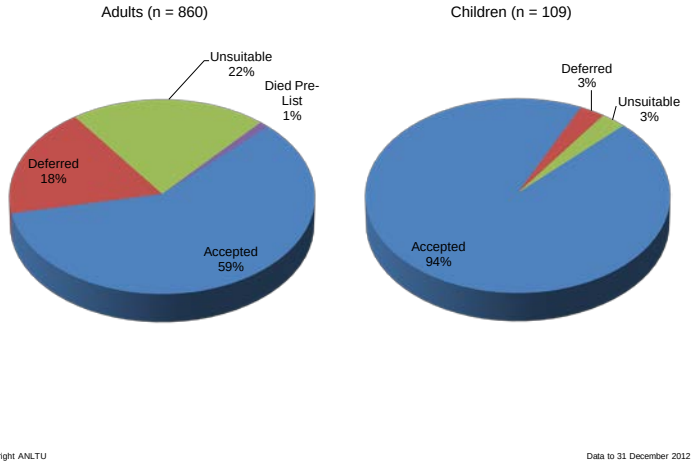
Comparison Over Time of Patients Assessed

1985 - 1994



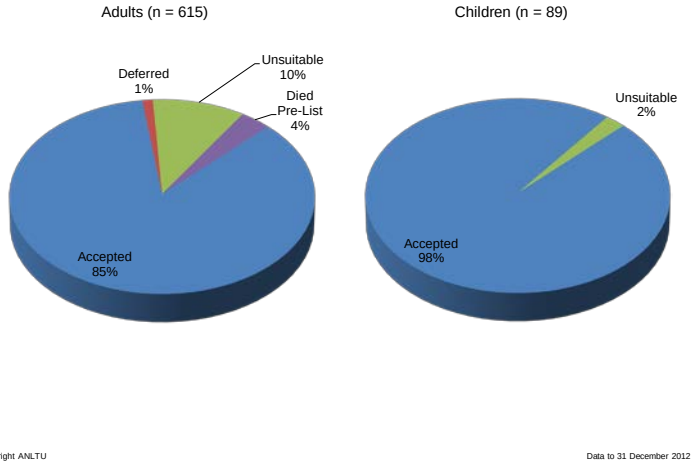
Data to 31 December 2012

1995 - 2004



Data to 31 December 2012

2005 - 2012



Data to 31 December 2012

- Adult patient acceptance rate has increased from 47% in the period of 1985 - 1994 to 85% in 2005 - 2012.
- Child patient acceptance rate has increased from 71% in the period of 1985 – 1994 to 98% in 2005 - 2012.

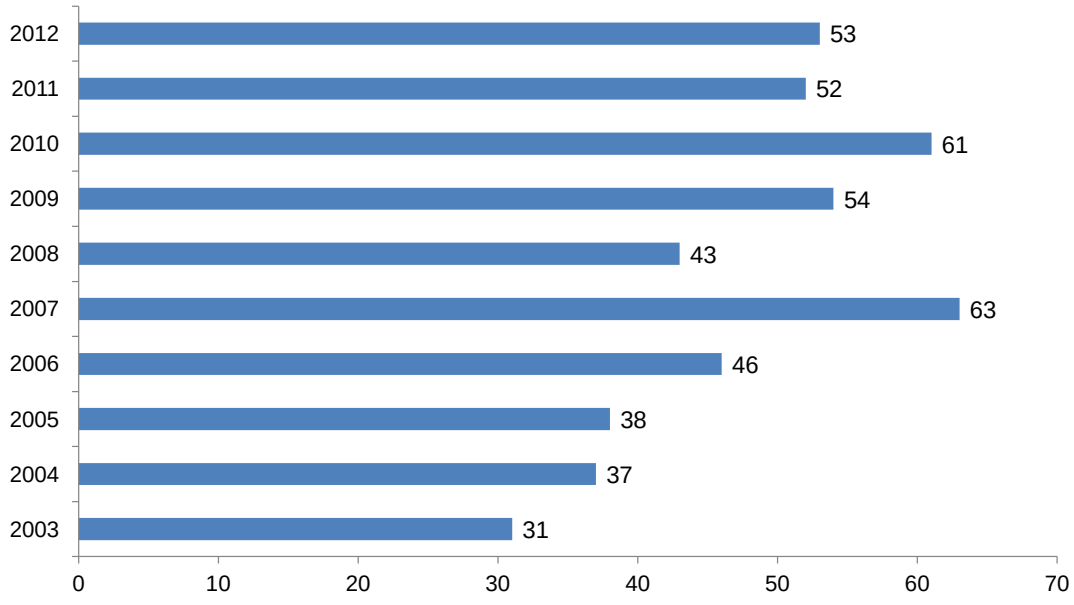
Waiting List Activity

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 *			
2003	n	35	69	104	49	5	8	8	21	3	31
	%				47	4.8	7.7	7.7	20	2.9	
2004	n	31	101	130	78	7	0	2	12	3	37
	%				60	5.4	0	1.5	9	2.3	
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	

Data to 31 December 2012

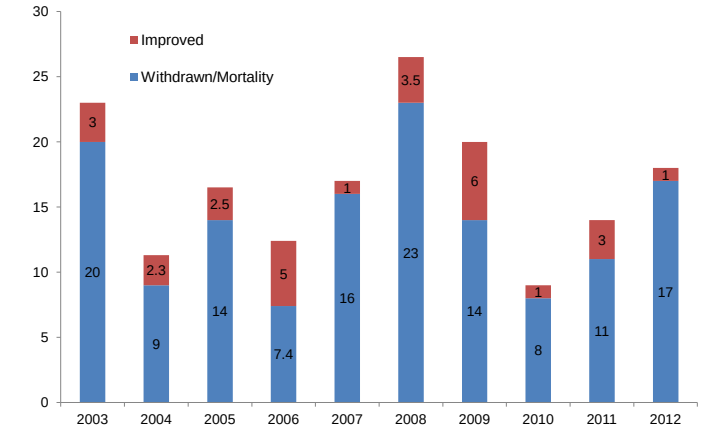
* Advanced and/or hepatic disease

Patients on Waiting List at the end of calendar year



Data to 31 December 2012

% Patients Withdrawn from Waiting List



Data to 31 December 2012

No of Patients Withdrawn from Waiting List

Data to 31 December 2012

Urgent Listings 2012

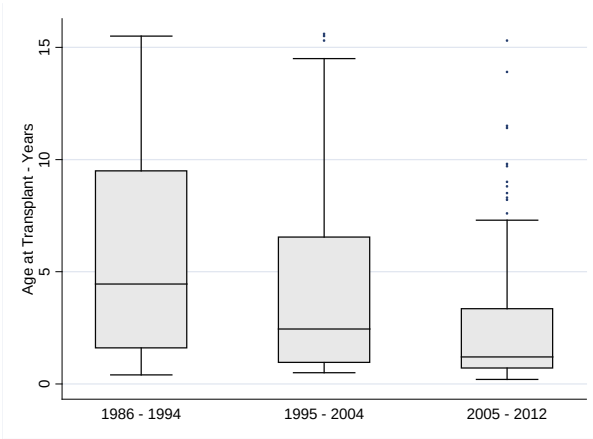
Number of Patients Listed as Urgent	Cat 1	Cat 2	**Total**
Transplanted	5	3	**8**
Died on Waiting List	0	1	**1**
Delisted (temporary = 1; permanent = 1)	1	1	**2**
Improved – withdrawn	1	0	**1**
Total	**7**	**5**	**12**

Data to 31 December 2012

Age of Transplant Recipients (Primary Grafts)

Children

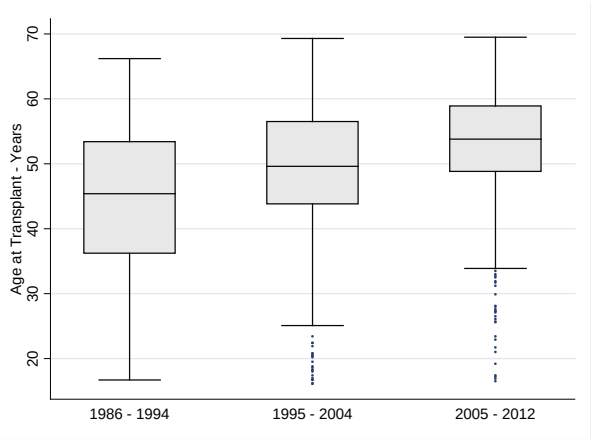
n	224
Median	2.0 years
Mean	4.1 years
Range	0.2 – 15.6 years



	1986 - 1994	1995 - 2004	2005 - 2012
n	56	84	84
Median	4.4	2.5	1.2
Mean	5.7	4.3	2.8

Adults

n	980
Median	50.9 years
Mean	48.8 years
Range	16.1 – 69.5 years



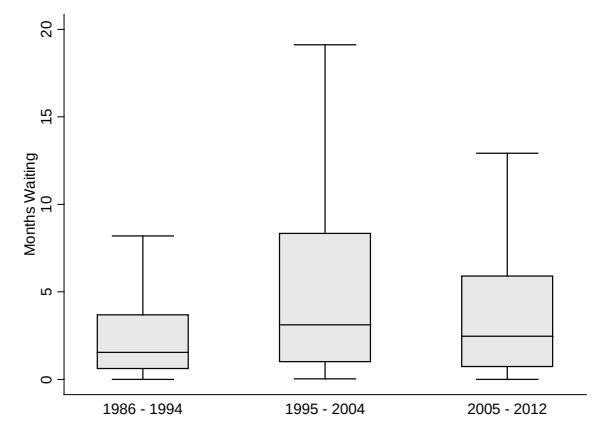
	1986 - 1994	1995 - 2004	2005 - 2012
n	218	381	381
Median	45.4	49.6	53.8
Mean	43.8	48.5	52.0

Data to 31 December 2012

Waiting Time of Transplant Recipients (Primary Grafts)

Children

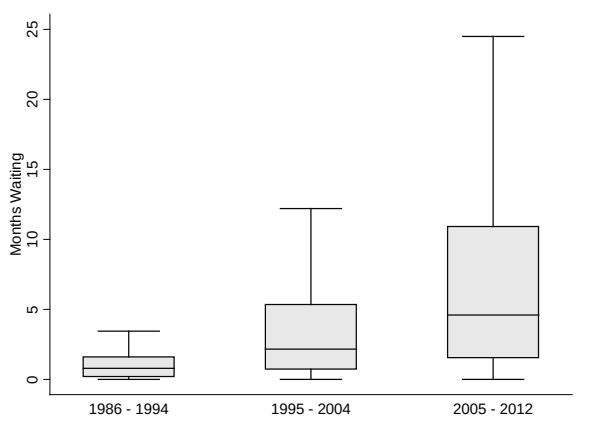
Median	2.39 months
Mean	4.82 months
Max	48.10 months



	1986 - 1994	1995 - 2004	2005 - 2012
Median	1.54	3.1	2.5
Mean	2.90	6.49	4.44
Max	14.5	48	34

Adults

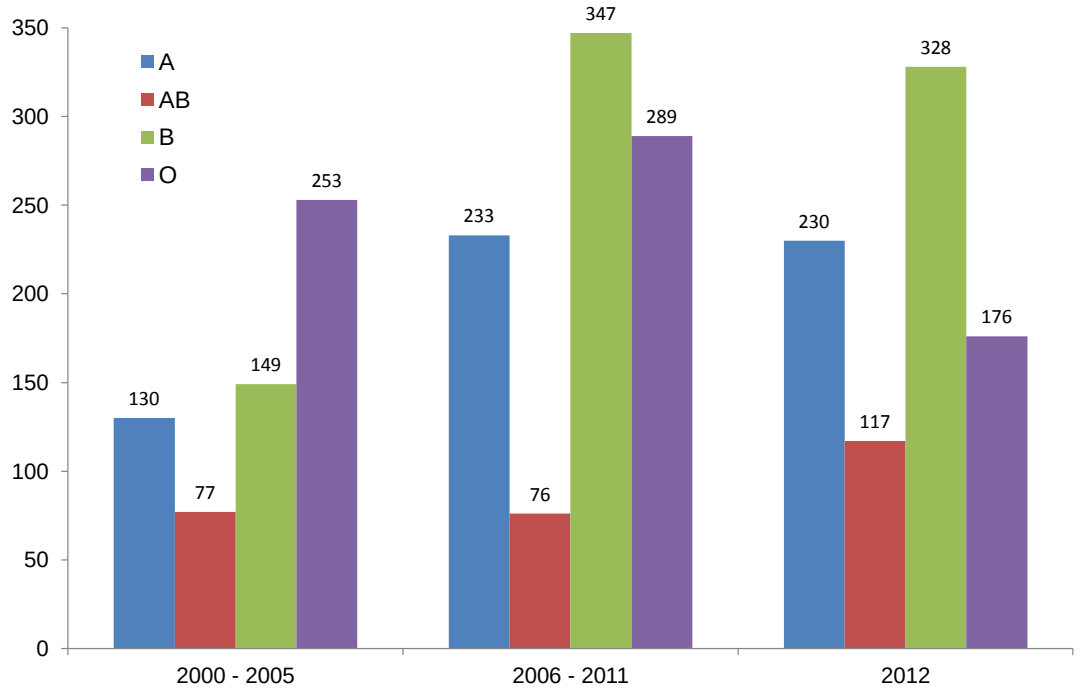
Median	2.23 months
Mean	5.10 months
Max	95.48 months



	1986 - 1994	1995 - 2004	2005 - 2012
Median	0.79	2.16	4.59
Mean	1.27	4.46	7.92
Max	7.8	69.25	95.48

Data to 31 December 2012

Adult Mean Days Waiting
Primary Liver Transplantation vs ABO (2000 – 2012)



Data to 31 December 2012

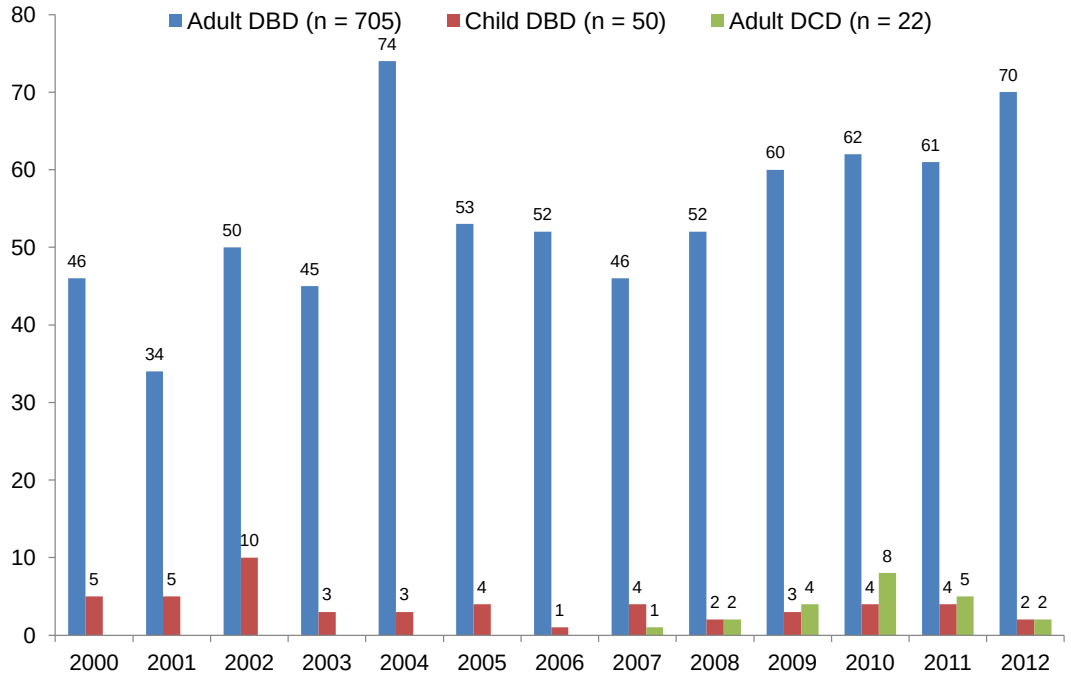
Adult Mean Days Waiting for Primary Liver Transplant

	2000 – 2005	2006 – 2011	2012	Overall
A	130	233	230	189
AB	77	76	117	78
B	149	347	328	259
O	253	289	176	264
Mean	181	261	228	

Data to 31 December 2012

DONOR INFORMATION

(Deceased) Adult vs Paediatric Donors by Year



Data to 31 December 2012

Since 2000, 93% of liver donors were adults (>=16yrs) and 7% were paediatric donors.

Deceased Donor Offers to NSW

Donor Type	State	2000 - 2005	2006 - 2011	2012	Total
DBD	ACT	33	27	9	69
	NSW	324	316	71	711
	NT	6	5	1	12
	NZ	25	23	3	51
	QLD	37	37	5	79
	SA	54	29	2	85
	TAS	3	7	0	10
	VIC	43	45	11	99
	WA	30	22	5	57
Total BDD Offers		555	515	107	1177
BDD Used		309	307	64	680
DCD	ACT	0	11	1	12
	NSW	0	84	23	107
	VIC	0	8	0	8
	SA/WA	0	0	2	2
Total DCD Offers		0	103	26	129
DCD Used		0	20	2	22
Total Offers		100	92	133	1306
Total Used		50	39	66	702

Data to 31 December 2012

DBD Donor Offers Declined 2012

43/107 (40%)

	Declined at Offer	Declined at Hepatectomy
Abnormal LFT's	3	
Cirrhosis		1
Donor history *	5	
Donor obesity	1	
Fibrosis		3
Impaired perfusion/ischaemia		2
Interstate donor not suitable for directed recipient	3	
Logistics **	1	
No suitable ABO compatible recipient	4	
No suitable recipient	1	
Offer waived for urgent Tx elsewhere	3	1
Steatosis		11
Vascular issues		1
Other ***	2	1
TOTAL	**23**	**20**

*	Donor History	1	Heavy drinker
		2	Age, steatosis, hx ca prostate
		3	Also donor obesity. BMI 45. Diabetes, HT.
		4	Breast Ca, diffuse fatty liver on CT, ? Pancreatitis
		5	Not med suitable - BMI 36, downtime >1hr, CVVHD, renal flr, hrt disease, asthma etc
**	Logistics	1	Unable to delay donor start time and already accepted another tx. Marginal donor.
***	Other	1	Early offer. Age, HCV pos, no blood group compatible recipients. Note patient died 30 mins after offer so not referred interstate
		2	Age, obesity, donor history. Kidney only retrieval
		3	Never progressed to formal offer. HCV, DCD, did not progress to BD

DCD Donor Offers Declined 2012

24/26 (92%)

	Declined at Offer	Declined at Hepatectomy
Consent withdrawn/relatives refused consent	2	
Did not proceed to hepatectomy		5
Donor history *	1	
High risk donor for tumour or infection	2	1
Interstate donor not suitable for directed recipient	1	
Logistics	1	
No suitable ABO compatible recipient	3	
Offer waived for urgent Tx elsewhere	2	
Outside DCD acceptance criteria **	3	
Steatosis		2
Other ***		1
TOTAL	**15**	**9**

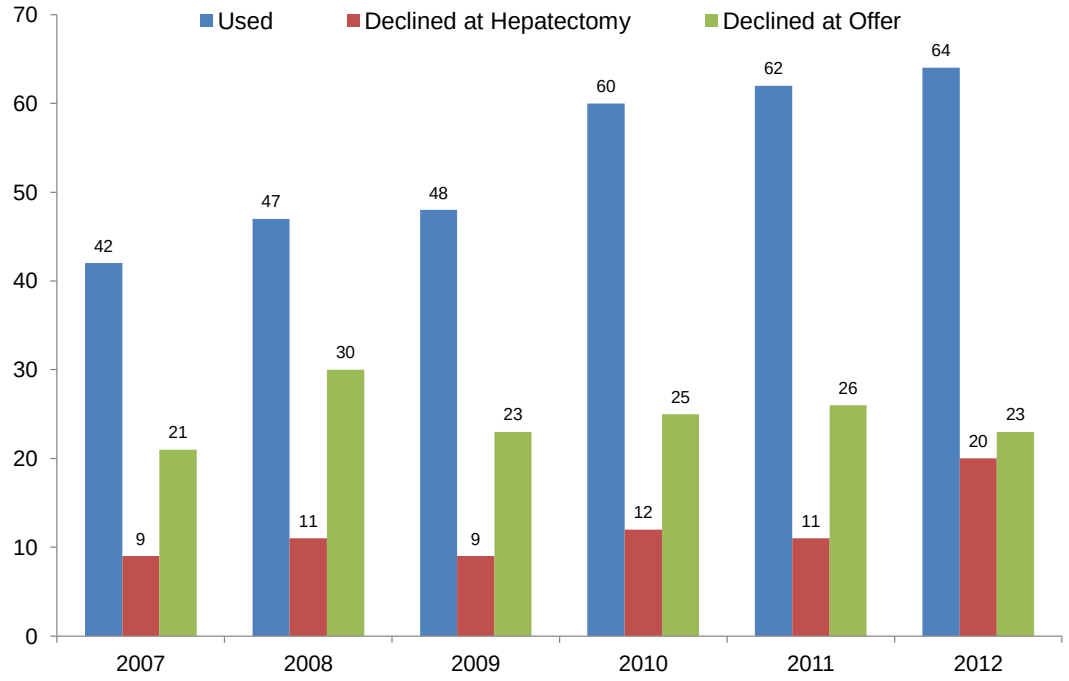
*	Donor History	1	Massive GI bleed, ETOH +++, IVDU
**	Outside DCD acceptance criteria	1	Age, obese, BMI 39
		2	DCD - Age, downtime, high LFT's
		3	?
***	Other	1	Lung abscesses, hrt vegetation. Sepsis

Enquiries Declined
1 January 2012 to 31 December 2012

	Declined at Enquiry
Abnormal LFTs	2
Consent withdrawn/Relatives refused consent	2
Donor history *	6
High risk donor for tumour or infection	3
Known liver disease **	1
No suitable ABO compatible recipient	2
Outside DCD acceptance criteria ***	2
Other ****	2
Not categorised *****	1
Total	**21**

