ANZIPTR Report 2015

This report is a compilation of data provided by Pancreas transplant units in Australia and New Zealand. The registry is funded in part by a grant from the Commonwealth Department of Health and Ageing

Australia and New Zealand Islet and Pancreas Transplant Registry data 1984-2014

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This report is produced and edited by:

Associate Professor Angela Webster, Abhijit Patekar, Paul Robertson and Associate Professor Patrick Kelly

We thank all contributors who have made the registry what it is and this report possible.

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ANZIPTR staff

Prof Jeremy Chapman	Westmead Medical Director
A/Prof Angela Webster	Registry Executive Officer
Abhijit Patekar	Data Analyst
Paul Robertson	Transplant Co-ordinator
Julie McKelvey	Registry Clerk
A/Prof Patrick Kelly	External Biostatistics Consultant

Contact the ANZIPTR

Inquiries or comments should be directed to ANZIPTR:

Australia and New Zealand Islet and Pancreas Transplant Unit

Westmead NSW 2145

Phone: +61 2 9845 6962 Fax: +61 2 9633 9351

Email: ANZIPTR@health.nsw.gov.au; Abhijit.Patekar@health.nsw.gov.au

Governance structure

This report is a compilation of data provided by the four current solid-organ Pancreas transplant units in Australia and New Zealand: Auckland Renal Transplant Group, New Zealand; National Pancreas Transplant Unit Monash Medical Centre, Victoria; Austin Hospital, Victoria; and National Pancreas Transplant Unit, Westmead Hospital, NSW. The ANZIPTR registry is funded in part by a grant from the Commonwealth Department of Health and Ageing.

Data release guidelines

The registry can provide de-identified data for free to Transplant Physicians, Transplant Units, research projects and Government Departments. The registry will not provide any personally identifiable data.

The clinical data provided contains potentially sensitive information and should be used only within agreed guidelines. If data are further published elsewhere ANZIPTR permission is necessary prior to submission for publication, and ANZIPTR should be identified as the source of the data. If data provided by ANZIPTR is the primary source of data, then a copy of publication should be provided to ANZIPTR.

Data provided by ANZIPTR should be utilised by requesting parties only, further data sharing with other parties or projects is not permitted without prior approval from ANZIPTR. The data supplied will be in accordance with ANZIPTR data specifications. Please contact the ANZIPTR for our data dictionary.

Participating Centres

Auckland Renal Transplant Group

Dr Helen Pilmore
Prof Stephen Munn

Monash Medical Centre

Prof Peter Kerr	Director of Nephrology
A/Prof John Kanellis	Director of Transplantation
Dr Bill Mulley	Physician
Mr Alan Saunder	Director of Surgery
Mr Roger Bell	Surgeon
Mr Ming Yii	Surgeon
Miss Nancy Suh	Surgeon
Ms Tia Mark	Transplant Coordinator
Ms Elaine Kennedy	Transplant Clinical Nurse Consultant

Westmead Hospital

Prof Henry Pleass	Director
Prof Philip O'Connell	Director
Prof Jeremy Chapman	Medical Director
Dr Brian Nankivell	Physician
A/Prof Angela Webster	Physician
A/Prof Germaine Wong	Physician
Dr Brendan Ryan	Surgeon
Dr Vincent Lam	Surgeon
Dr Lawrence Yuen	Surgeon
Prof Richard Allen	Surgeon
Dr Jane Holmes-Walker	Endocrinologist
Ms Kathy Kable	Transplant Nurse Practitioner
Mr Paul Robertson	Transplant Co-ordinator
Ms Patricia Anderson	Islet Transplant Co-ordinator
A/Prof Wayne Hawthorne	Director Transplant Laboratories
Mr Abhijit Patekar	Data Analyst
Ms Julie McKelvey	Registry Clerk

Analysis and Methods

The aim of this report is to record all pancreas transplant activity in Australia and New Zealand. Data included in this report was extracted from RISC (Renal Information System Catalogue) on the 4 May 2015, for all people transplanted up to the end of 2014. Please note new data is added to the registry regularly, and corrections are made where previous data is missing or where errors are discovered. There are many new changes in this year's report in terms of format, organisation, content and analysis.

A functioning pancreas transplant is defined as a recipient free of exogenous insulin dependence; thus a pancreas transplant failure is declared when either a pancreatectomy is performed, or when the recipient returns to insulin therapy. Kidney transplants are defined as functioning if recipients are dialysis free. All causes of death are included in the mortality analyses.

Kaplan-Meier survival curves were used to illustrate the survival distributions, and these were generated using Stata software version 13 (StataCorp, College Station, TX USA). Transplant survival is analysed and presented both including and excluding death with a functioning transplant as a failed graft. For patients receiving a second transplant, in calculating mortality, time was measured from time of first transplant.

Glossary

SPK - Simultaneous Kidney Pancreas Transplant

PTA - Pancreas Transplant Alone

PAK - Pancreas after Kidney Transplant

ITA - Islet Transplant Alone

PLK - Pancreas Liver Kidney

PLI – Pancreas Liver Intestine

Synopsis

655solid organ Pancreas transplants have been performed in Australia and New Zealand (ANZ) from 1984-2014 (Excluding Islet transplants)

In 2014, 45 people received a pancreas transplant, by centre this was; Auckland (2); Monash (15); Westmead (28). All of the 2014 transplants were SPK.

From 2002-2014, 66 Islet transplants have been performed in 30 patients.

New in the annual report this year

This year's annual report has a new look; we have reorganised the content into discrete chapters and developed a new ANZIPTR logo. We have expanded the survival analyses and undertaken 2 special projects to generate abstracts for scientific meetings. We have also developed a data dictionary, and started to develop a website.

The ANZIPTR welcomes suggestions for improvement or specific analyses you would like to see in the next annual report.

Chapter 1: Waiting List

Overview of waiting list activity

Definitions

Patients join the waiting list on the date they are referred to the transplanting centre; however this may occur some time before their kidneys fail. Patients are therefore classified as “under consideration” until such time as they medically require a kidney pancreas transplant. Once they require a kidney pancreas transplant they are classified as “active” on the list while they remain medically fit. The “under consideration” classification also captures people recently referred to the transplant centre, who are still undergoing assessment about their medical fitness for pancreas transplant. People referred to a transplanting centre when they are already on dialysis, become “active” on the list as soon as they are accepted as medically fit. People referred to a transplanting centre when their kidneys function, become active once their kidney disease progresses to such a level that dialysis is planned in the near future. Once active on the waiting list, patients are transplanted in order of their waiting time, by blood group.

Patient waiting list flow

Detailed data on waiting list patient flow is only available for Australia (Westmead and Monash Units).

Table 1.1: Waiting list activity in Australia during 2014

	2012	2013	2014
People on active list at beginning of year	85	88	84
People added to active list during the year	49	41	38
People removed from active list during year	7	9	14
Transplants to people on waiting list	37	33	43
Kidney only transplants to people on waiting list	0	0	1
Transplants performed outside Australia / New Zealand to people on waiting list	0	0	0
People who died while active on list	2	3	5
People on active waiting list at the end of year	88	84	59
People who died within 12 months of removal from list	-	-	2
People under consideration but not active on list	94	89	100
People referred but declined for pancreas transplantation	-	-	-

Table 1.2: waiting list activity in New Zealand in 2014

	2012	2013	2014
People on active list at beginning of year	2	3	4
People under consideration but not active on list	6	6	5

Distribution of active patients

Figure 1.1 and tables 1.3 and 1.4 show the state of residence for people active on the pancreas waiting list, by the pancreas transplanting centre

they were referred to, in Australia. For data for New Zealand, there is no breakdown beyond that seen in *table 1.2*

Figure 1.1: Distribution of people active on the waiting list by state of residence, as of December 2014