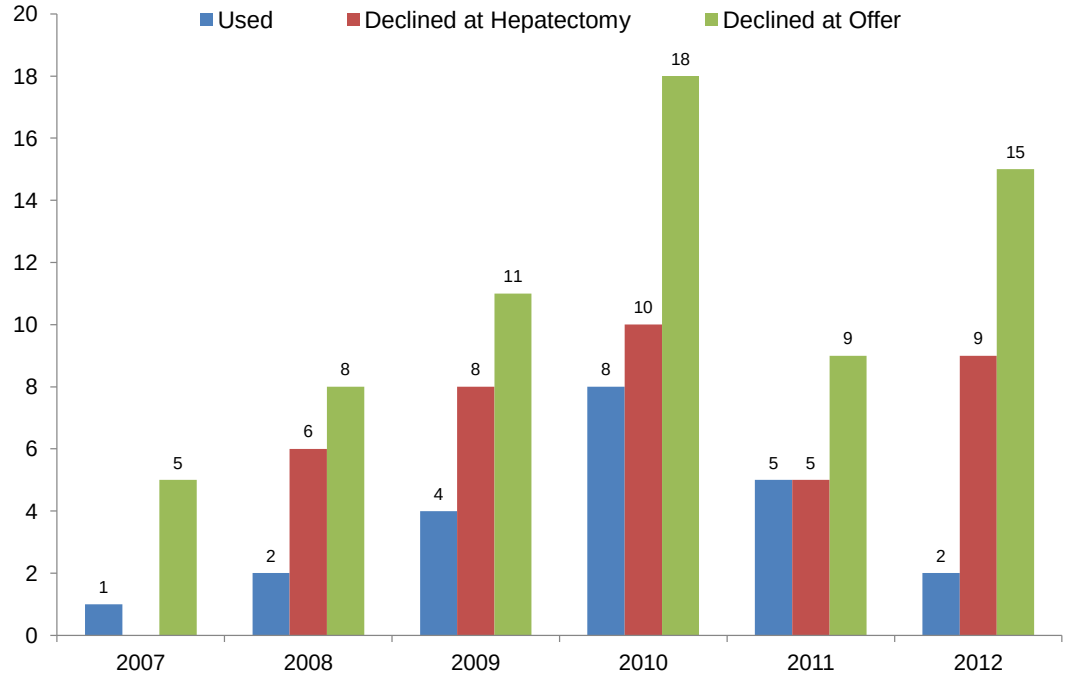
*	Donor History	1	Declined age, medical hx (AF, diabetes), cold time, already doing 2 transplants.
		2	HCV +, IVDU. Declined due to possible cirrhotic &/or fatty. Less than 20% chance being usable. 7 donors in 5 days - logistical issues.
		3	Comorbidities and age. Kidneys not suitable.
		4	C1 deficiency. No pt's sick enough.
		5	Factor V haemophilia, HCV. Insufficient medical hx.
		6	HCV pos, age, abnormal LFT's.
**	Known liver disease	1	HCV, cirrhosis, alcoholic liver disease, hx obesity, other extensive medical issues.
***	Outside DCD acceptance criteria	1	Age, medical hx, GGT 172
		2	HCV, age. Medical hx (diabetes, ESRF, ? Bone tumour).
****	Other	1	Did not progress to brain death
		2	HCV, did not progress to brain death
*****	Not categorised	1	Current IVDU & HCV positive, we said we would be interested if he progressed to brain death. This 'early enquire' never progressed to a formal offer

DBD Donor Offers to NSW



Data to 31 December 2012

DCD Donor Offers to NSW



Data to 31 December 2012

Allocation of Accepted and Utilised Deceased Donor Livers – 2012

1st Recipient Allocation		Total
DBD	Highest prioritised patient suitable for this type of graft	45
	Higher priority patient(s) medically unfit	9
	Size of graft not suitable for higher priority patient(s)	5
	High risk donor on history for virus or tumour	1
	Higher priority patient(s) has HCV and older donor	1
	Logistical reasons not suitable for higher priority patients *	1
	No prioritised patient in this ABO suitable for this type of graft	1
	No prioritised patient in this ABO suitable for ECD graft	1
DCD	Highest prioritised patient suitable for this type of graft	2
Total		66

* Back to back liver transplants. Previous case technically difficult

2nd Recipient Allocation		Total
DBD	Highest prioritised patient suitable for this type of graft	6
	Higher priority patient(s) medically unfit	1
Total		7

Living Donor Procedures – Paediatric vs Adult

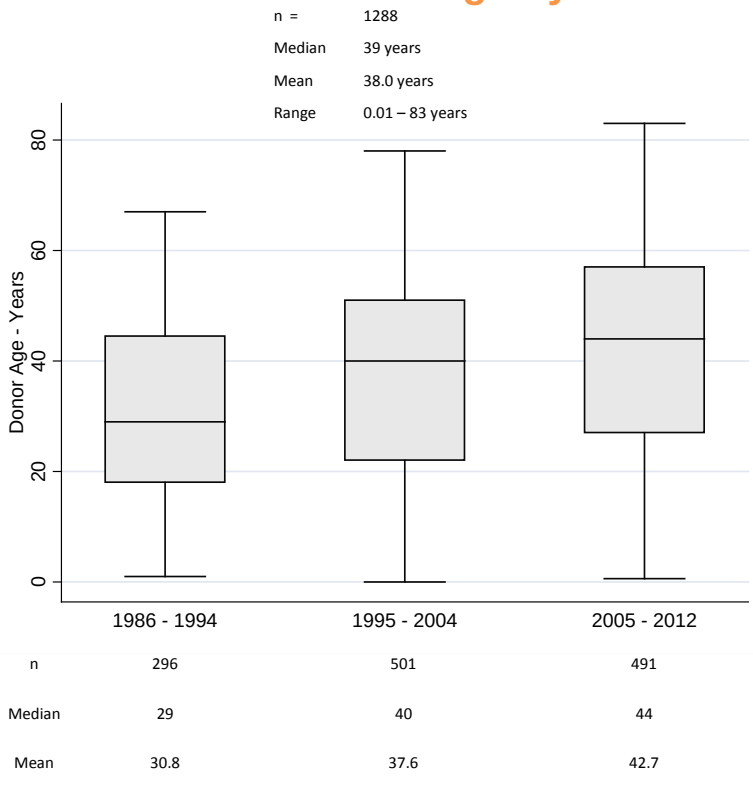
Year	Type	Total
1990	LRD	1
2002	LRD	1
2003	LUD *	1
2004	LRD	1
2006	LRD	2
2007	LRD	3
2008	LRD	3
2009	LRD	2
2010	LRD	3
2011	LUD **	1
2012	LRD	2
Total		20

* The Living Unrelated Donor Procedure in 2003 was an adult domino transplant.

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

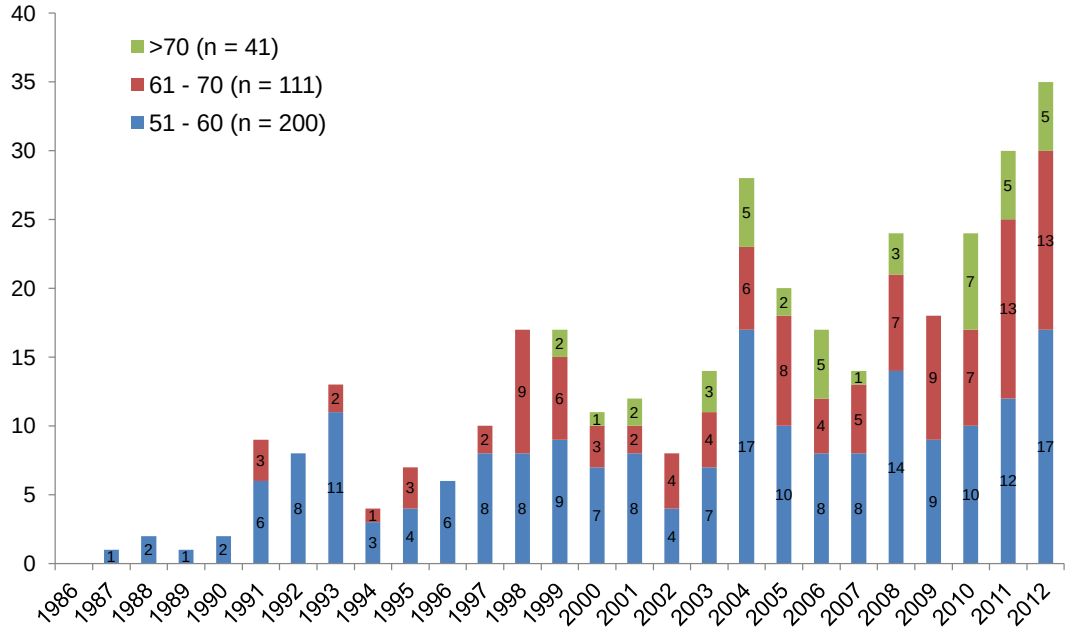
Data to 31 December 2012

Deceased Donor Age by Era



Data to 31 December 2012

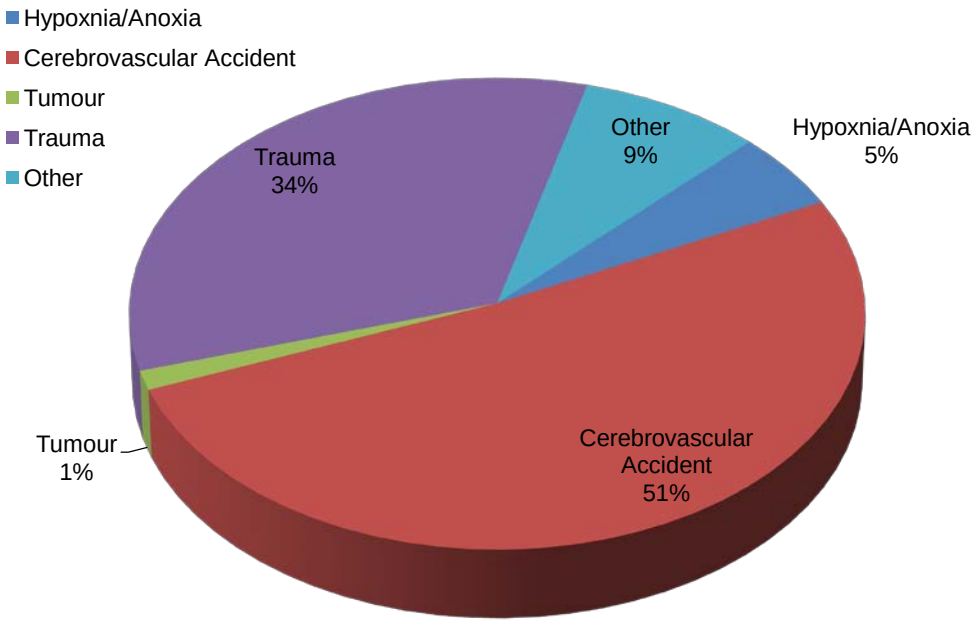
Deceased Donors Over 50 Years (n = 352)



Data to 31 December 2012

Donor age ranged from 0 to 84 years, with a mean value of 37.9 years

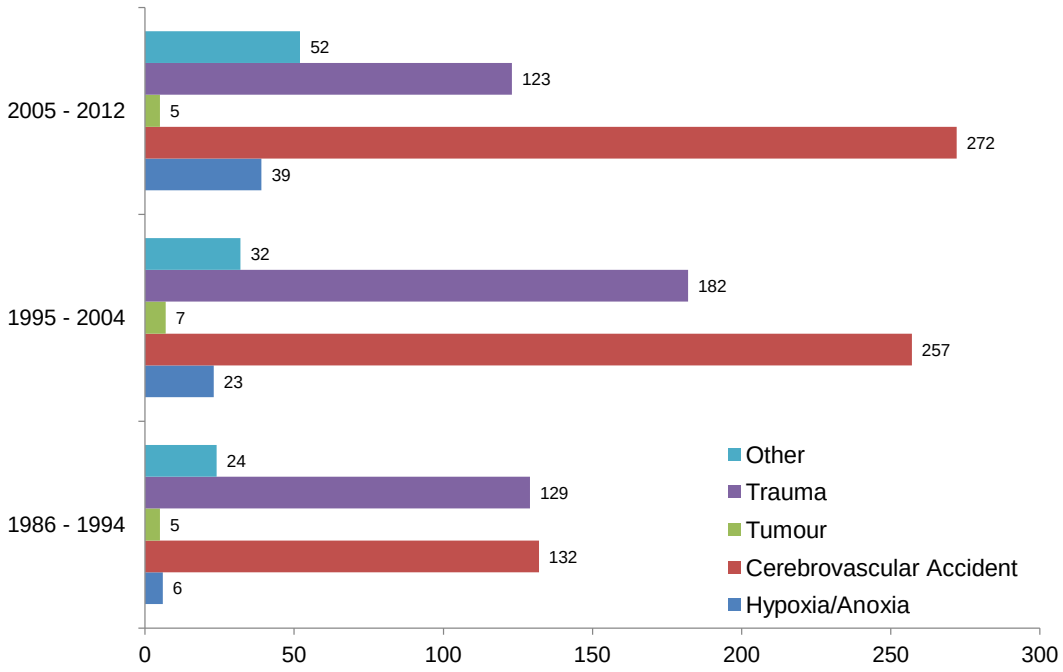
Deceased Donor Cause of Death n = 1288



Data to 31 December 2012

661 (51%) donors died due to cerebral haemorrhage, 433 (34%) died due to trauma.

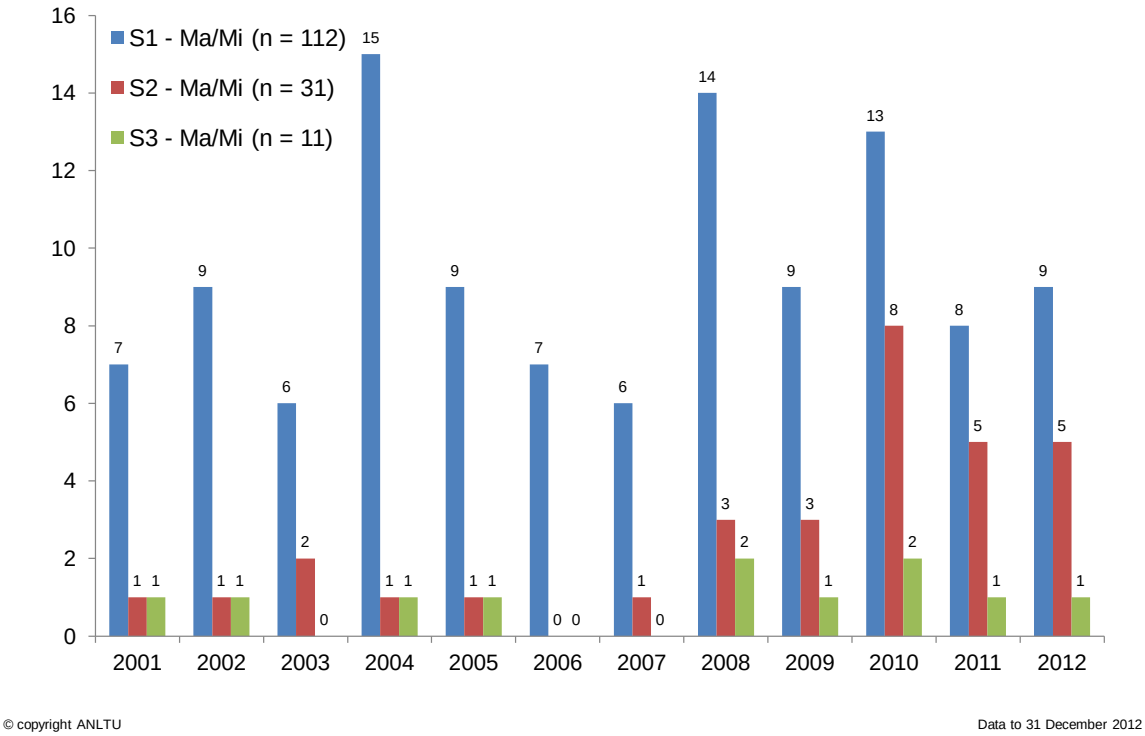
Deceased Donor Cause of Death by Era



Data to 31 December 2012

Deaths due to trauma were 43% (1986 – 1995), 36% (1996 – 2005) and 25% (2006 – 2012). In these same time periods, deaths due to cerebral causes were 45%, 51% and 55%.

Adult Graft Steatosis 2001 - 2012



Data to 31 December 2012

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

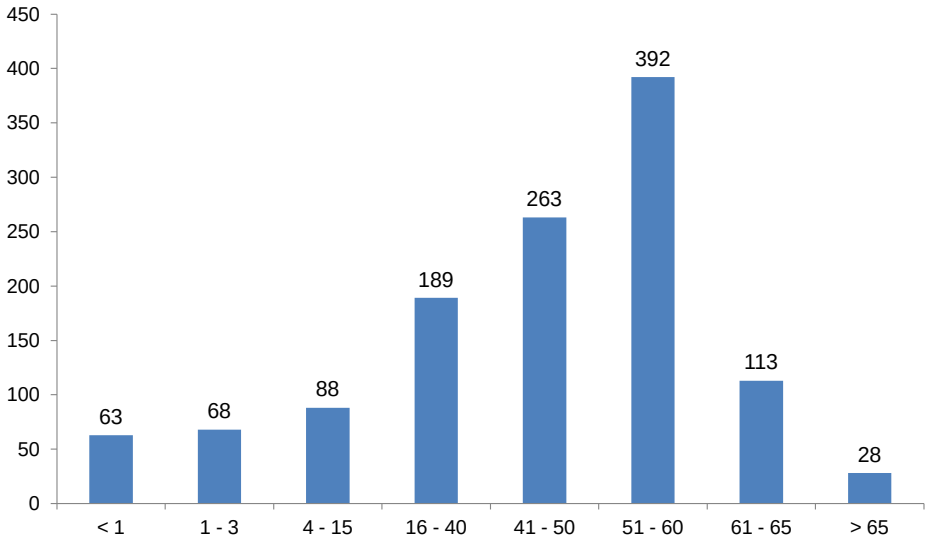
S2 Ma/Mi 30<60% Macrovesicular steatosis on biopsy combined with varying degrees of Micro

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

There are 54 cases (9.2%) where post reperfusion biopsy was not performed.

RECIPIENT DEMOGRAPHICS

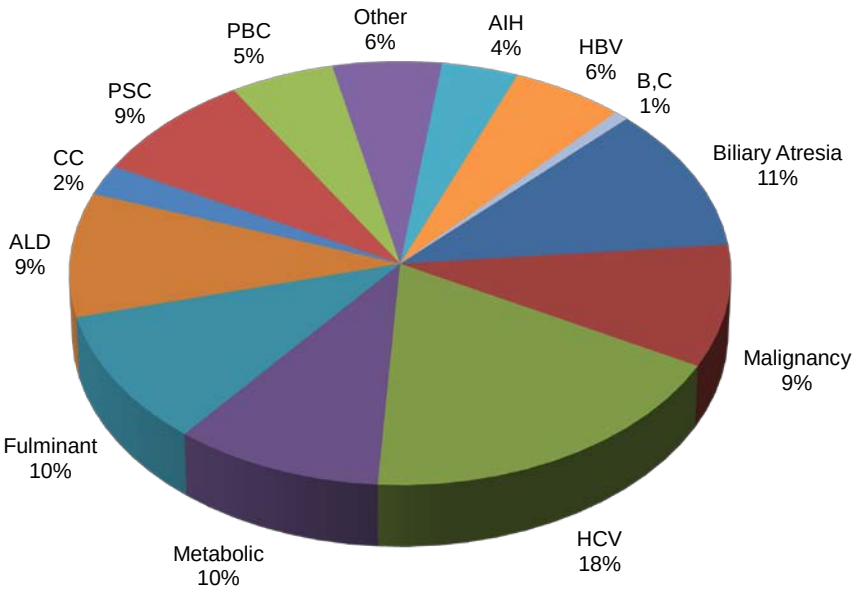
Breakdown of Patient Age at Primary Transplant
n = 1204



Data to 31 December 2012

The modal group was in the age range 51-60 years (32.6%).

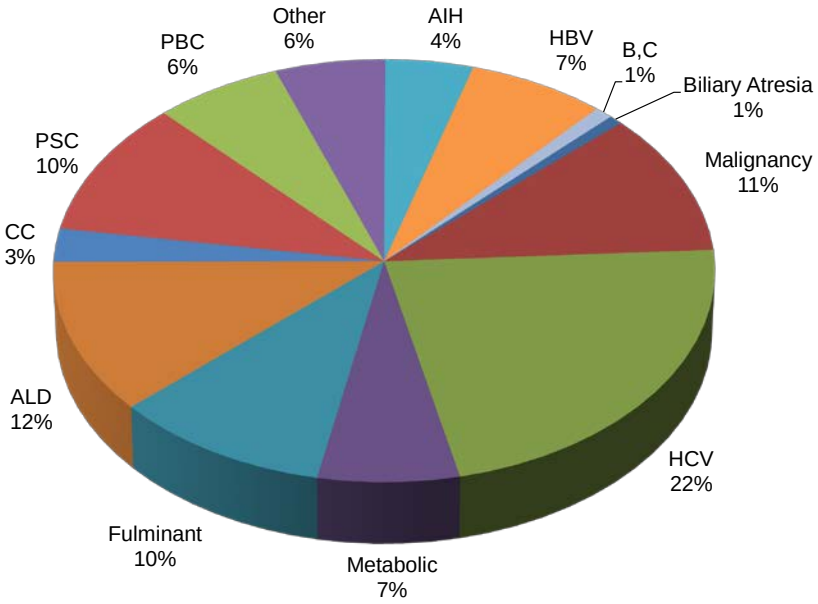
Primary Disease – All Patients
n = 1204



Data to 31 December 2012

The most common indications for transplantation are Chronic Hepatitis C (219, 18%), Biliary Atresia (133, 11%), Fulminant Liver Failure (122, 10%) and Metabolic Disease (118, 10%).

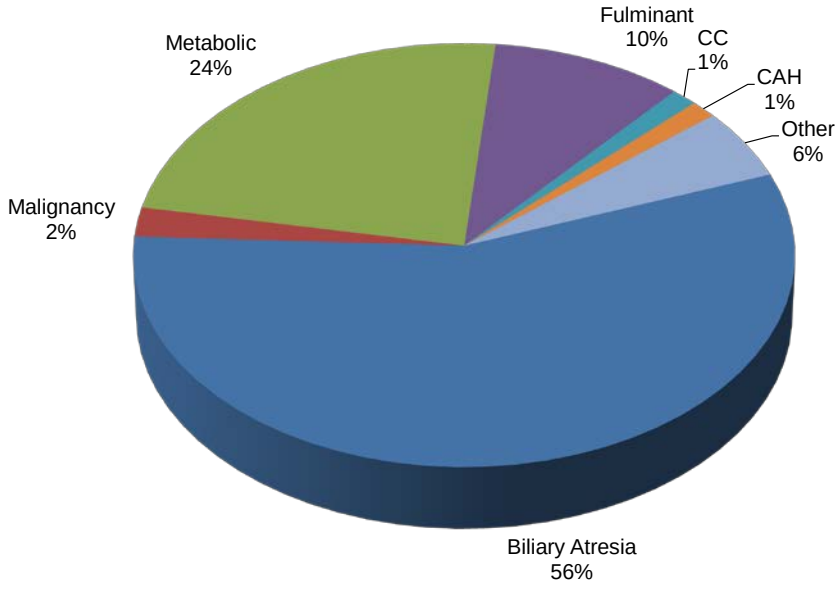
Primary Disease – Adults
n = 980



Data to 31 December 2012

Hepatitis C was the most common indication of transplantation in adults (222, 23%), followed by Alcoholic Liver Disease (ALD 115, 12%), Malignancy (104, 11%), Primary Sclerosing Cholangitis (PSC 102, 10%), Fulminant Hepatic Failure (100, 10%), and Hepatitis B (69, 7%).

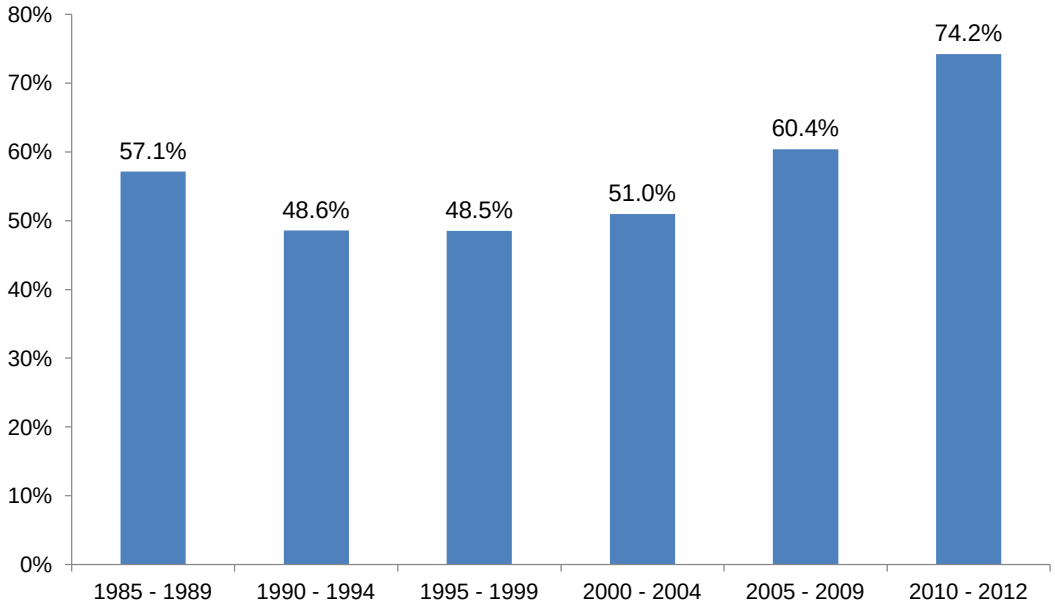
Primary Disease – Children
n = 224



Data to 31 December 2012

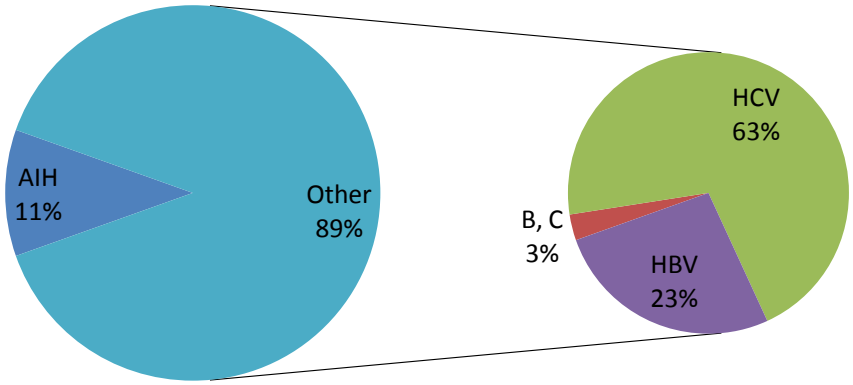
The most common indication for transplantation in children was Biliary Atresia (126, 56%), followed by Metabolic disease (53, 24%) and Fulminant Hepatic Failure (22, 10%).

Percentage of Children Transplanted for Biliary Atresia
n = 126 (56% of all Children)



Data to 31 December 2012

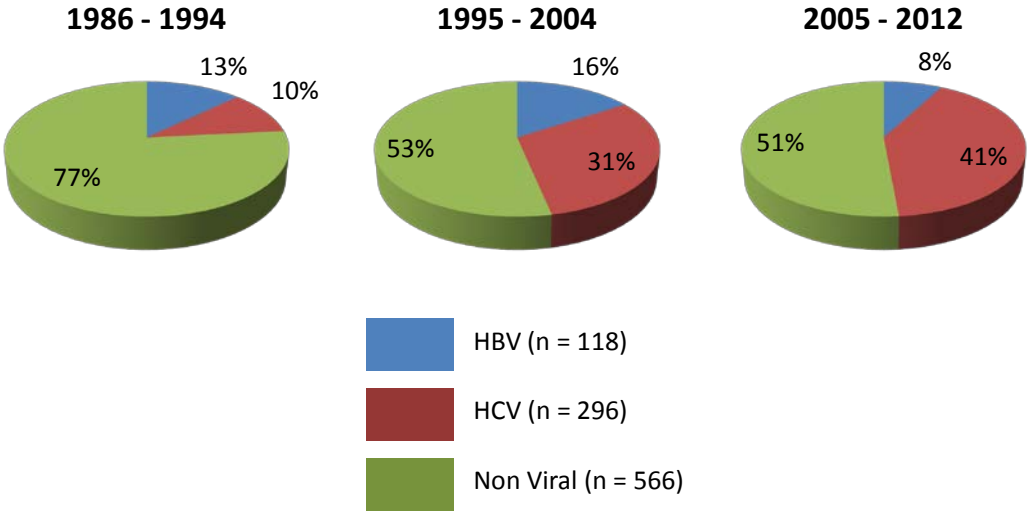
Chronic Viral and Auto-Immune Hepatitis
Primary and Secondary
n = 450 (46% of all Adults)



Data to 31 December 2012

Auto-Immune Hepatitis (AIH) comprised 11% of cases, the remainder (89%) being viral in origin (CVH). Of the cases of viral hepatitis, the most common is Hepatitis C (HCV) (61%), followed by Hepatitis B (HBV) (25%) and HBV/HCV co-infection (3%).

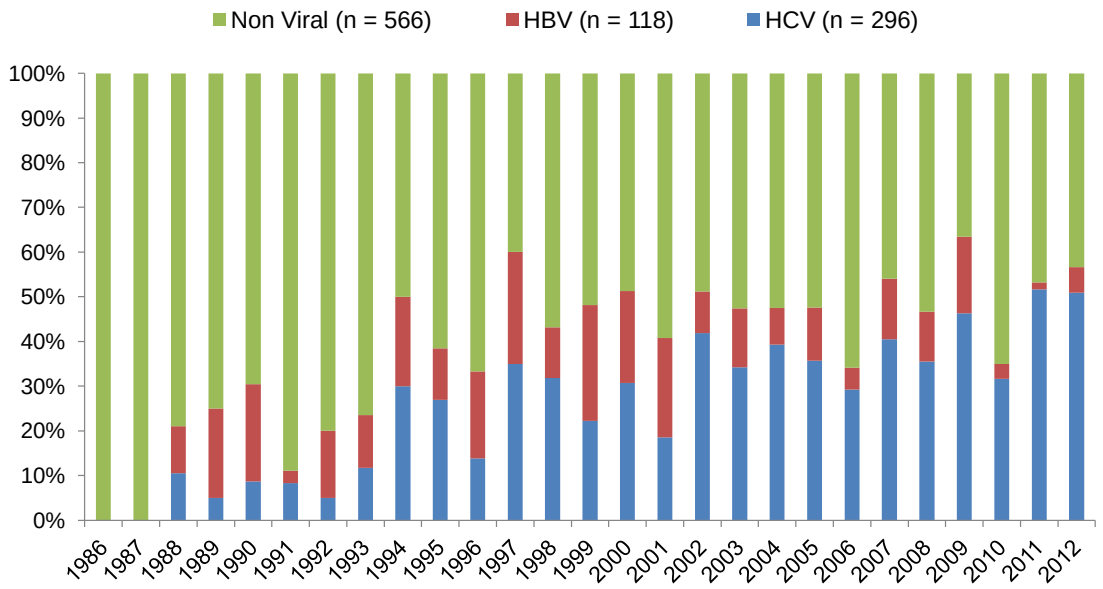
Chronic Viral (Primary and Secondary)
Adults by Era



Data to 31 December 2012

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 2012

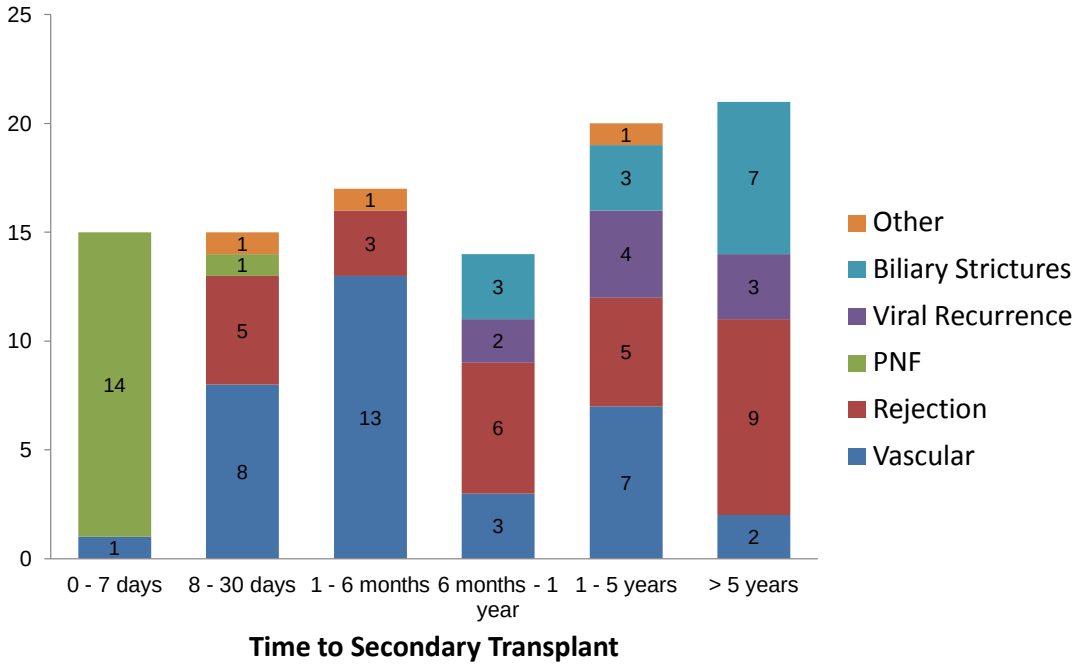
Chronic HCV infection comprises 28.9% of adults transplanted, and is expected to continue to rise in the future.

Fulminant Hepatic Failure As Primary Indication Treated by Liver Transplantation

Aetiology	No of Patients	No of Tx	Outcome	
			Alive	Dead
Idiopathic	49	54	31	18
Drug Induced	19	20	13	6
Wilson's Disease	13	15	11	2
Viral Hepatitis				
Hep B	28	29	17	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	4	4	3	1
Totals	122	132	77 (63% pts)	45 (37% pts)

Data to 31 December 2012

Indication for Secondary Transplantation
n = 102

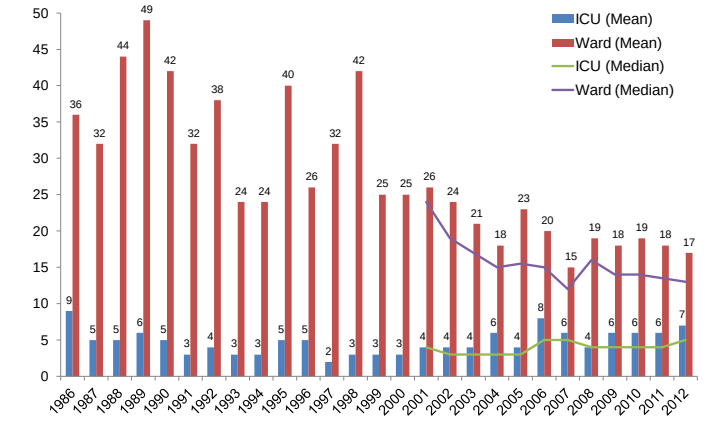


Data to 31 December 2012

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.

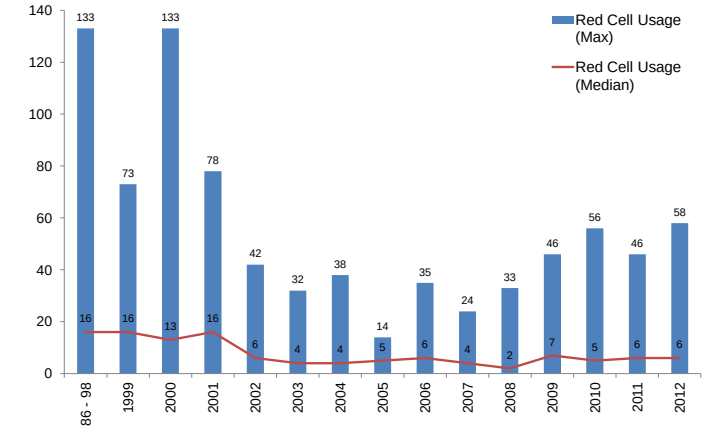
PERIOPERATIVE DATA

Hospital Stay (Mean & Median Days)
Adults Only



Data to 31 December 2012

Red Cell Usage
(Units of Packed Cells)



Data to 31 December 2012

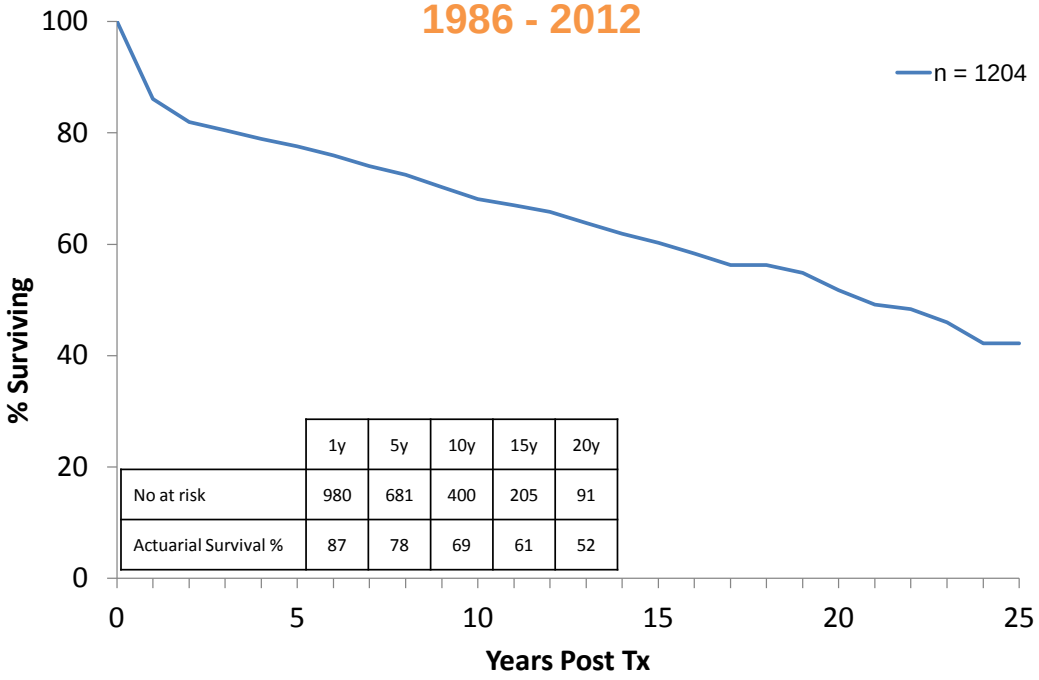
Graft Ischaemic Time, Operation Duration
And Red Cell Utilisation

	1986 – 1994	1995 – 2004	2005 – 2012
Mean Graft Ischaemic Time	9 hr 12 min	9 hr 16 min	8 hr 38 min
Mean Operation Time	7 hr 51 min	7 hr 43 min	7 hr 10 min
No. Of Packed Cells Utilised	1 – 133 Mean = 20.6; Median = 16	0 – 133 Mean = 16.0; Median = 12	0 – 58 Mean = 7.1; Median = 5

Data to 31 December 2012

OUTCOME DATA

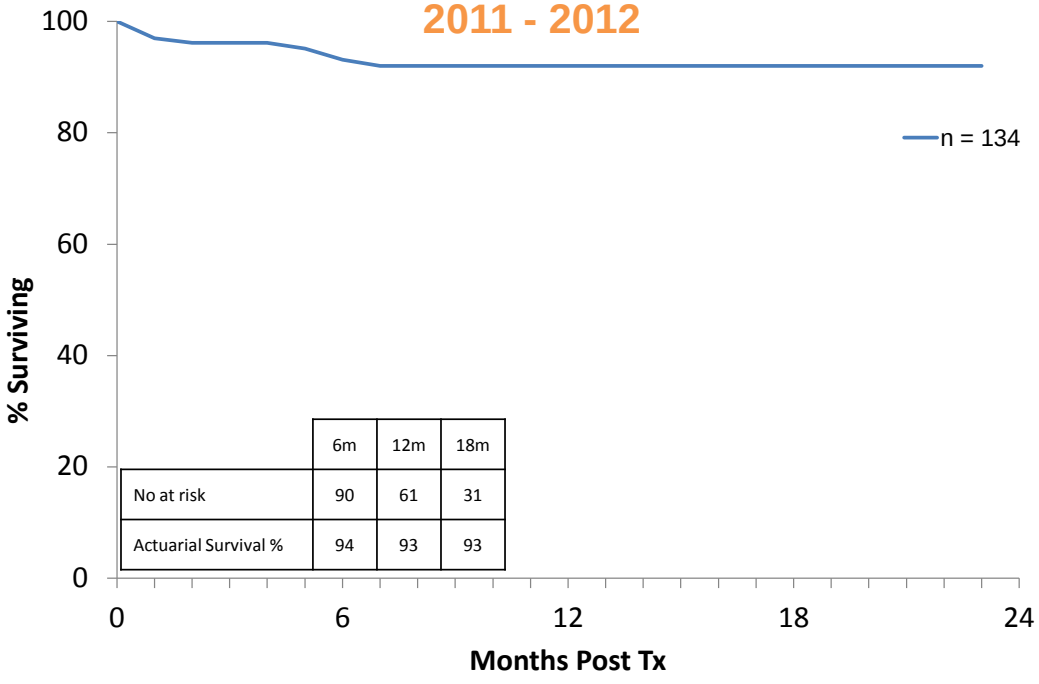
Overall Patient Survival (Adults and Children) 1986 - 2012



	1y	5y	10y	15y	20y
No at risk	980	681	400	205	91
Actuarial Survival %	87	78	69	61	52

Data to 31 December 2012

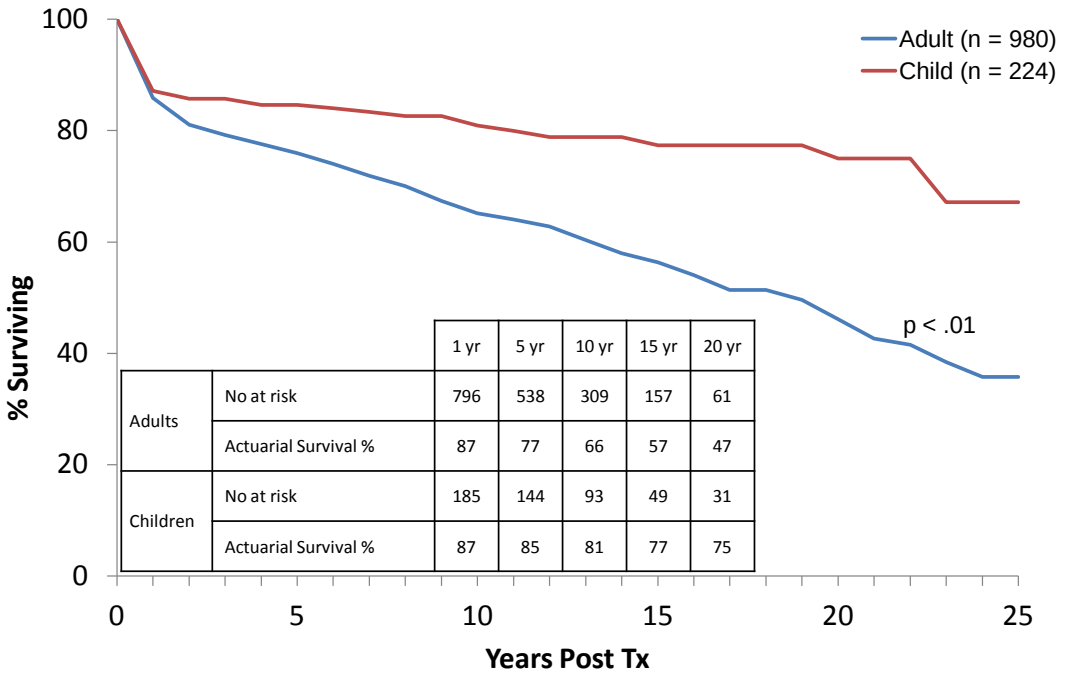
Patient Survival (Adults and Children) 2011 - 2012