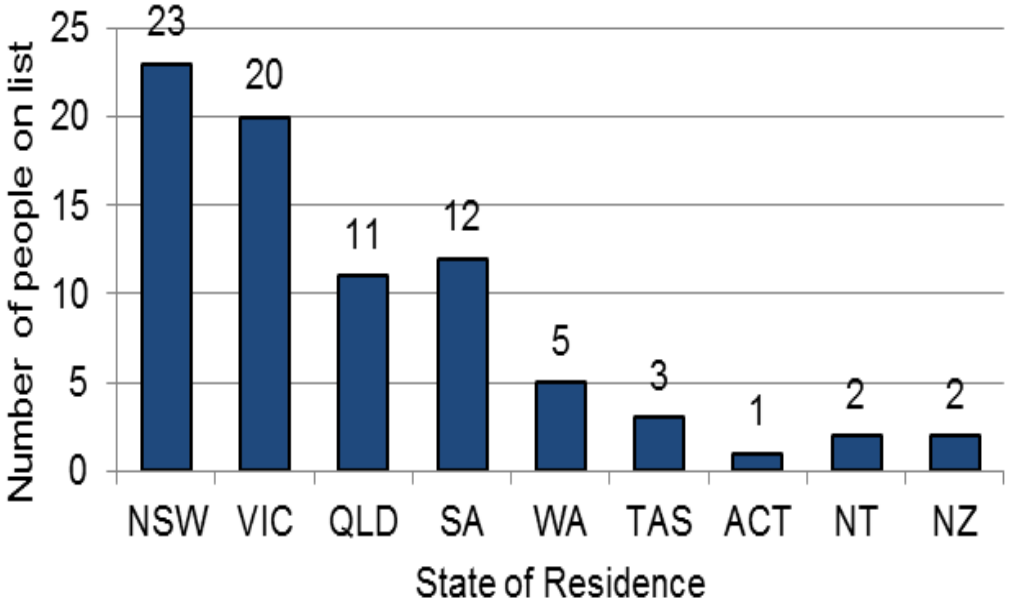


Table 1.3: Patient state of residence for people active on the list at Westmead national pancreas transplant unit (NSW), December 2014

State of residence	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	Total
2014	23	-	11	1	5	-	1	2	43
2013	12	–	9	1	4	–	1	2	29
2012	9	–	11	3	6	–	3	1	33

Table 1.4: Patient state of residence for people active on the list at Monash pancreas transplant unit (VIC), December 2014

State of residence	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	Total
2014	-	20	-	11	-	3	-	-	34
2013	–	12	–	1	–	–	–	–	13
2012	1	15	1	1	–	2	–	–	20

Table 1.5 and 1.6 show the state of residence for people who are under consideration together with people who are active on the pancreas waiting list, by the pancreas transplanting centre they were referred to, in Australia. For data for New Zealand, there is no breakdown beyond that seen in table 1.2

Table 1.5: State of residence for people under consideration and for people active on the list at Westmead national pancreas transplant unit (NSW), December 2014

State of residence	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	Total
2014	39	1	32	5	21	-	5	3	106
2013	43	–	36	8	24	1	3	2	117
2012	45	–	45	12	22	1	4	1	130

Table 1.6: State of residence for people under consideration and for people active on the list at Monash pancreas transplant unit (VIC), December 2014

State of residence	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	Total
2014	1	46	1	17	-	8	-	-	73
2013	1	49	–	7	–	10	–	–	67
2012	2	41	1	4	1	6	–	–	55

New referrals received over time

Table 1.7, 1.8 and 1.9, so the distribution of new referrals received by the transplanting units over time.