	6m	12m	18m
No at risk	90	61	31
Actuarial Survival %	94	93	93

Data to 31 December 2012

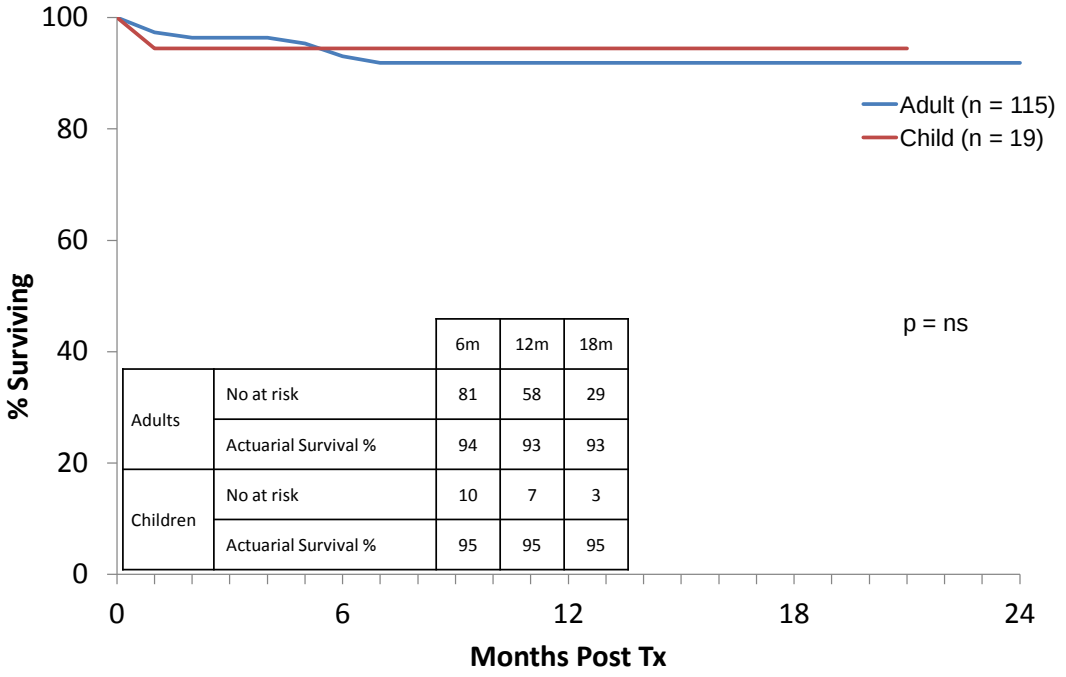
Patient Survival 1986 – 2012
Adults vs Children



		1 yr	5 yr	10 yr	15 yr	20 yr
Adults	No at risk	796	538	309	157	61
	Actuarial Survival %	87	77	66	57	47
Children	No at risk	185	144	93	49	31
	Actuarial Survival %	87	85	81	77	75

Data to 31 December 2012

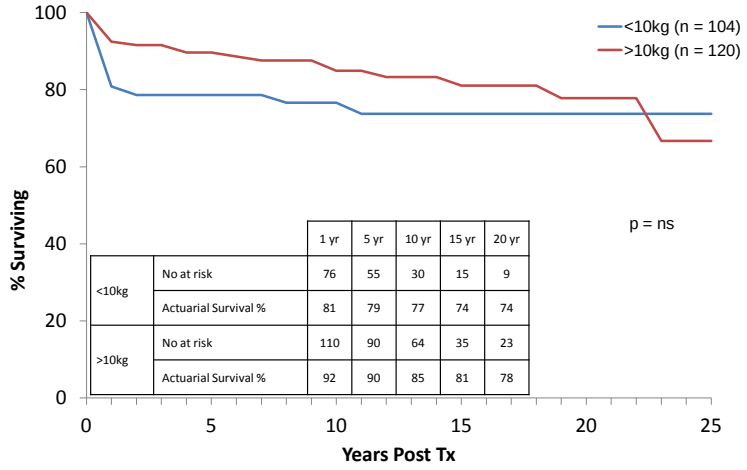
Patient Survival 2011 - 2012
Adults vs Children



		6m	12m	18m
Adults	No at risk	81	58	29
	Actuarial Survival %	94	93	93
Children	No at risk	10	7	3
	Actuarial Survival %	95	95	95

Data to 31 December 2012

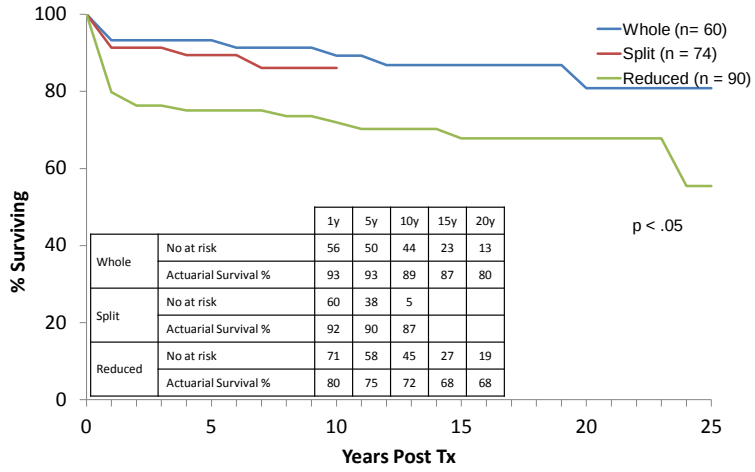
Children – Weight vs Outcome (Primary Grafts)



		1 yr	5 yr	10 yr	15 yr	20 yr
<10kg	No at risk	76	55	30	15	9
	Actuarial Survival %	81	79	77	74	74
>10kg	No at risk	110	90	64	35	23
	Actuarial Survival %	92	90	85	81	78

Data to 31 December 2012

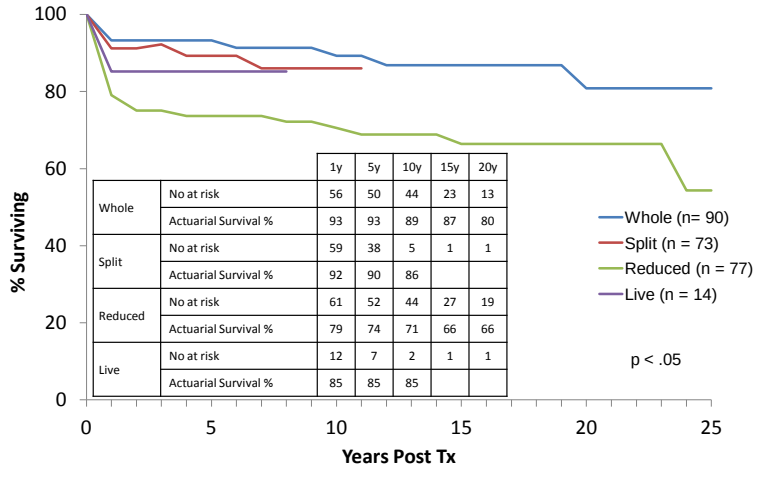
Children – Type of Transplant vs Outcome (Primary Grafts)



		1y	5y	10y	15y	20y
Whole	No at risk	56	50	44	23	13
	Actuarial Survival %	93	93	89	87	80
Split	No at risk	60	38	5		
	Actuarial Survival %	92	90	87		
Reduced	No at risk	71	58	45	27	19
	Actuarial Survival %	80	75	72	68	68

Data to 31 December 2012

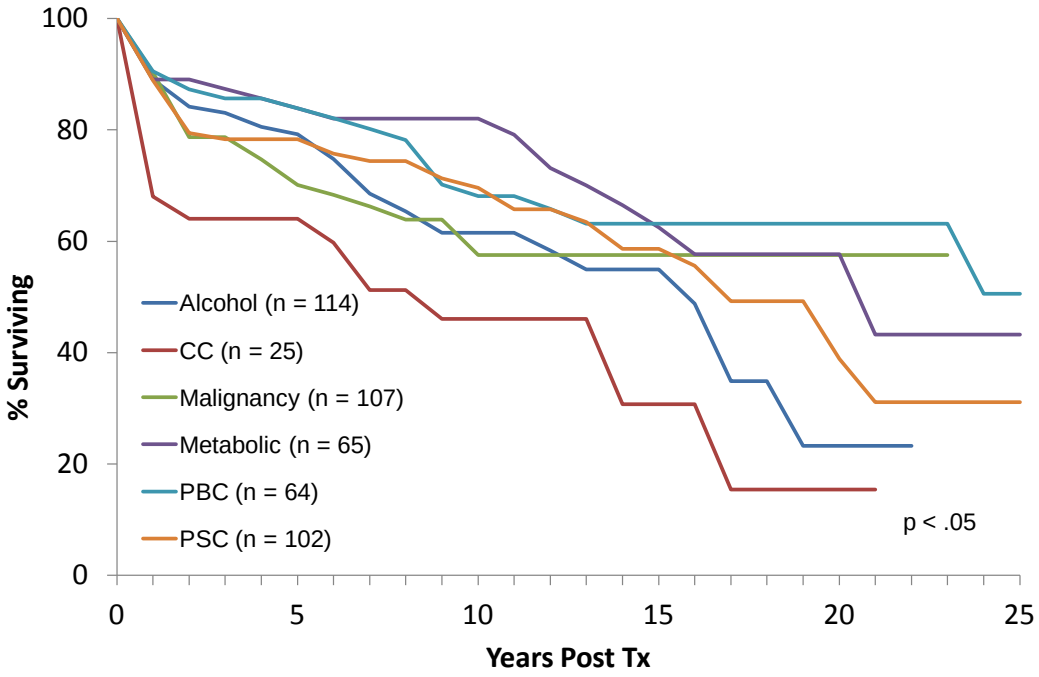
Children – Donor Type (Primary Grafts)



		1y	5y	10y	15y	20y
Whole	No at risk	56	50	44	23	13
	Actuarial Survival %	93	93	89	87	80
Split	No at risk	59	38	5	1	1
	Actuarial Survival %	92	90	86		
Reduced	No at risk	61	52	44	27	19
	Actuarial Survival %	79	74	71	66	66
Live	No at risk	12	7	2	1	1
	Actuarial Survival %	85	85	85		

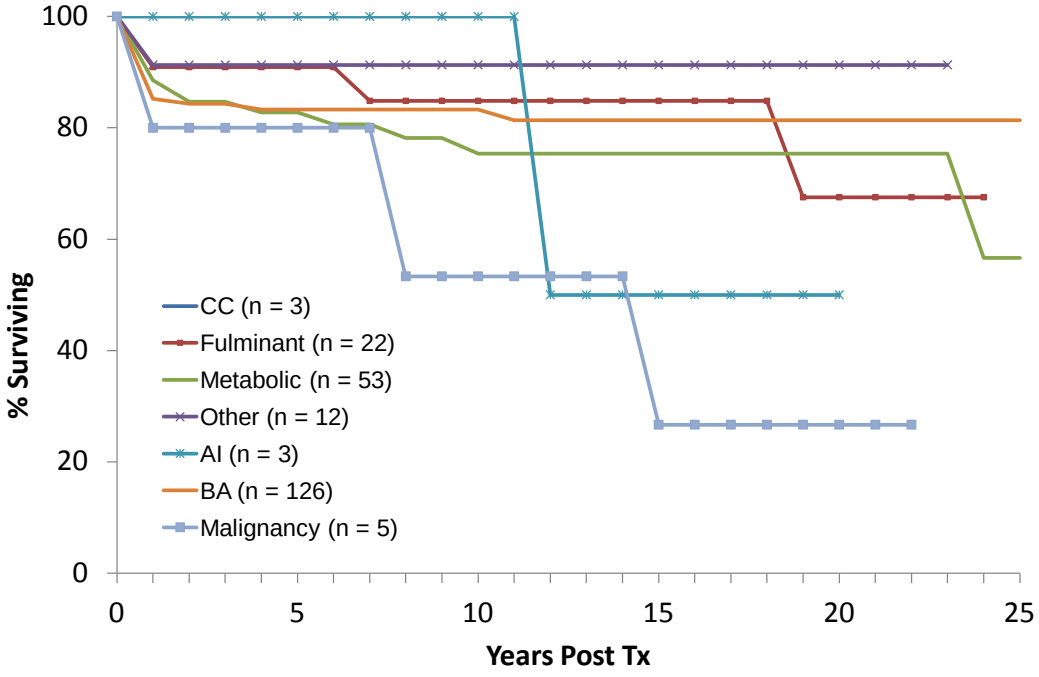
Data to 31 December 2012

Primary Disease vs Outcome
Adults



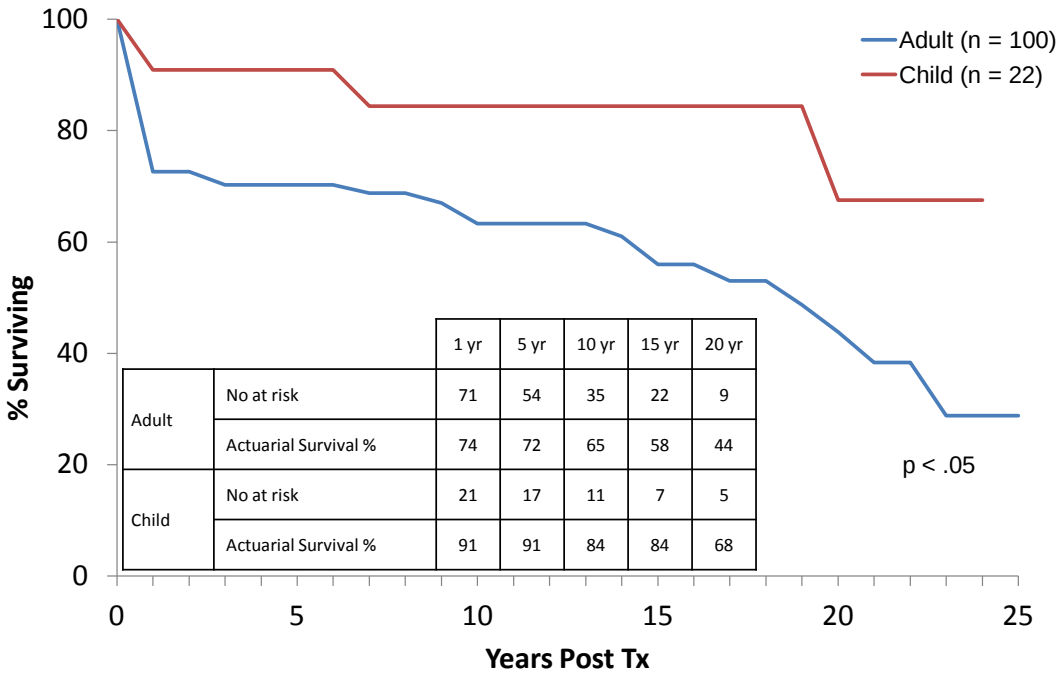
Data to 31 December 2012

Primary Disease vs Outcome
Children



Data to 31 December 2012

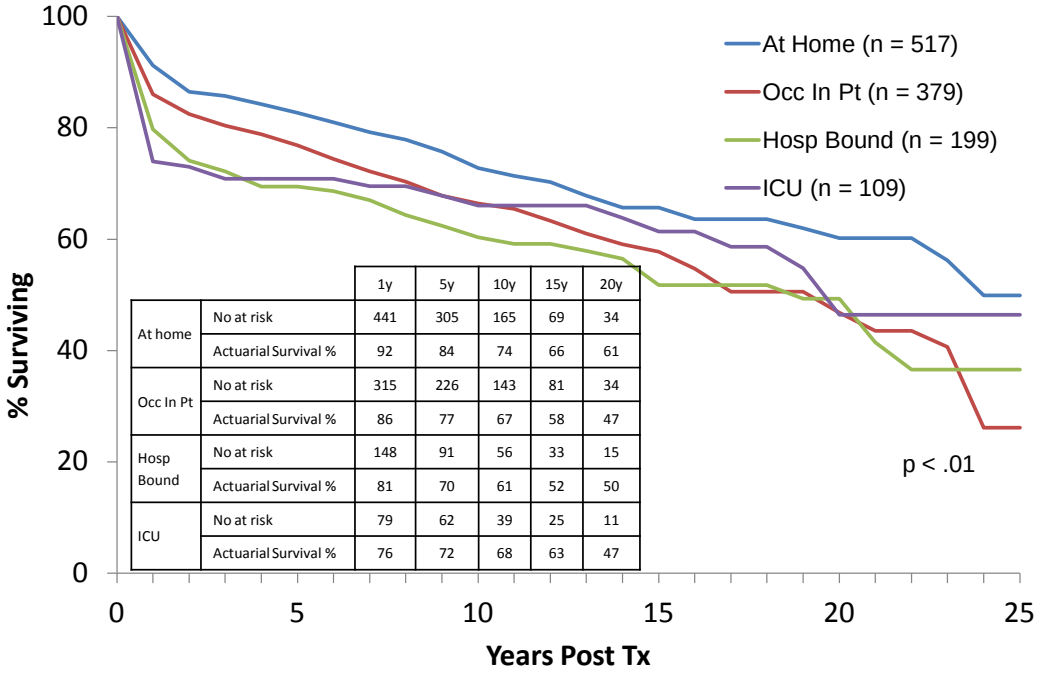
Fulminant Disease vs Outcome
Adults vs Children



		1 yr	5 yr	10 yr	15 yr	20 yr
Adult	No at risk	71	54	35	22	9
	Actuarial Survival %	74	72	65	58	44
Child	No at risk	21	17	11	7	5
	Actuarial Survival %	91	91	84	84	68

Data to 31 December 2012

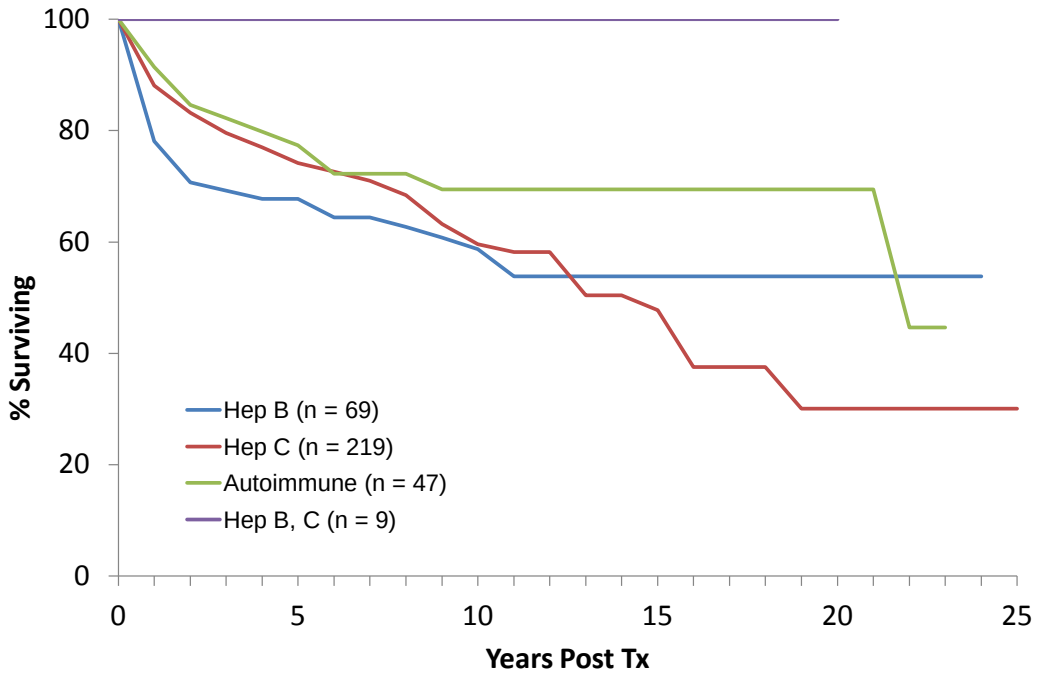
Status vs Outcome
(Adults and Children – Primary Grafts)



		1y	5y	10y	15y	20y
At home	No at risk	441	305	165	69	34
	Actuarial Survival %	92	84	74	66	61
Occ In Pt	No at risk	315	226	143	81	34
	Actuarial Survival %	86	77	67	58	47
Hosp Bound	No at risk	148	91	56	33	15
	Actuarial Survival %	81	70	61	52	50
ICU	No at risk	79	62	39	25	11
	Actuarial Survival %	76	72	68	63	47

Data to 31 December 2012

Chronic Viral, Autoimmune Disease vs Outcome (Primary Grafts)



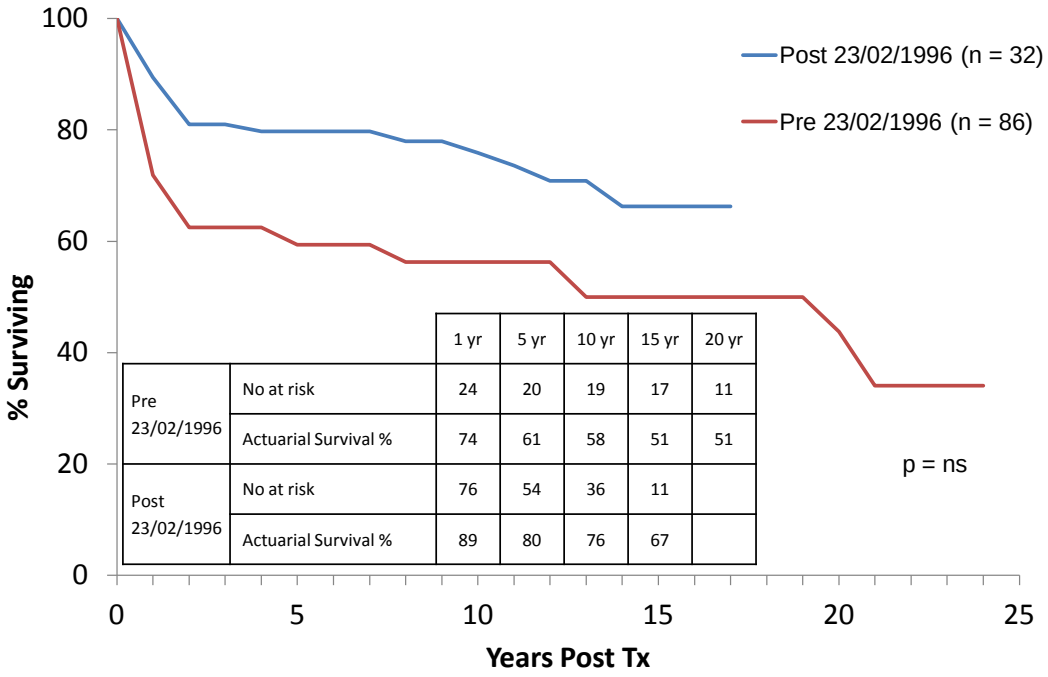
Data to 31 December 2012

Chronic Viral, Autoimmune Disease vs Outcome (Primary Grafts)

		1y	5y	10y	15y	20y
HBV	No at risk	54	44	39	20	9
	Actuarial Survival %	78	68	64	54	54
HCV	No at risk	176	101	48	17	3
	Actuarial Survival %	89	75	60	48	30
AI	No at risk	43	34	25	16	13
	Actuarial Survival %	93	82	71	64	64
B, C	No at risk	9	9	6	5	3
	Actuarial Survival %	100	100	100	100	100

Data to 31 December 2012

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

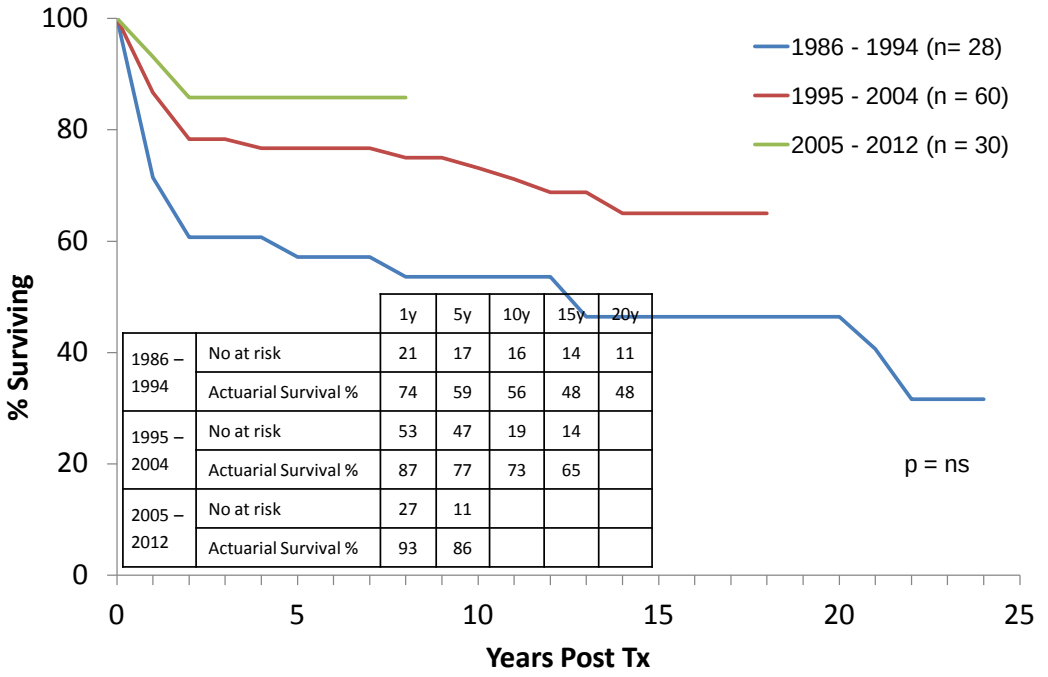


		1 yr	5 yr	10 yr	15 yr	20 yr
Pre 23/02/1996	No at risk	24	20	19	17	11
	Actuarial Survival %	74	61	58	51	51
Post 23/02/1996	No at risk	76	54	36	11	
	Actuarial Survival %	89	80	76	67	

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

Data to 31 December 2012

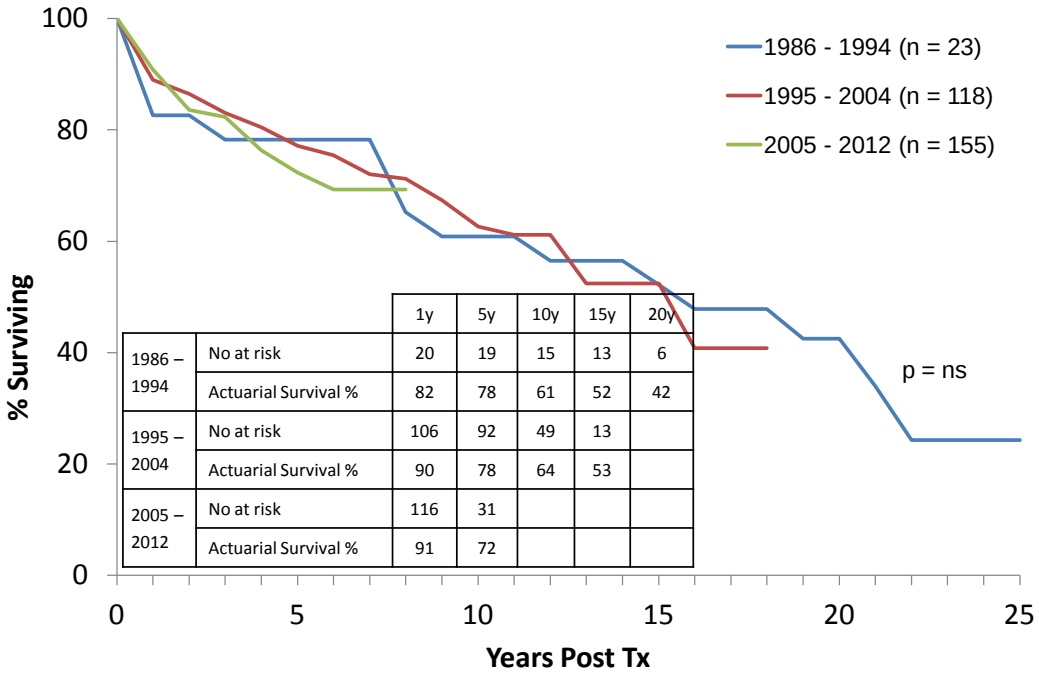
Chronic HBV (Primary and Secondary) vs Era



		1y	5y	10y	15y	20y
1986 – 1994	No at risk	21	17	16	14	11
	Actuarial Survival %	74	59	56	48	48
1995 – 2004	No at risk	53	47	19	14	
	Actuarial Survival %	87	77	73	65	
2005 – 2012	No at risk	27	11			
	Actuarial Survival %	93	86			

Data to 31 December 2012

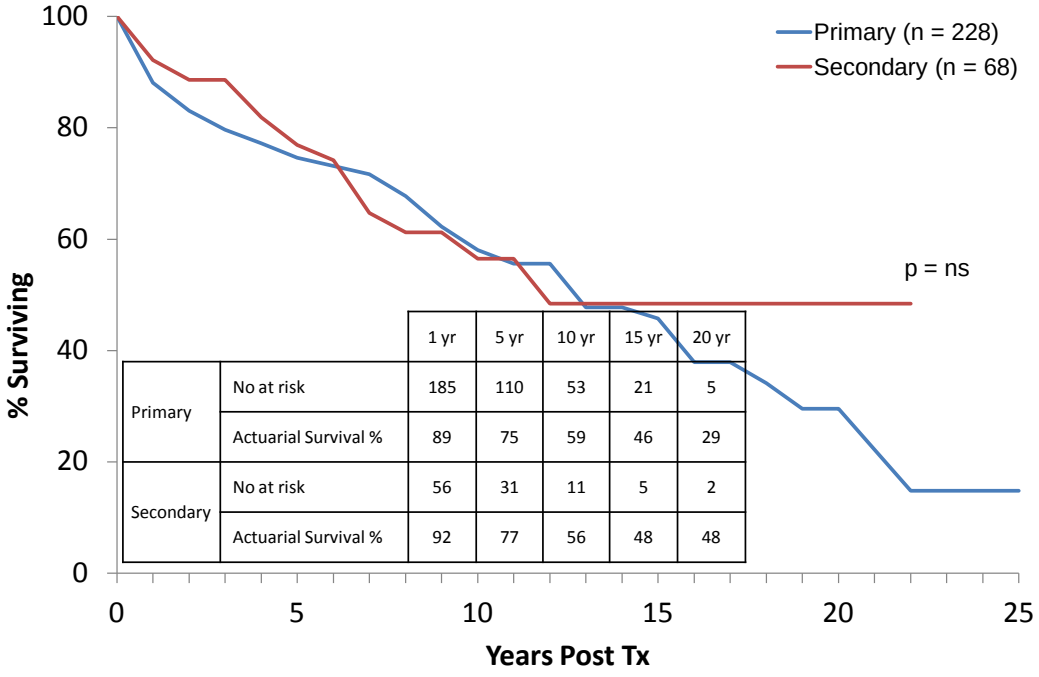
Chronic HCV (Primary and Secondary) vs Era



		1y	5y	10y	15y	20y
1986 – 1994	No at risk	20	19	15	13	6
	Actuarial Survival %	82	78	61	52	42
1995 – 2004	No at risk	106	92	49	13	
	Actuarial Survival %	90	78	64	53	
2005 – 2012	No at risk	116	31			
	Actuarial Survival %	91	72			

Data to 31 December 2012

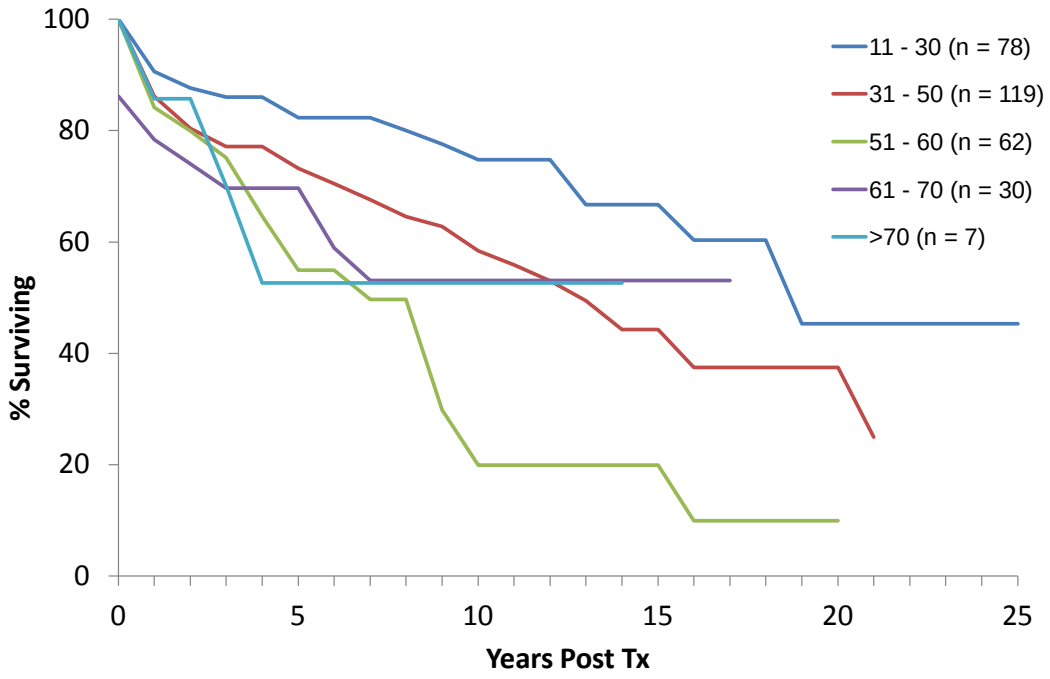
Chronic HCV Primary vs Secondary Indication Primary Graft Survival



		1 yr	5 yr	10 yr	15 yr	20 yr
Primary	No at risk	185	110	53	21	5
	Actuarial Survival %	89	75	59	46	29
Secondary	No at risk	56	31	11	5	2
	Actuarial Survival %	92	77	56	48	48

Data to 31 December 2012

HCV vs Donor Age vs Primary Graft Outcome
Adults (n = 296)



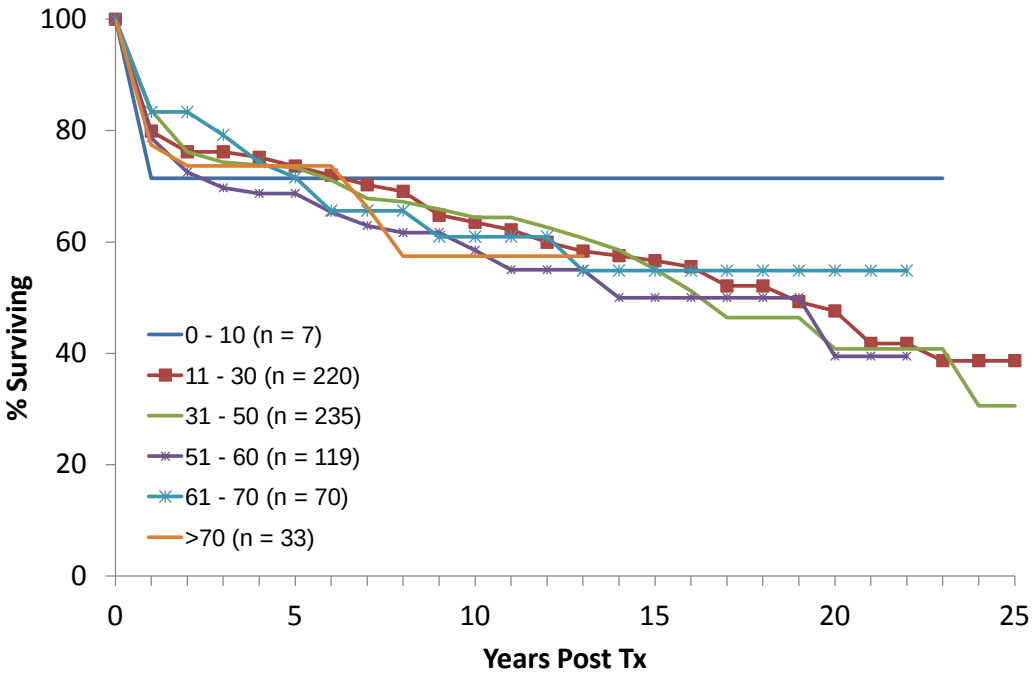
Data to 31 December 2012

HCV vs Donor Age vs Primary Graft Outcome
Adults (n = 296)

		1y	5y	10y	15y	20y
11 - 30	No at risk	65	45	26	14	3
	Actuarial Survival %	91	83	75	67	40
31 - 50	No at risk	97	55	26	8	4
	Actuarial Survival %	87	74	59	44	37
51 - 60	No at risk	44	16	3	3	
	Actuarial Survival %	86	57	22	22	
61 – 70	No at risk	25	15	5	2	
	Actuarial Survival %	86	69	52	52	
>70	No at risk	7	4	3		
	Actuarial Survival %	86	51	51		

Data to 31 December 2012

Non HCV vs Donor Age vs Primary Graft Outcome Adults (n = 684)



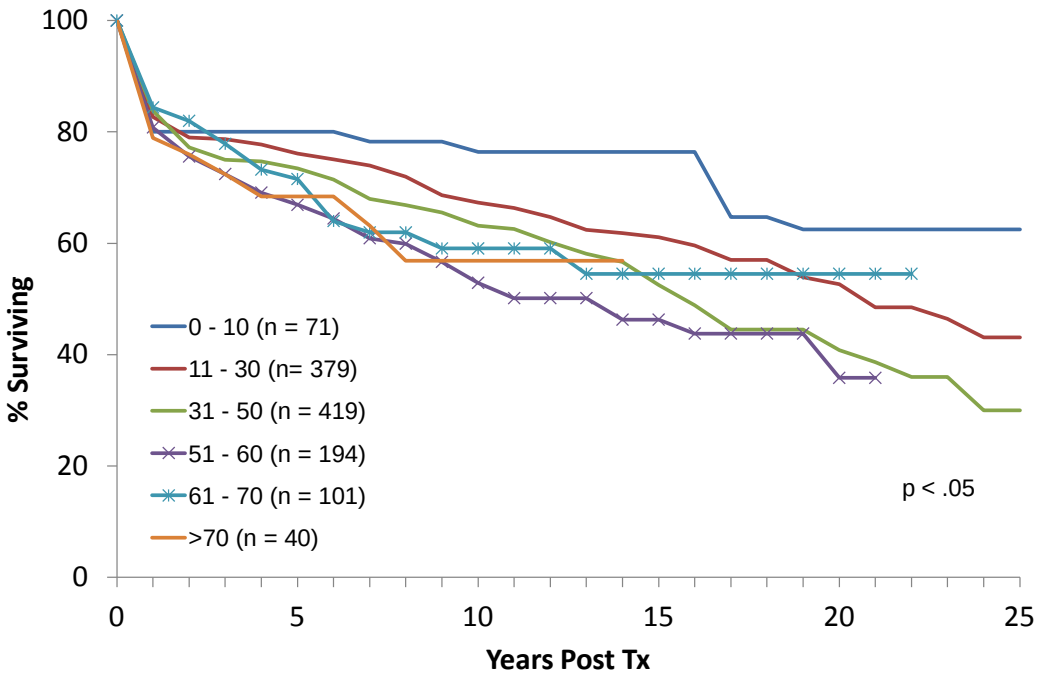
Data to 31 December 2012

Non HCV vs Donor Age vs Primary Graft Outcome Adults (n = 684)

		1y	5y	10y	15y	20y	25y
0 -10	No at risk	6	5	5	4	2	
	Actuarial Survival %	71	71	71	71	71	
11 - 30	No at risk	175	139	96	58	27	3
	Actuarial Survival %	81	75	65	58	49	39
31 - 50	No at risk	194	140	85	47	15	
	Actuarial Survival %	84	73	64	55	41	
51 - 60	No at risk	92	63	36	17	7	
	Actuarial Survival %	81	71	60	52	40	
61 – 70	No at risk	52	26	12	3	3	
	Actuarial Survival %	84	72	62	56	56	
>70	No at risk	23	13	3			
	Actuarial Survival %	78	75	58			

Data to 31 December 2012

Donor Age vs Primary Graft Outcome



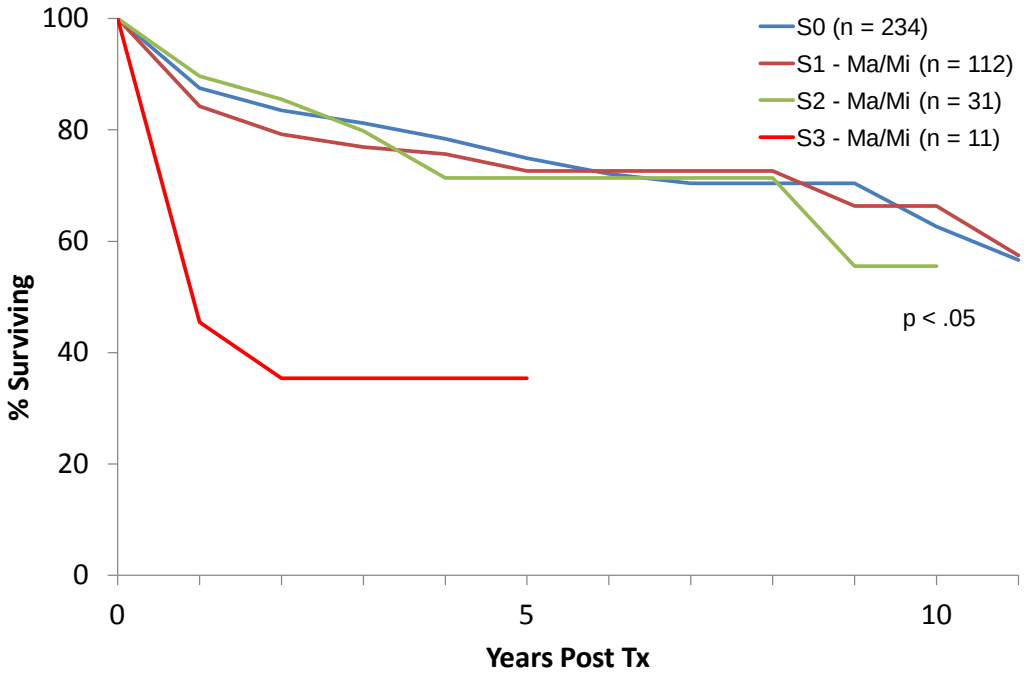
Data to 31 December 2012

Donor Age vs Primary Graft Outcome

		1y	5y	10y	15y	20y
0 -10	No at risk	56	49	41	21	9
	Actuarial Survival %	80	80	77	77	63
11 - 30	No at risk	298	226	146	87	41
	Actuarial Survival %	84	77	68	62	53
31 - 50	No at risk	341	229	125	62	22
	Actuarial Survival %	84	74	63	53	41
51 - 60	No at risk	146	86	41	20	8
	Actuarial Survival %	83	69	55	48	37
61 - 70	No at risk	77	41	17	5	4
	Actuarial Survival %	85	72	60	55	55
>70	No at risk	29	16	5		
	Actuarial Survival %	79	69	57		