Table 1.7: New referrals received by Westmead national pancreas unit (NSW)

State of residence	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	Total
2014	25	1	12	4	9	-	2	3	56
2013	16	–	16	4	9	–	1	1	47
2012	14	–	13	6	12	–	3	2	50
2011	11	–	14	4	9	–	2	1	41
2010	15	–	12	4	7	–	1	–	39
2009	12	–	15	3	9	–	1	–	40

Table 1.8: new referrals received by Monash pancreas transplant unit (VIC)

State of residence	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	Total
2014	-	38	-	6	-	4	-	-	48
2013	–	30	–	5	–	3	–	–	38
2012	–	26	–	1	–	5	–	–	32
2011	–	28	–	3	–	2	–	–	33
2010	1	29	1	1	–	2	–	–	34
2009	–	28	–	–	1	2	–	–	31

Table 1.9: new referrals received by Auckland national pancreas transplant unit (NZ)

	NZ
2014	9
2013	4
2012	5+
2011	5+
2010	2+

Distribution of patient characteristics for those active on the list in 2014

The following figures illustrate the distribution of other characteristics of those active on the waiting list in 2014, including the distribution of Blood groups, patient ages,

Figure 1.2: Distribution of people active on the list by their blood group, as of December 2014

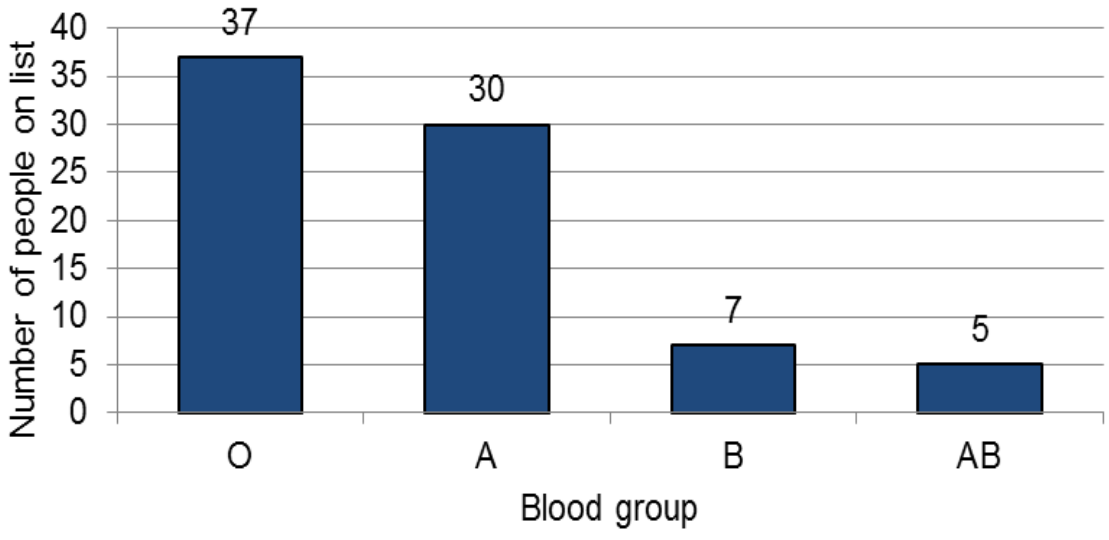
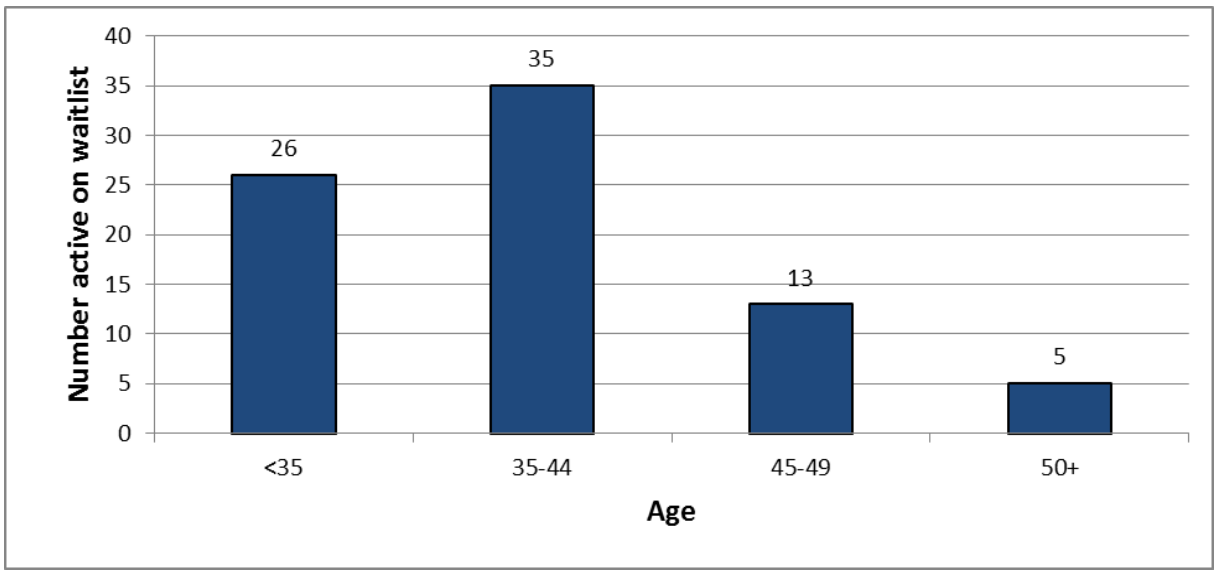


Figure 1.3: Distribution of people active on the list by their age, as of December 2014



Time waiting and survival on the waiting list

We planned analyses in this section to document the progression of patients from referral to active, and from active to transplantation. We also planned to investigate the average time from becoming active on the list to transplantation, for different patient characteristics, such as blood group, age, state of residence etc. We also planned to look at overall survival on the waiting list once referred, and to document characteristics of those referred but who did not progress.

However, in preparing the data it became clear that over time data definitions and data recording were not consistent. During 2015 we are working to improve data quality such that we can report these analyses in the 2016 report.

Chapter 2: Pancreas transplant recipients

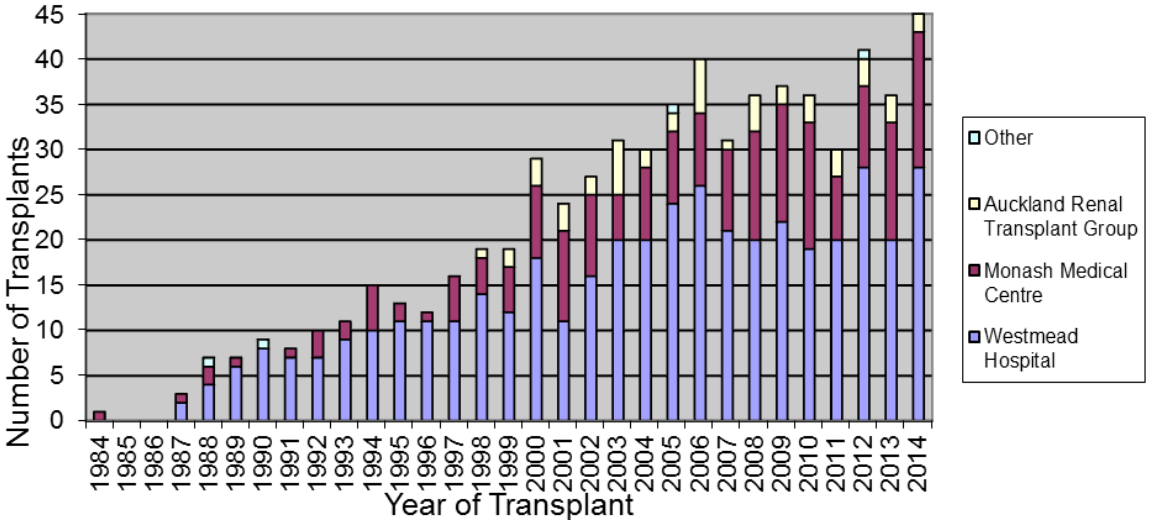
Pancreas transplant incidence

Figure 2.1 illustrates the number of pancreas transplants performed in Australia and New Zealand between 1984 and 2014. The transplants were performed in Westmead (425), Monash (181), Auckland (48), RPA (1), RMH (1), QEH (1), Austin (1).