Data to 31 December 2012

Macro Steatosis vs Primary Graft Outcome (Adults) 2001 - 2012



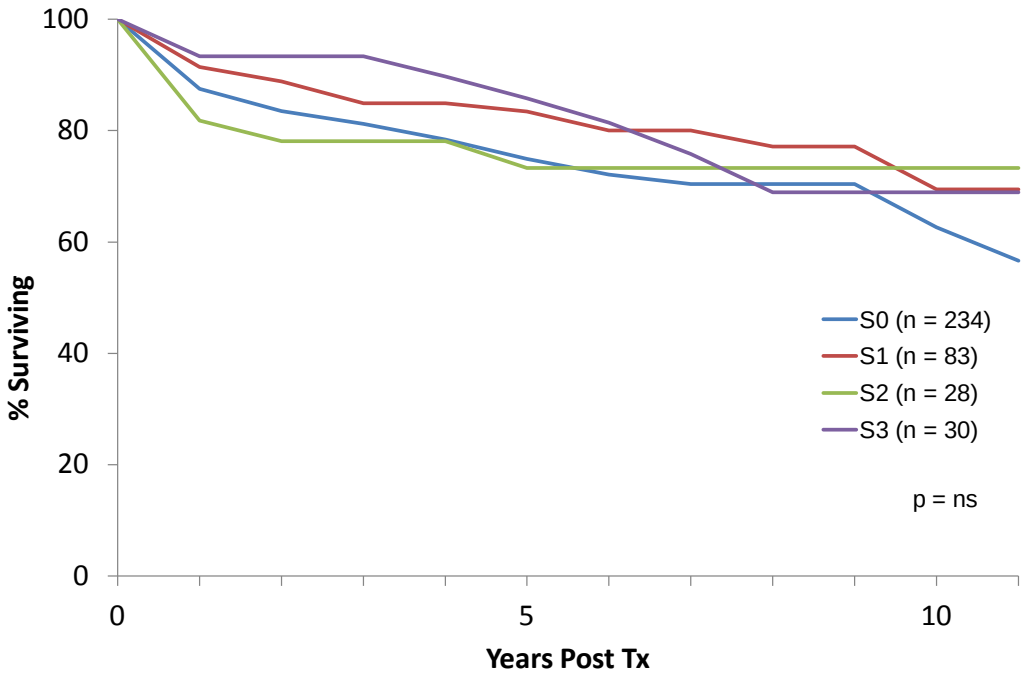
Data to 31 December 2012

Macro Steatosis vs Primary Graft Outcome (Adults) 2001 - 2012

		1y	5y	10y
S0	No at risk	173	57	13
	Actuarial Survival %	89	76	62
S1 Ma/Mi	No at risk	88	42	12
	Actuarial Survival %	84	73	67
S2 Ma/Mi	No at risk	25	6	2
	Actuarial Survival %	90	70	56
S3 Ma/Mi	No at risk	6	1	1
	Actuarial Survival %	50		

Data to 31 December 2012

Micro Steatosis vs Primary Graft Outcome (Adults) 2001 - 2012



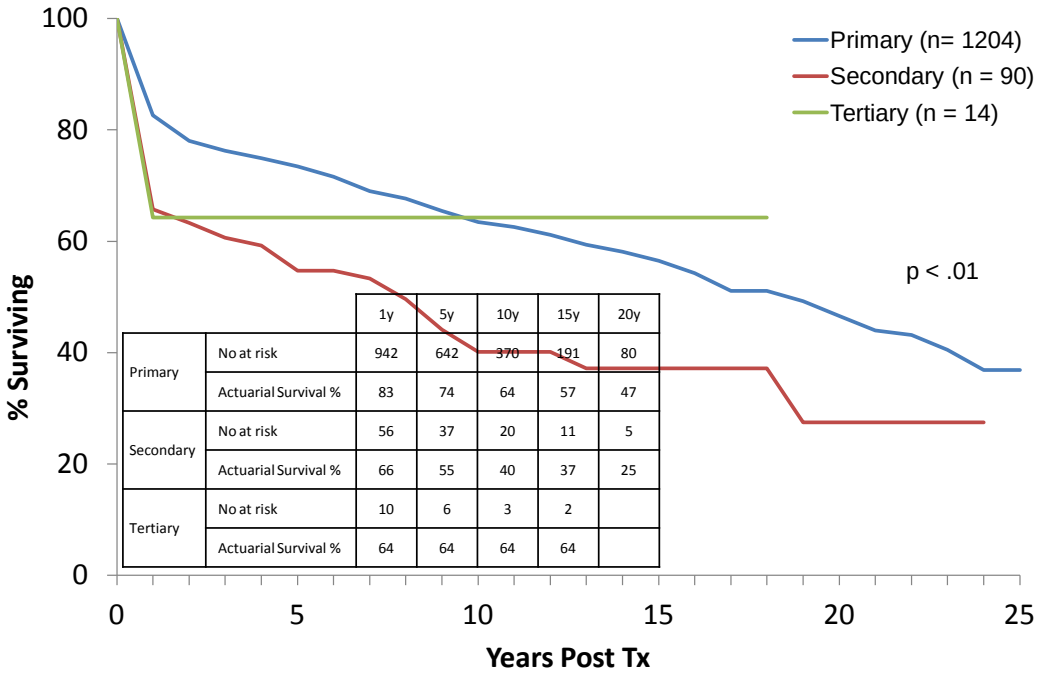
Data to 31 December 2012

Micro Steatosis vs Primary Graft Outcome (Adults) 2001 - 2012

		1y	5y	10y
S0	No at risk	173	57	13
	Actuarial Survival %	89	76	62
S1 Mi	No at risk	74	56	7
	Actuarial Survival %	91	84	71
S2 Mi	No at risk	23	16	4
	Actuarial Survival %	82	73	73
S3 Mi	No at risk	29	23	5
	Actuarial Survival %	93	86	70

Data to 31 December 2012

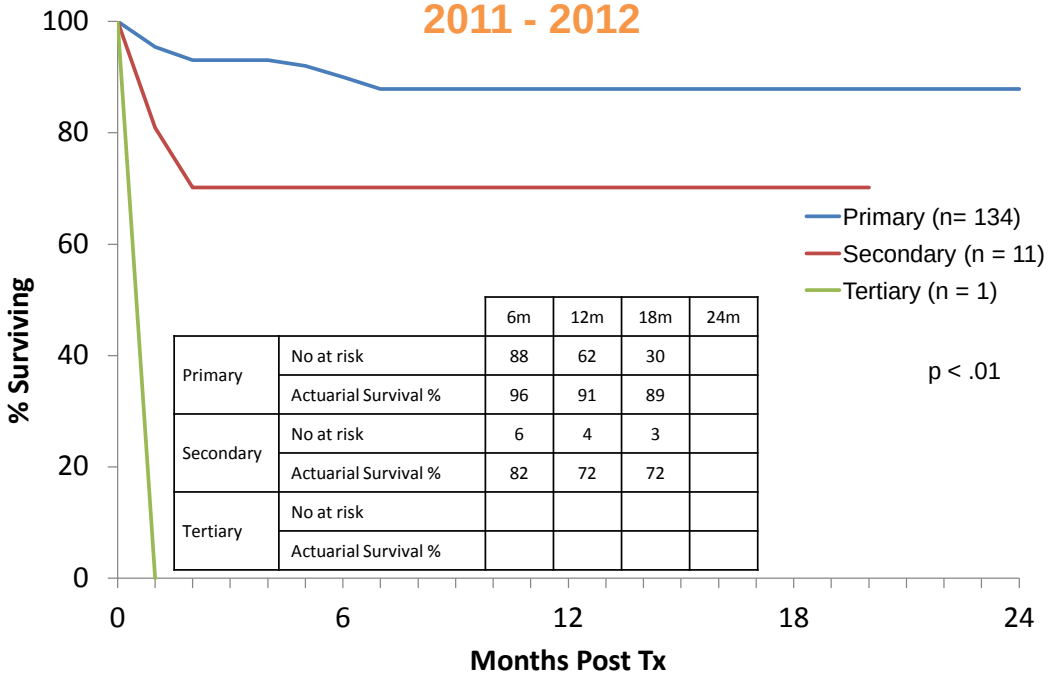
Graft Survival by Graft No (Adults and Children)



		1y	5y	10y	15y	20y
Primary	No at risk	942	642	370	191	80
	Actuarial Survival %	83	74	64	57	47
Secondary	No at risk	56	37	20	11	5
	Actuarial Survival %	66	55	40	37	25
Tertiary	No at risk	10	6	3	2	
	Actuarial Survival %	64	64	64	64	

Data to 31 December 2012

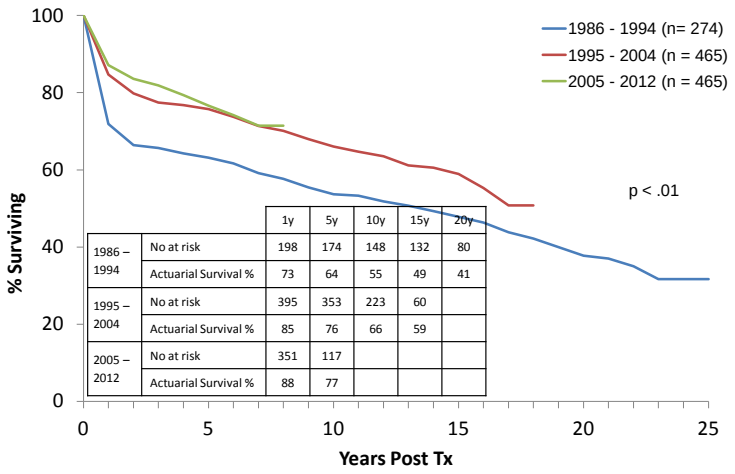
Graft Survival by Graft No (Adults and Children) 2011 - 2012



		6m	12m	18m	24m
Primary	No at risk	88	62	30	
	Actuarial Survival %	96	91	89	
Secondary	No at risk	6	4	3	
	Actuarial Survival %	82	72	72	
Tertiary	No at risk				
	Actuarial Survival %				

Data to 31 December 2012

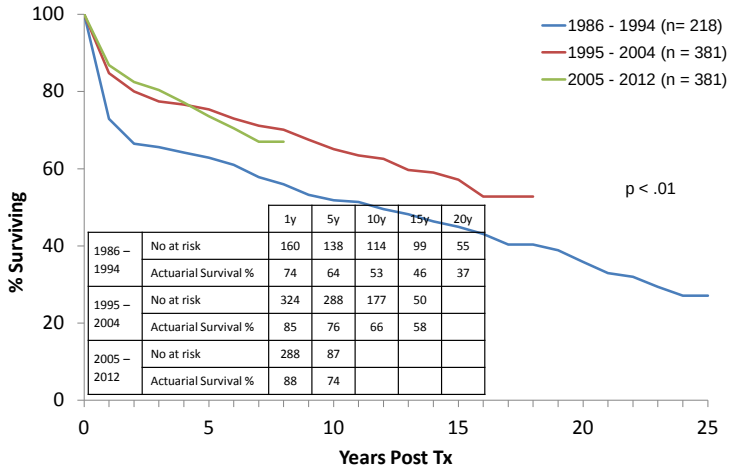
Primary Graft Survival by Era (Adults and Children)



		1y	5y	10y	15y	20y
1986 – 1994	No at risk	198	174	148	132	80
	Actuarial Survival %	73	64	55	49	41
1995 – 2004	No at risk	395	353	223	60	
	Actuarial Survival %	85	76	66	59	
2005 – 2012	No at risk	351	117			
	Actuarial Survival %	88	77			

Data to 31 December 2012

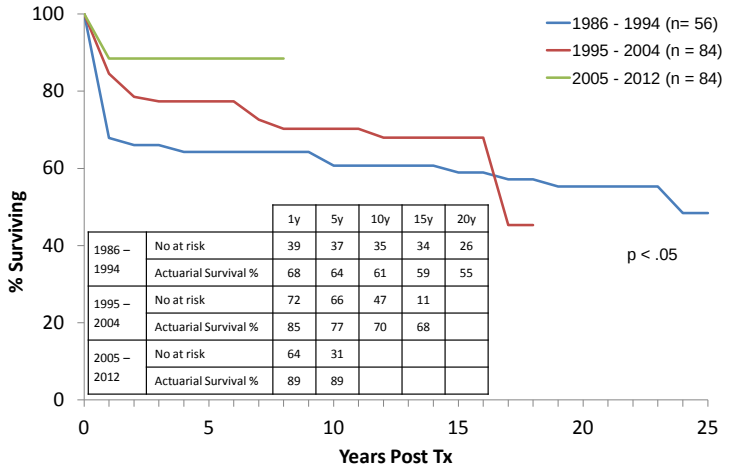
Primary Graft Survival by Era Adults



		1y	5y	10y	15y	20y
1986 – 1994	No at risk	160	138	114	99	55
	Actuarial Survival %	74	64	53	46	37
1995 – 2004	No at risk	324	288	177	50	
	Actuarial Survival %	85	76	66	58	
2005 – 2012	No at risk	288	87			
	Actuarial Survival %	88	74			

Data to 31 December 2012

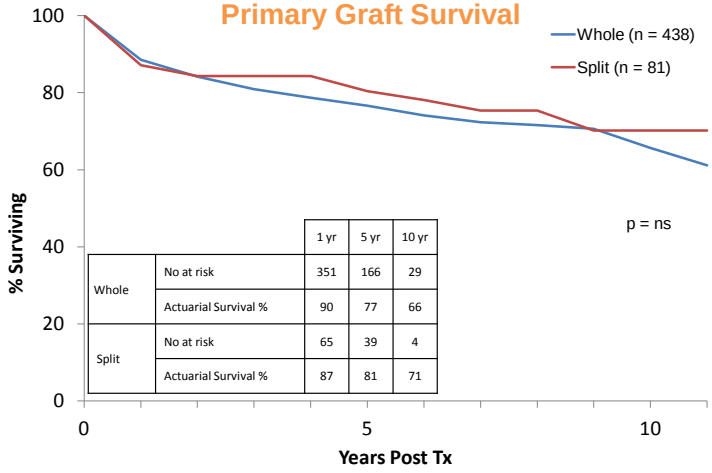
Primary Graft Survival by Era Children



		1y	5y	10y	15y	20y
1986 – 1994	No at risk	39	37	35	34	26
	Actuarial Survival %	68	64	61	59	55
1995 – 2004	No at risk	72	66	47	11	
	Actuarial Survival %	85	77	70	68	
2005 – 2012	No at risk	64	31			
	Actuarial Survival %	89	89			

Data to 31 December 2012

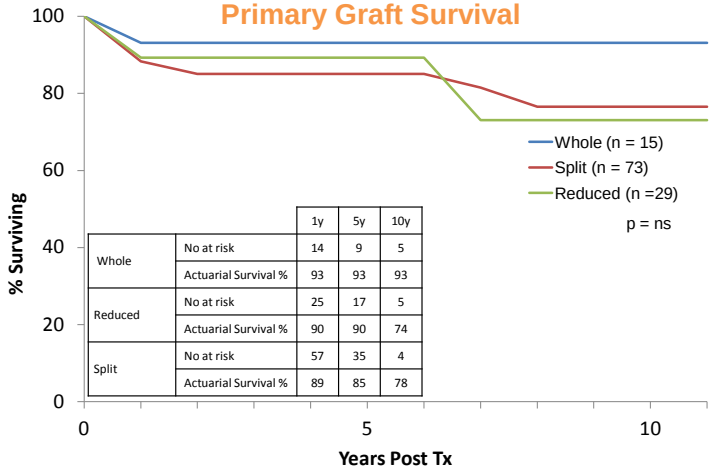
Split vs Whole Grafts (Adults)
2002 – 2012
Primary Graft Survival



		1 yr	5 yr	10 yr
Whole	No at risk	351	166	29
	Actuarial Survival %	90	77	66
Split	No at risk	65	39	4
	Actuarial Survival %	87	81	71

Data to 31 December 2012

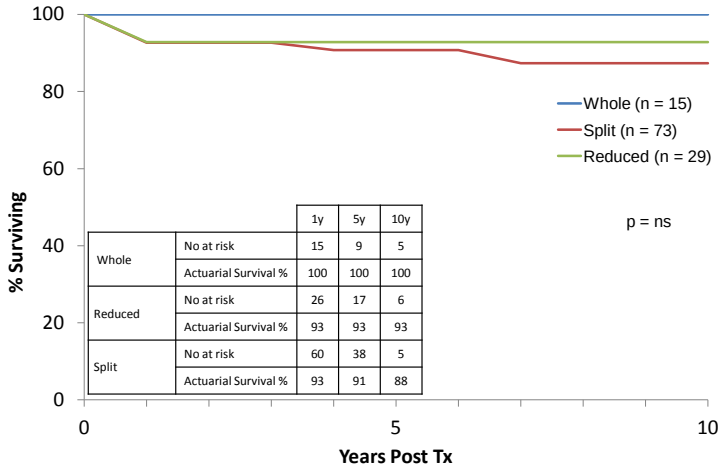
Split vs Reduced vs Whole Grafts (Children)
2002 – 2012
Primary Graft Survival



		1y	5y	10y
Whole	No at risk	14	9	5
	Actuarial Survival %	93	93	93
Reduced	No at risk	25	17	5
	Actuarial Survival %	90	90	74
Split	No at risk	57	35	4
	Actuarial Survival %	89	85	78

Data to 31 December 2012

Split vs Reduced vs Whole Grafts (Children)
Patient Survival 2002 – 2012



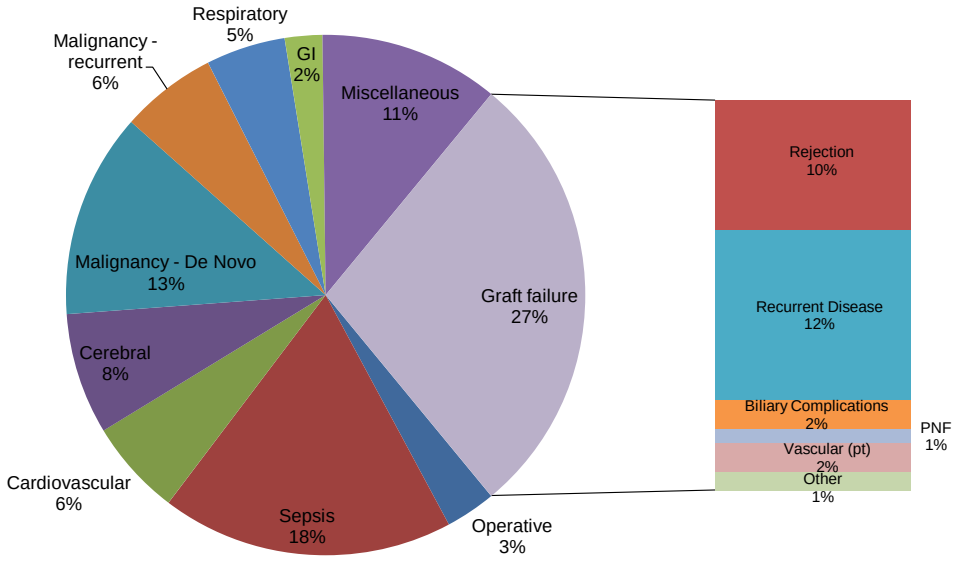
		1y	5y	10y
Whole	No at risk	15	9	5
	Actuarial Survival %	100	100	100
Reduced	No at risk	26	17	6
	Actuarial Survival %	93	93	93
Split	No at risk	60	38	5
	Actuarial Survival %	93	91	88

Data to 31 December 2012

Cause of Death

Graft Failure		108 (28.1%)
	Rejection: Chronic	26
	Rejection: Acute	10
	Recurrent disease	
	Hepatitis C	33
	Hepatitis B	11
	Vascular	8
	Biliary Complications	5
	PNF	4
	NASH	2
	Other	6
Sepsis		70 (18.2%)
Malignancy		72 (18.7%)
	Recurrent disease	23
	De Novo	48
	Transferred from donor	1
Cerebral		29 (7.5%)
Cardiovascular		23 (6.0%)
Respiratory		19 (4.9%)
Operative		12 (3.1%)
Gastrointestinal		9 (2.3%)
Multi-organ Failure		8 (2.1%)
Vascular		5 (1.3%)
GVHD		4 (1.0%)
Renal Failure		4 (1.0%)
Other		22 (5.7%)
TOTAL		385 (31.8% of all pts)

Cause of Death (n = 385)



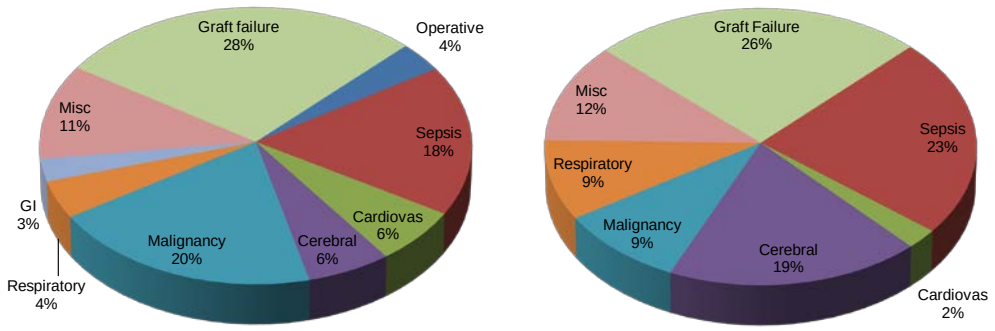
 Data to 31 December 2012

385 patients, or 31.8% of all patients transplanted, have died. 70 (18.2%) have died due to sepsis and 108 (28.1%) from graft failure.

Of the 108 cases of death due to graft failure, 35 (32.3%) patients lost grafts due to rejection, 45 (41.6%) from recurrent disease and 4 (3.7%) from primary non function (PNF).

Cause of Death (n = 385)

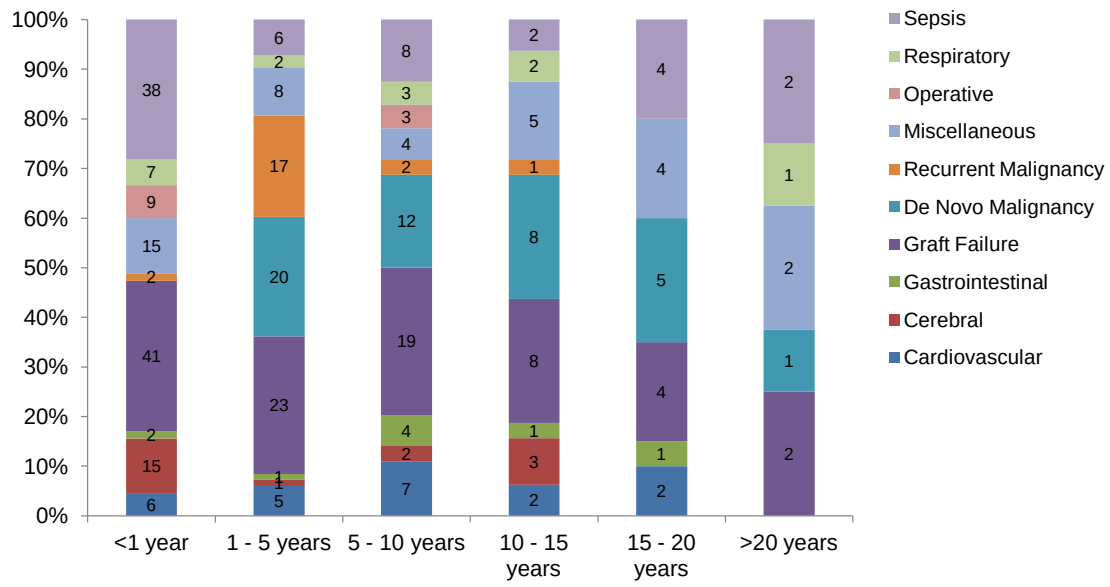
Adults (n = 342) Children (n = 43)



 Data to 31 December 2012

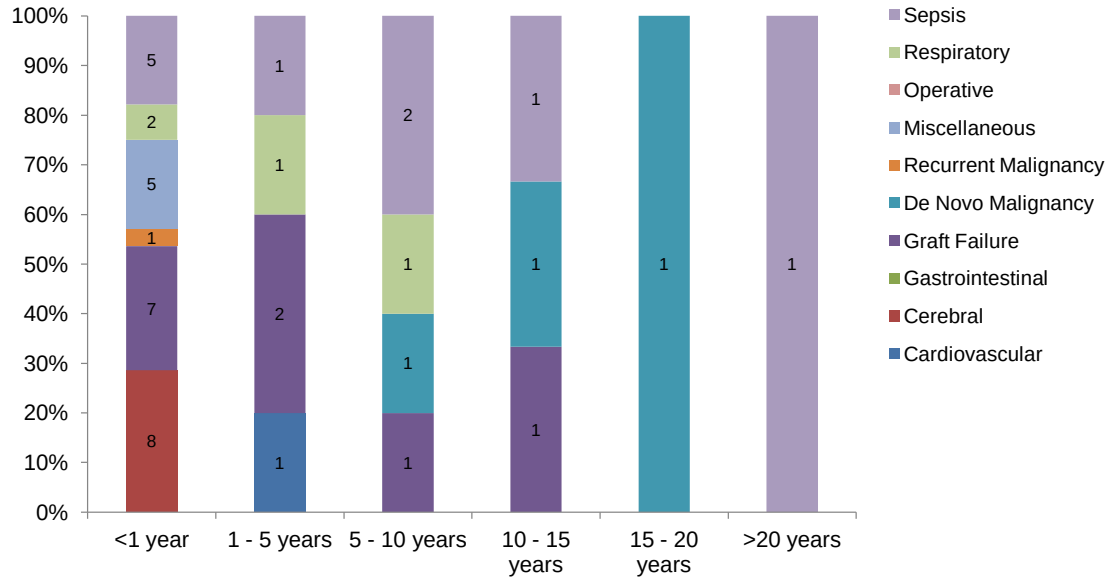
The majority of adult deaths were due to Graft Failure (97 or 28.4%), Sepsis (60 or 17.5%) and Malignancy (68 or 19.9%). The majority of child deaths were due to Graft Failure (11 or 25.6%), Sepsis (10 or 23.3%) and Cerebrovascular accident (8 or 18.6%).

Cause of Death by Time - Adults
n = 342 (34.8% of adults)



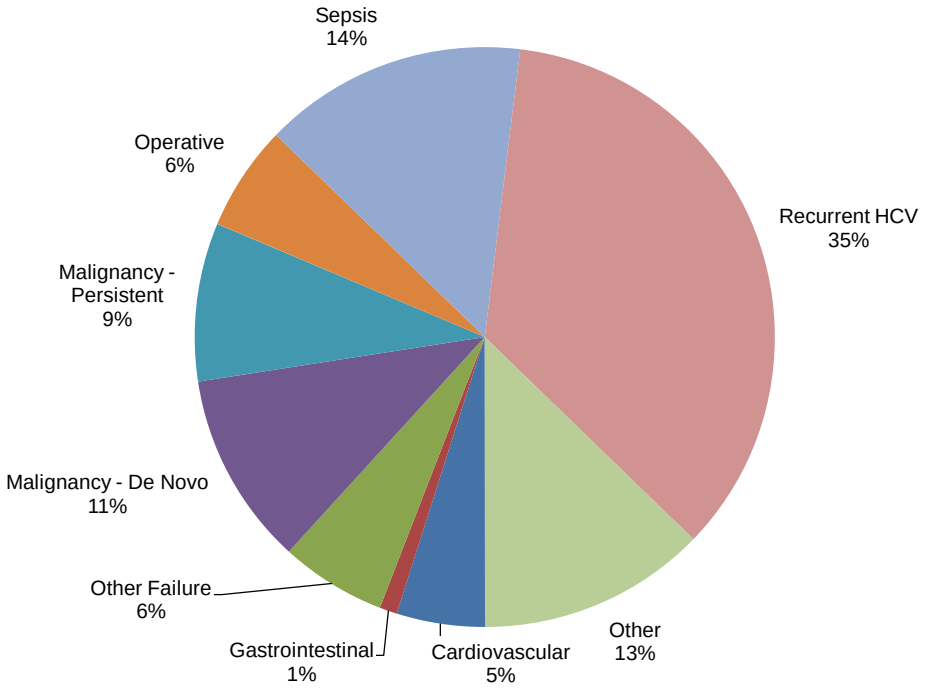
Data to 31 December 2012

Cause of Death by Time - Children
n = 43 (19.2% of children)



Data to 31 December 2012

Cause of Death – HCV Recipients (n = 102)

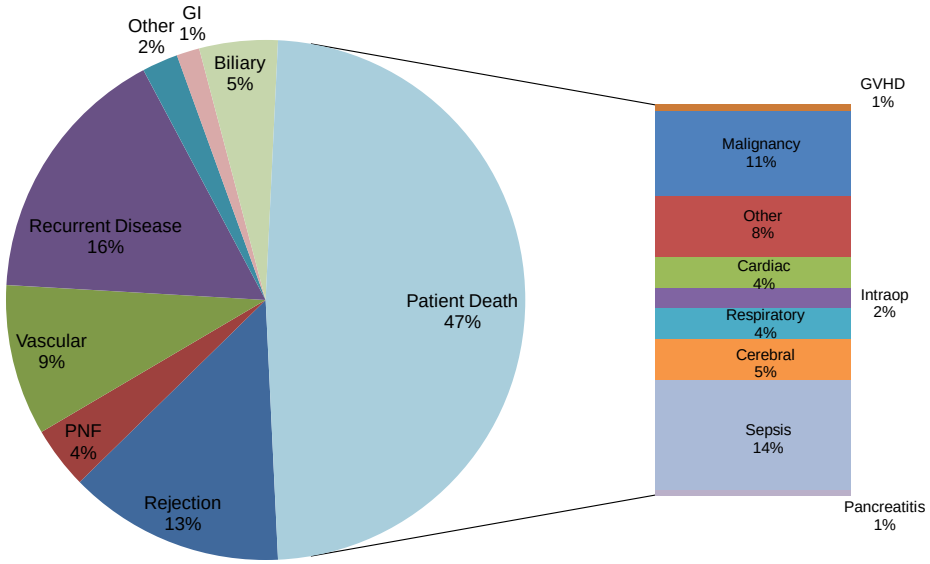


Data to 31 December 2012

Cause of Graft Failure

Rejection		66 (13.4%)
	Acute	17
	Chronic	42
	ABO incompatibility	6
	Subacute	1
Vascular complications		46 (9.4%)
	Hepatic artery thrombosis	36
	Portal vein thrombosis	3
	Graft infarction	2
	Dissection in donor	1
	Graft compression	1
	Hepatic vein stenosis	1
	Rupture	1
	Vena Cava obstruction	1
Recurrent disease		80 (16.3%)
	Hep C	42
	Malignancy	20
	Hep B	13
	NASH	2
	PSC	2
	Alcohol	1
Primary non function		19 (3.9%)
	Graft infarction	6
	Severe steatosis	4
	Antibody mediated rejection	1
	Arterial thrombosis	1
	Blood loss	1
	HA occlusion	1
	Preservation injury	1
	Profound hypotension	1
	Vena	1
	Other	2
Patient deaths		245 (50.0%)
	Sepsis	66
	Malignancy	51
	Cerebral	27
	Cardiovascular	22
	Respiratory failure	19
	Intraoperative	12
	GI haemorrhage	7
	GVHD	4
	Pancreatitis	3
	Other	37
Biliary complications		24 (4.9%)
	Biliary strictures	17
	Other	7
Other		11 (2.2%)
TOTAL		491 (37.5%) of all grafts

Cause of Graft Failure (n = 491)



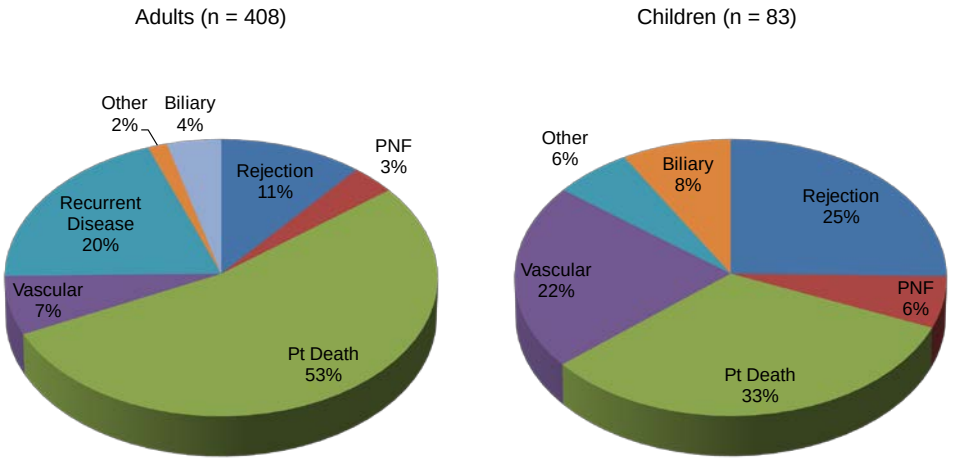
Data to 31 December 2012

491 of 1308 grafts (37.5%) have failed.

238 grafts (48.5%) were lost due to patient deaths, 66 (13.4%) due to rejection and 80 (16.3%) due to disease recurrence.

Sepsis was the most significant cause of patient death (67 patients), followed by malignancy (52 patients) and cerebral catastrophe (25 patients).

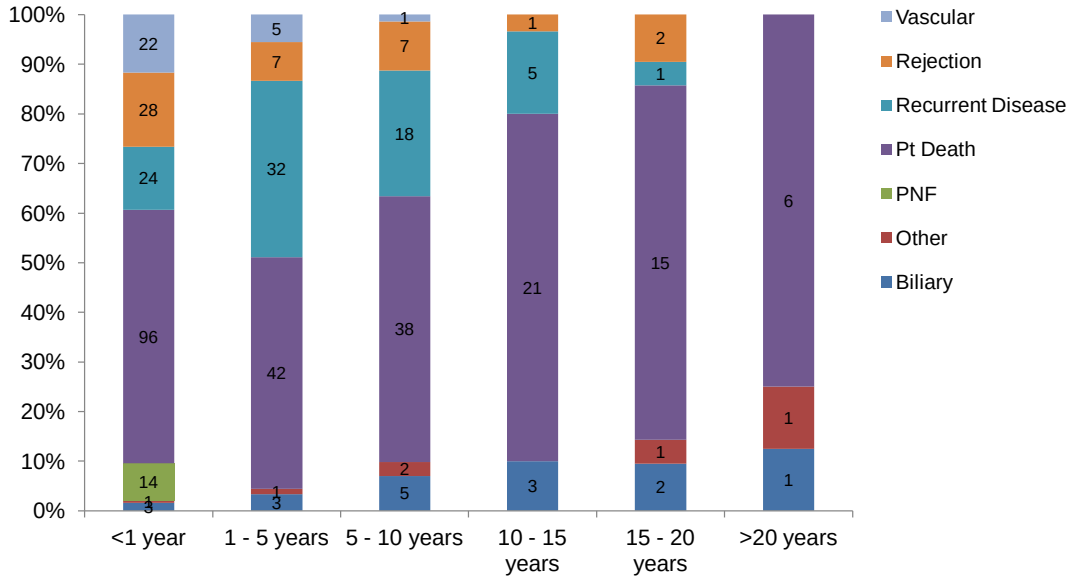
Cause of Graft Failure (n = 491)



Data to 31 December 2012

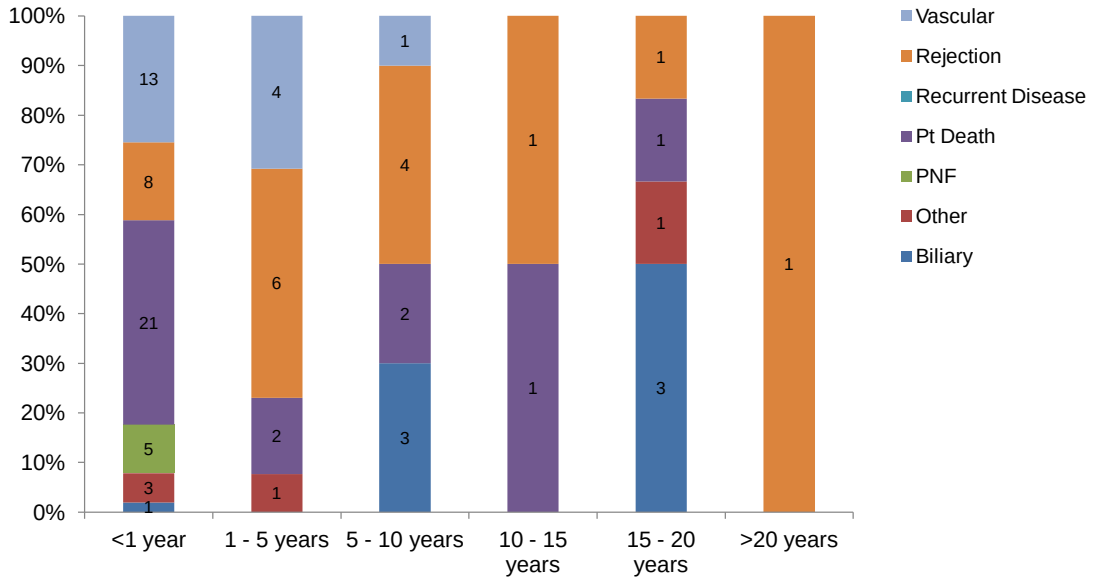
Patient death was the most significant cause of graft failure, followed by rejection.

Cause of Graft Failure by Time - Adults
n = 408 (38.9% of adult grafts)



Data to 31 December 2012

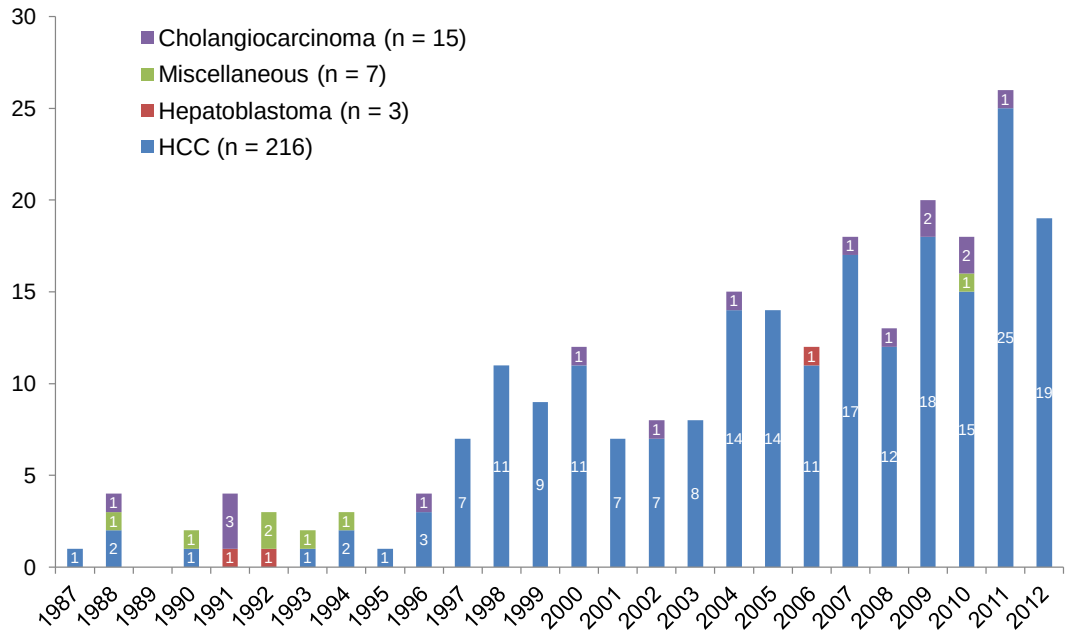
Cause of Graft Failure by Time - Children
n = 83 (31.9% of child grafts)



Data to 31 December 2012

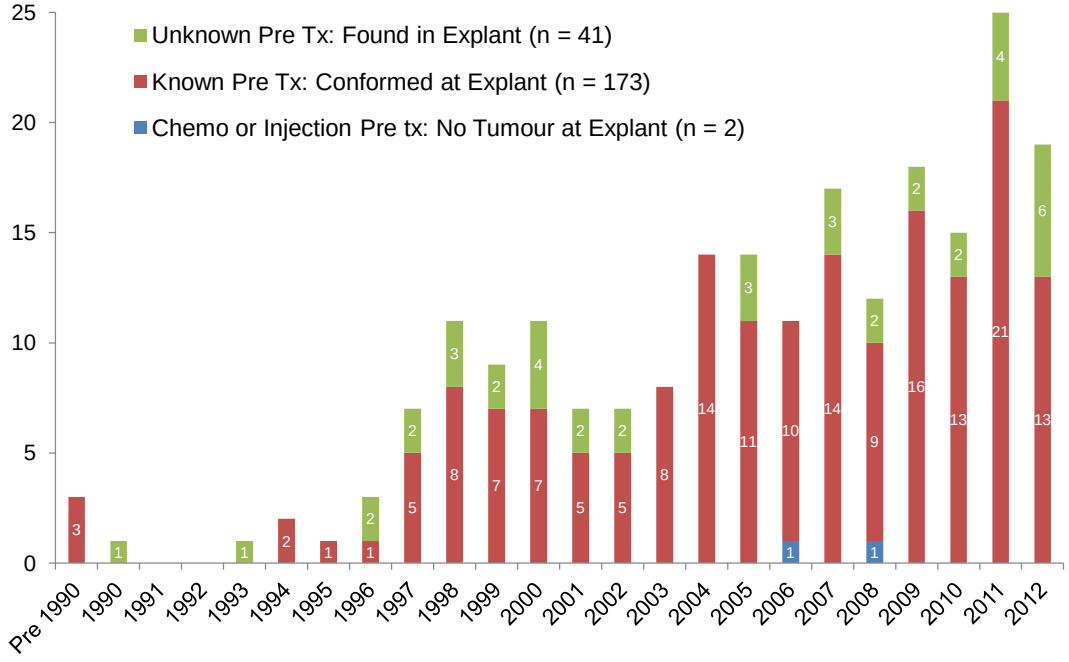
CANCER AND TRANSPLANTATION

Malignancy at Transplantation
n = 238 pts/ 241 Ca (20% of patients)



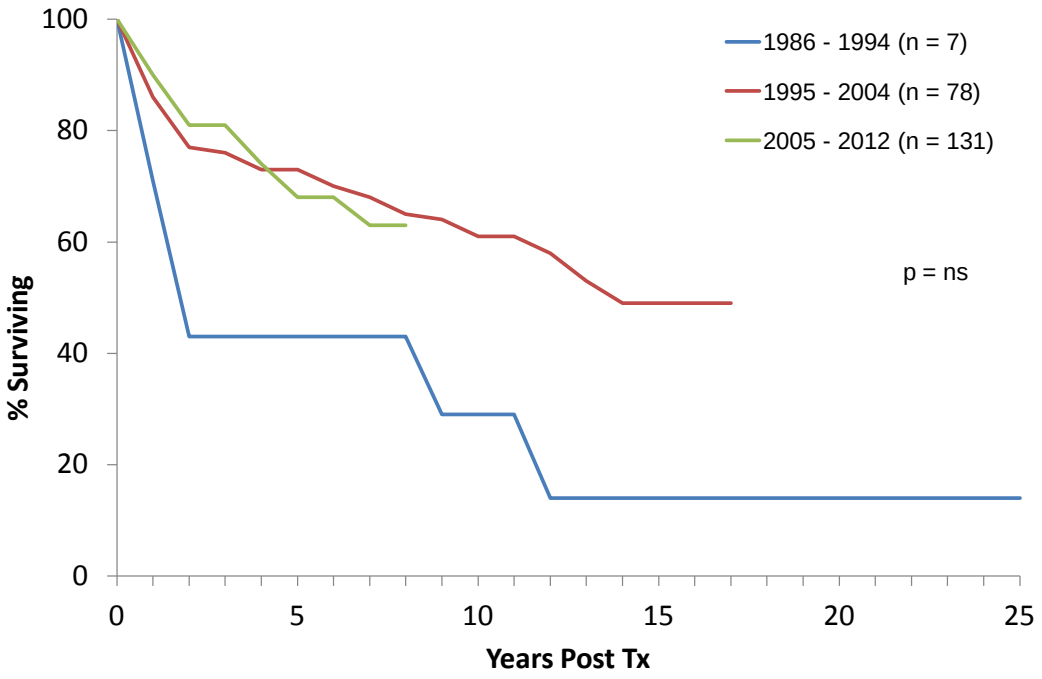
Data to 31 December 2012

HCC at Transplantation
n = 216



Data to 31 December 2012

HCC vs Era
(Primary and Secondary Indication)