In 2014, 45 transplants were performed: Auckland (2), Monash (15), and Westmead (28). The number of transplants in 2014 increased by 25% compared to 2013 as predicted.

The figure also shows the variation in the number of transplants over last 15 years (2000-2014). The number of transplants has substantially increased in last decade compared to previous years.

Figure 2.1: Incidence of pancreas transplants over time, 1984-2014.



Not all pancreas transplant operations are undertaken with the same organs. Simultaneous pancreas-kidney transplant (SPK) is the most common operation, representing 97% of all pancreas transplants in Australia and New Zealand. All 45 transplants performed in 2014 were SPK. However, Pancreas after kidney (PAK) operations are done for people who either had a first kidney transplant without a pancreas (most commonly from a living donor relative) and subsequently opt for a pancreas, or for people who underwent an SPK but had a pancreas transplant failure, so need a further pancreas transplant. Pancreas transplant alone (PTA) is a less common operation and occurs rarely. On rare occasions, a multi-organ transplant is undertaken which includes a pancreas transplant. There was one simultaneous Pancreas, Liver plus Kidney transplant which was performed in 2005, and one Liver, Pancreas plus Intestine transplant in 2012. The distribution of operations is displayed in Table 2.1, and shown graphically in figure 2.2

Figure 2.2: pancreas transplants by type, over time

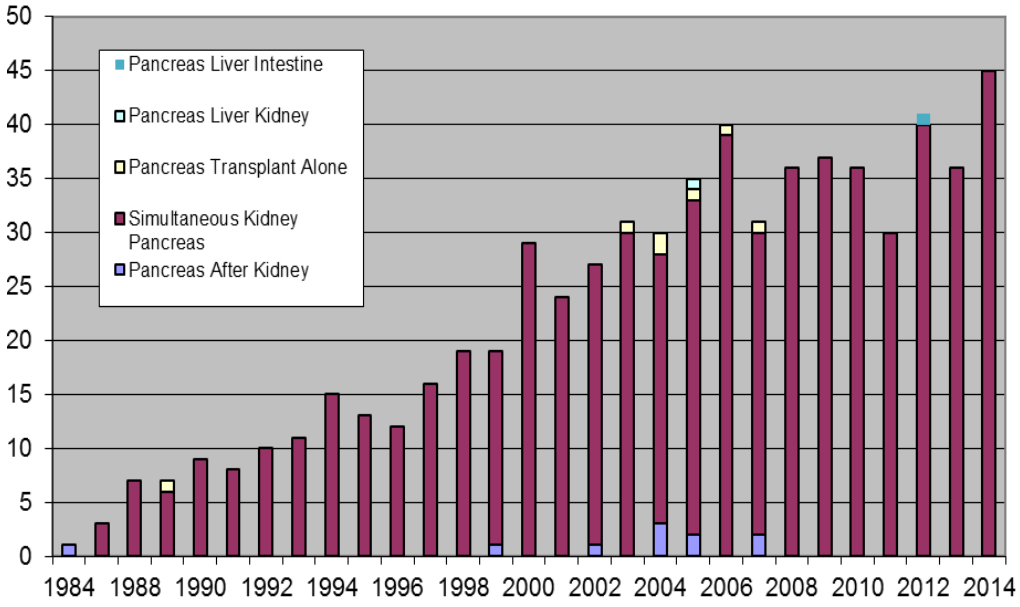


Table 2.1: Pancreas transplant operations by centre, over time

year	Westmead			Monash			Other*	New Zealand	Total
	SPK	PAK	PA	SPK	PAK	PA		All	
2014	28	0	0	15	0	0	0	2	45
2013	20	0	0	13	0	0	0	1	34
2012	28	0	0	9	0	0	1	2	40
2011	19	0	0	7	0	0	0	3	29
2010	19	0	0	14	0	0	0	3	36
2009	22	0	0	14	1	0	0	2	39
2008	20	0	0	12	0	0	0	4	36
2007	16	2	1	9	0	0	0	1	29
2006	25	0	1	8	0	0	0	6	40
2005	21	2	1	8	0	0	1	2	35
2004	15	2	3	8	0	0	0	2	30
2003	19	0	1	5	0	0	0	6	31
2002	15	1	0	9	0	0	0	2	27
2001	11	0	0	10	0	0	0	3	24
2000	18	0	0	8	0	0	0	3	29
1999	11	1	0	5	0	0	0	2	19
1998	14	0	0	4	0	0	0	1	19
1997	11	0	0	5	0	0	0	0	16
1996	11	0	0	1	0	0	0	0	12
1995	11	0	0	2	0	0	0	0	13
1994	10	0	0	5	0	0	0	0	15
1993	9	0	0	2	0	0	0	0	11
1992	7	0	0	4	0	0	0	0	11
1991	7	0	0	1	0	0	0	0	8
1990	8	0	0	0	0	0	1	0	9
1989	5	0	1	1	0	0	0	0	7
1988	4	0	0	2	0	0	1	0	7
1987	2	0	0	1	0	0	0	0	3
1986	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	1	0	0	0	1
Total	**406**	**8**	**8**	**182**	**2**	**0**	**4**	**45**	**655**