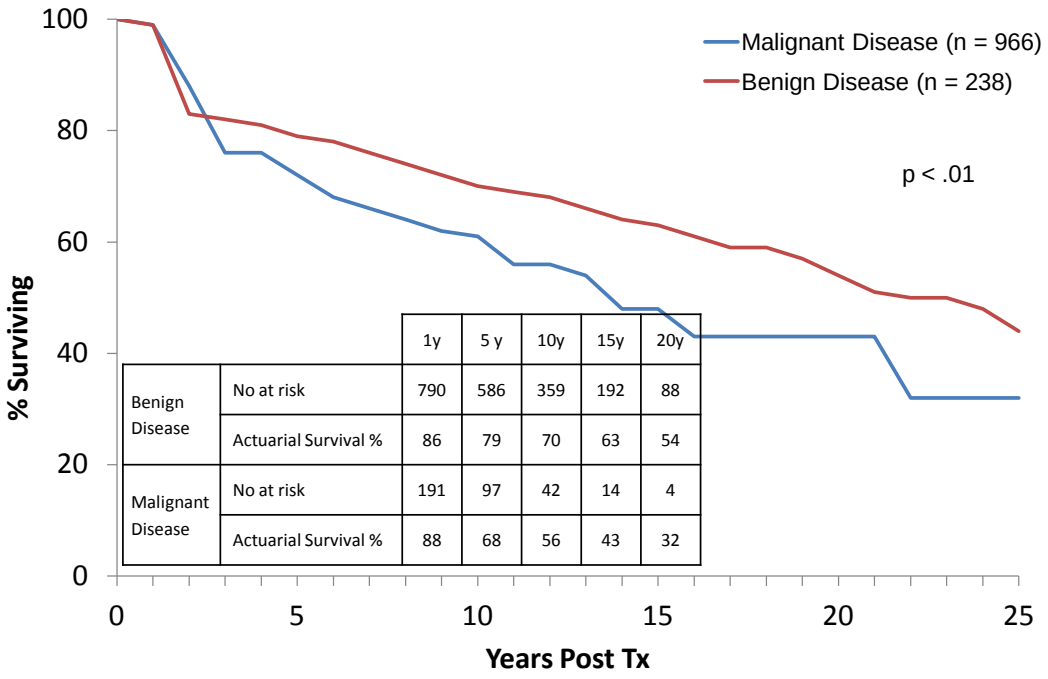
Data to 31 December 2012

HCC vs Era
(Primary and Secondary Indication)

		1y	5y	10y	15y	20y
1986 – 1994	No at risk	7	3	3	1	1
	Actuarial Survival %	86	43	29	14	14
1995 – 2004	No at risk	78	58	47	18	
	Actuarial Survival %	99	73	61	49	
2005 – 2012	No at risk	131	41			
	Actuarial Survival %	90	81			

Data to 31 December 2012

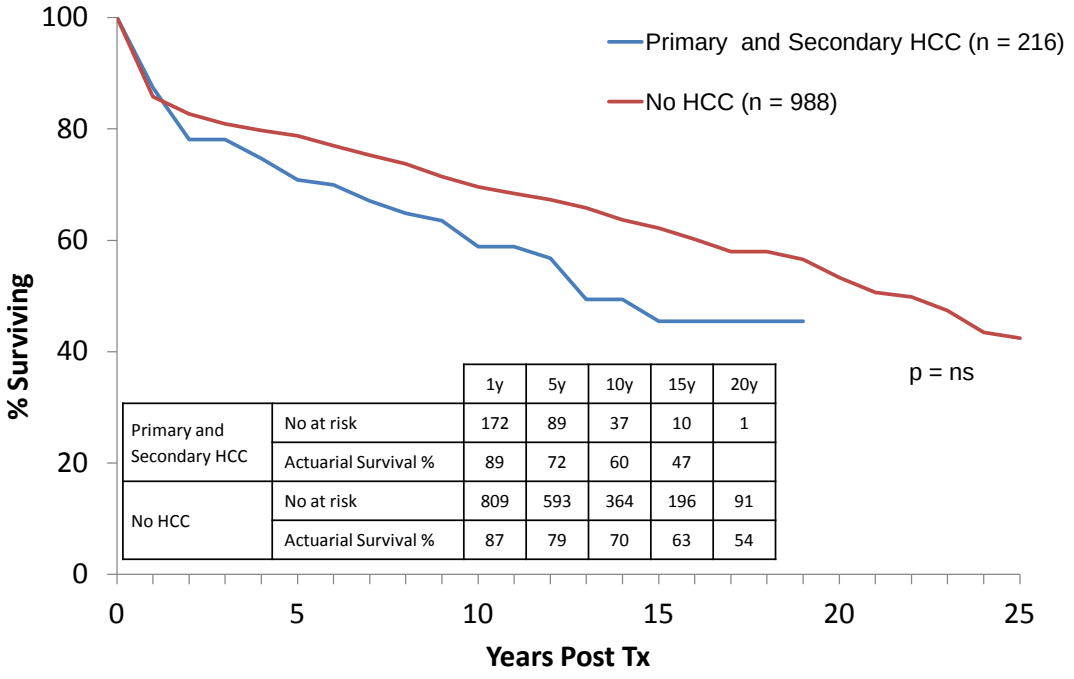
Benign Disease vs Malignancy



		1y	5 y	10y	15y	20y
Benign Disease	No at risk	790	586	359	192	88
	Actuarial Survival %	86	79	70	63	54
Malignant Disease	No at risk	191	97	42	14	4
	Actuarial Survival %	88	68	56	43	32

Data to 31 December 2012

Primary and Secondary HCC vs No HCC



		1y	5y	10y	15y	20y
Primary and Secondary HCC	No at risk	172	89	37	10	1
	Actuarial Survival %	89	72	60	47	
No HCC	No at risk	809	593	364	196	91
	Actuarial Survival %	87	79	70	63	54

Data to 31 December 2012

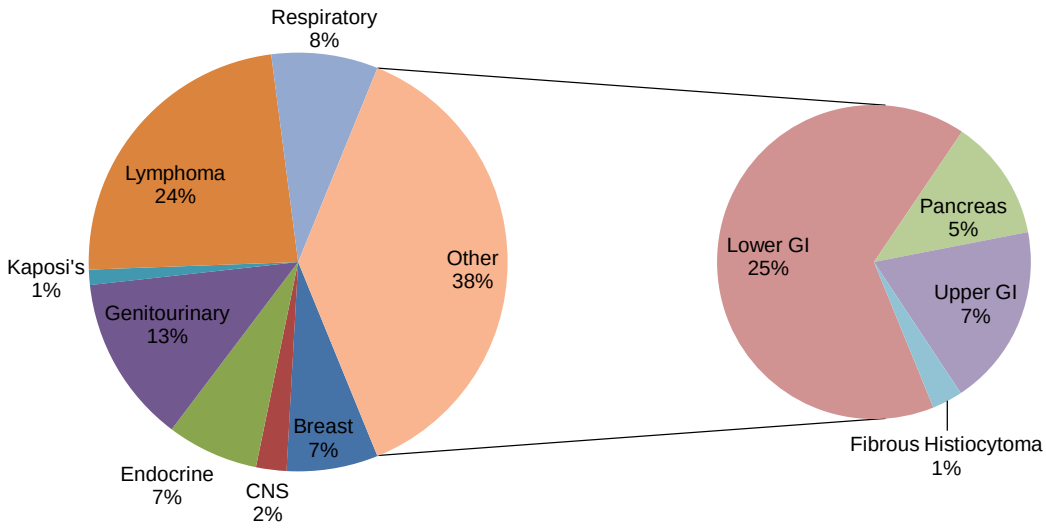
De Novo Cancer (Excluding Skin)

	No	Male	Female	Age of patients (years)	Time to diagnosis (months)	Died of This Cancer		Died Other
Alimentary	37	28	9	13 -78 (m 58)	6 – 232 (m 74)	21	57%	6
Lymphoma (including PTLD)	20	12	8	1.5 – 70 (m 45)	4 – 183 (m 70)	5	25%	5
Genitourinary	11	8	3	21 – 74 (m 59)	2 – 227 (m 81)	2	18%	4
Respiratory	7	6	1	29 – 68 (m 61)	74 – 170 (m 34)	6	86%	0
Breast	6	0	6	30 – 60 (m 45)	50 – 241 (m 115)	4	67%	1
Endocrine	6	2	4	36 – 70 (m 56)	35 – 145 (m 82)	2	33%	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		0
Total	**91**	**58**	**33**	**1.5 – 78 (m 55)**	**2.3 – 241 (m 70)**	**42**	**47%**	**16**

NB: m = median

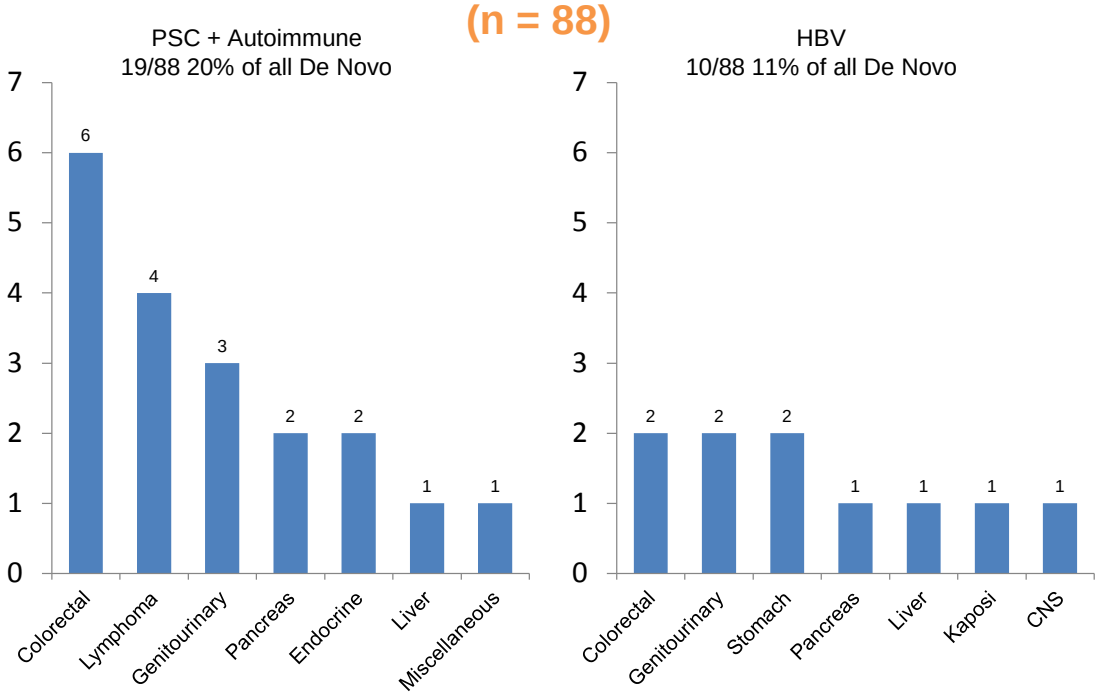
Data to 31 December 2012

De Novo Cancer (Excluding Skin)
n = 88 Pts, 91 Ca (7% pts transplanted)



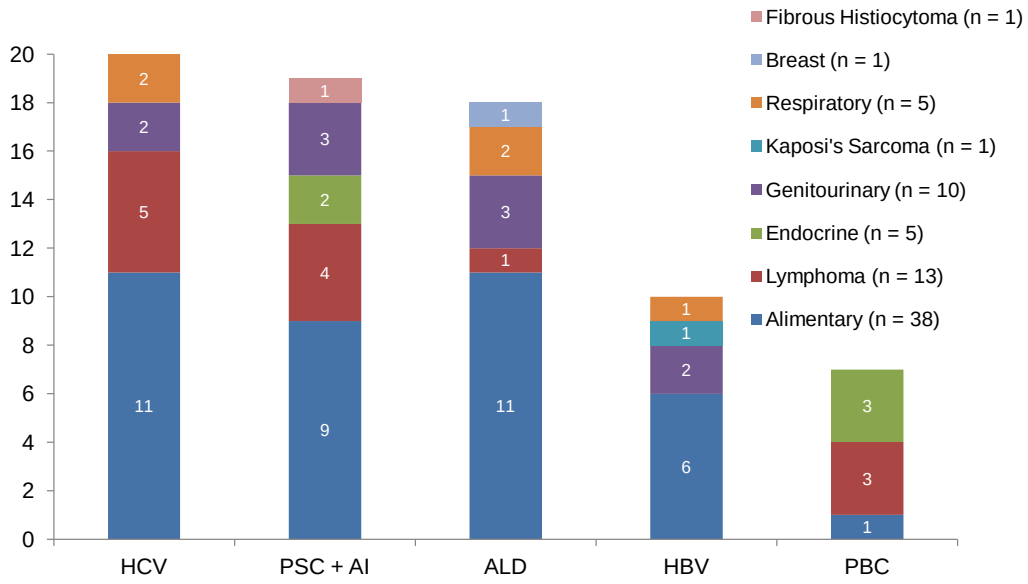
Data to 31 December 2012

Pre Transplant Liver Disease and De Novo Cancer (Excluding Skin) (n = 88)



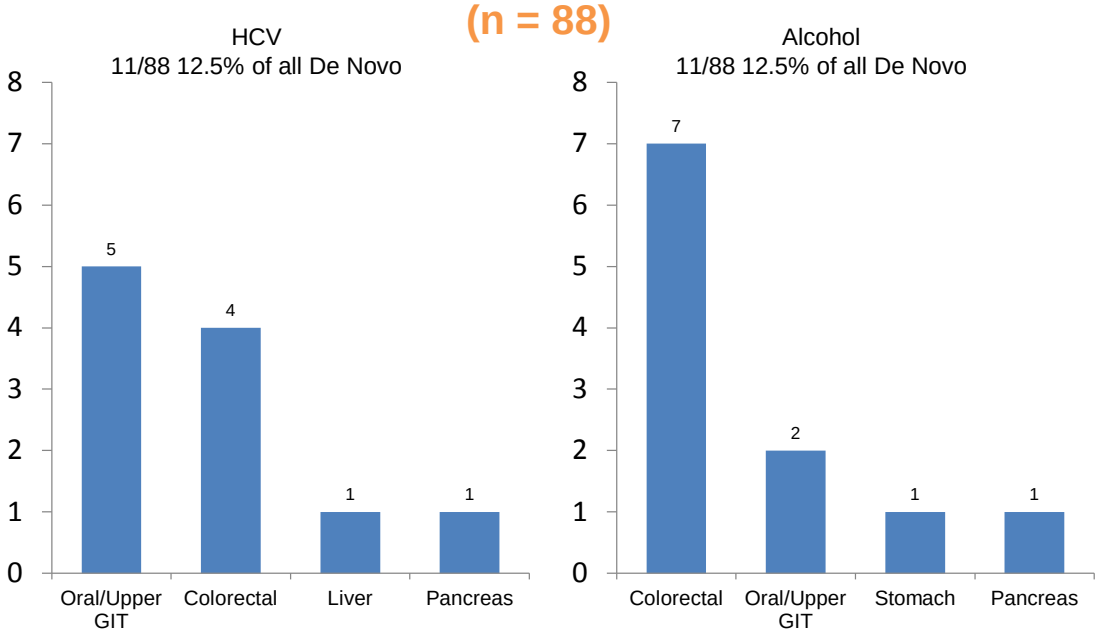
Data to 31 December 2012

Primary Liver Disease and De Novo Cancer (Excluding Skin)



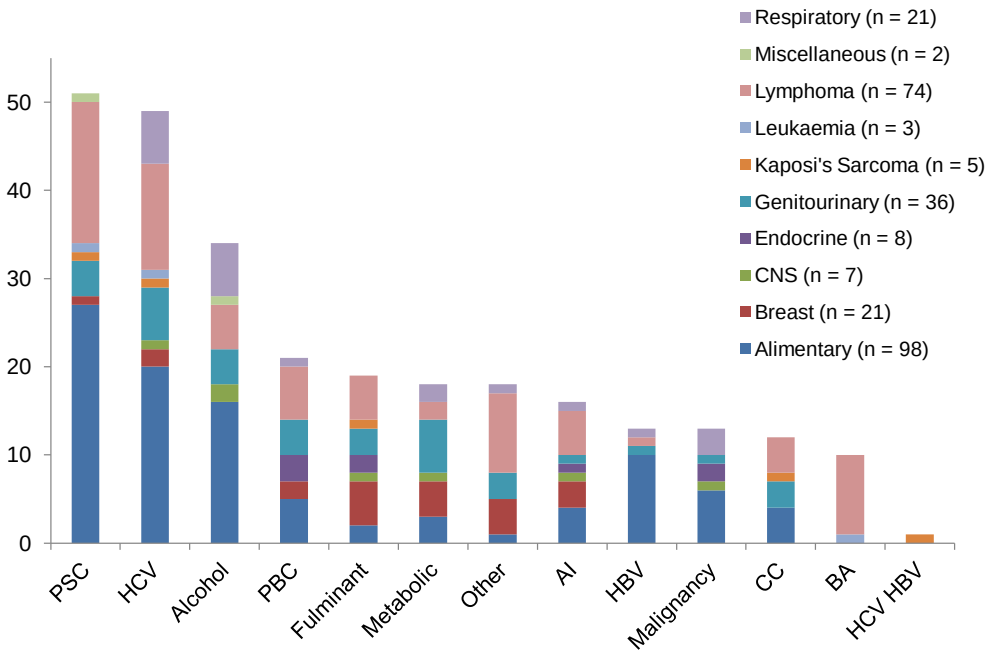
Data to 31 December 2012

Pre Transplant Liver Disease and De Novo Cancer (Excluding Skin) (n = 88)



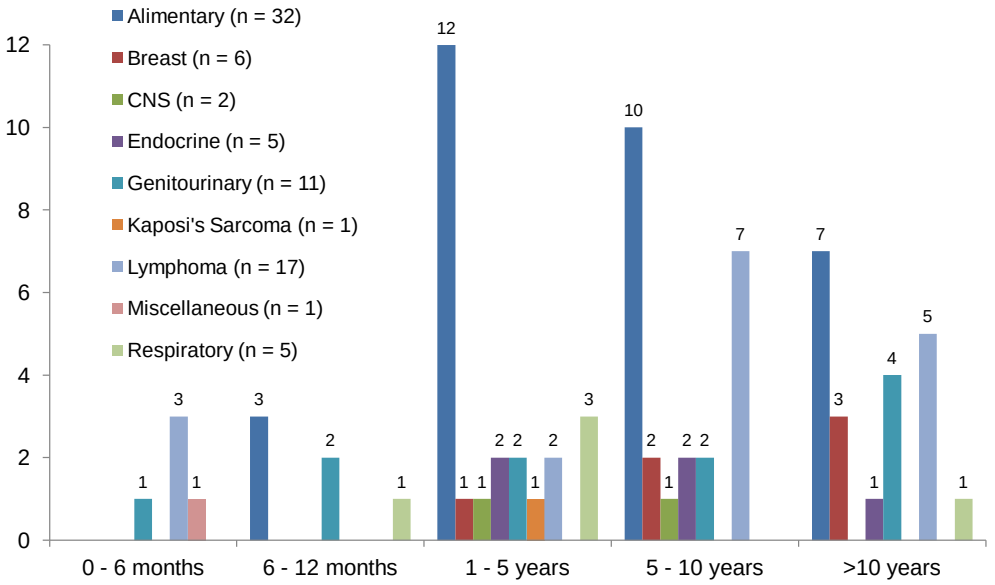
Data to 31 December 2012

Primary Liver Disease and De Novo Cancer (Excluding Skin)



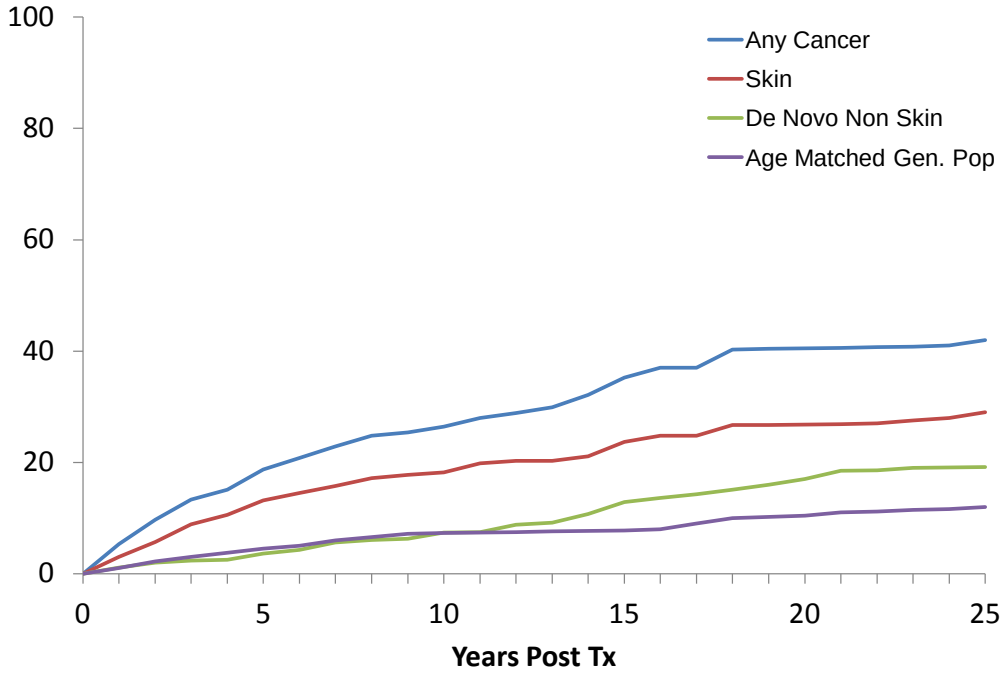
Data to 31 December 2012

Time to Diagnosis
De Novo Cancer (Excluding Skin)



Data to 31 December 2012

Cumulative Risk of Diagnosis of Cancer
Following Liver Transplantation 1986 – 2012



Data to 31 December 2012