SPK= simultaneous pancreas-kidney; PAK= Pancreas after kidney; PA= pancreas alone; Other = other multi-organ transplants, or SPK done at a centre other than Westmead, Monash or Auckland.

Patients transplanted by region

The states of origin of the people receiving pancreas transplants are shown in the following tables, stratified by transplanting centre. Numbers for New Zealand can be found in table 2.1.

Table 2.2: Distribution of state of residence of people receiving pancreas transplants in Australia over time at Westmead national pancreas transplant unit (NSW)

State of residence	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	Total
2014	12	-	11	2	2	-	-	1	28
2013	7	–	8		3	–	1	1	20
2012	12	–	9	4	2	–	1	–	28
2011	9	–	3	4	2	–	1	–	19
2010	6	–	8	2	2	–	1	–	19
2009	7	–	6	2	5	–	2	–	22
Total	53	0	45	14	16	0	6	2	136

Table 2.3: Distribution of state of residence of people receiving pancreas transplants in Australia over time at Monash pancreas transplant unit (VIC)

State of residence	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	Total
2014	-	14	-	-	-	1	-	-	15
2013	–	13	-	-	–	-	–	–	13
2012	–	8	–	1	–	-	–	–	9
2011	-	4	–	-	–	3	–	–	7
2010	–	13	–	1	–	-	–	–	14
2009	–	13	–	1	1	–	–	–	15
Total	0	65	0	3	1	4	0	0	73

Demographics of new pancreas transplant recipients

The characteristics of pancreas transplant recipients in 2014 and in previous years are shown in table 2.4. The primary diagnosis causing end stage kidney disease of recipients during 2014 and historically was type I diabetes. The number of diabetic recipients with other cause of end stage kidney failure was small. The number of type ll diabetics accepted for pancreas transplantation was also small

Table 2.4: Demographics and characteristics of pancreas transplant recipients

Recipient characteristics	2014	1984-2013	total
Total (%)	45	610{585^}	655{630^}
Age (years)			
Mean (sd)	40(8.0)	39(7.5)	39(7.6)
<35	11	195	206
35-44	21	255	276
45-49	6	98	104
50+	7	37	44
Sex (%)			
Male	28(62.2%)	304(52%)	332(52.7%)
Female	17(37.8%)	280(47.9%)	297(47.1%)
Unknown	0	1(0.2%)	1(02%)
Cause of ESKD			
Type I diabetes	45	577	622
Type II diabetes	0	3	3
Haemolytic uraemic syndrome	0	1	1
Interstitial nephritis	0	1	1
Wegener's granulomatosis	0	1	1
Unknown(Uncertain Diagnosis)	0	2	2
Cultural and Ethnic Group*			
White	45	144	189
North East Asian (Chinese)	0	1	1
South East Asian	0	97	97
South and Central Asian (Indian)	0	2	2
Middle Eastern or North African	0	0	0
Indigenous Australian or Torres Strait Islander	0	0	0
Maori and Pacific Islander	0	4	4
Other	0	5	5
Unknown	0	332	332
Blood group			
A	17	203	220

O	19	247	266
B	8	44	52
AB	1	23	24
Unknown	0	68	68

* Classified according to the Australian Bureau of Statistics standard classification, 2nd Edition;
http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1249.02011?OpenDocument

Balance of donor and recipient characteristics in 2014

Cross tabulations of donor and recipient blood group and gender for people transplanted in 2014 are displayed in the following tables 2.5 and 2.6. Theses distributions remain similar to previous years.

Table 2.5: Cross tabulation of recipient and donor blood groups for 2014

Number (% total)	Donor Blood Group				
Recipient Blood Group	A	O	B	AB	Total
A	17 (38)	0	0	0	17 (38)
O	0	19 (42)	0	0	19 (42)
B	0	0	8 (18)	0	8 (18)
AB	0	0	0	1 (2)	1 (2)
Total	17 (38)	19 (42)	8 (18)	1 (2)	45 (100)

Table 2.6: Cross tabulation of recipient and donor sex for 2014

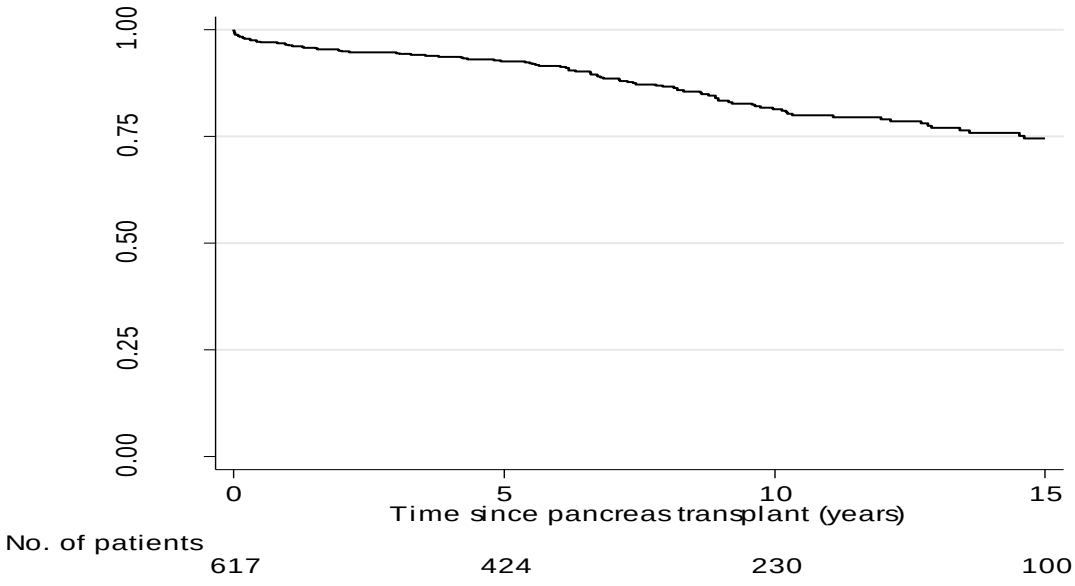
Number (% total)	Donor sex			
Recipient sex	Female	Male	Unknown	Total
Female	9 (20)	7 (16)	1 (2)	17 (38)
Male	12 (27)	15 (33)	1 (2)	28 (62)
Total	21 (47)	22 (49)	2 (4)	45 (100)

Patient survival

Patient survival is calculated from the date of transplantation until death. Patients still alive at the end of the follow-up period are censored. For people who had more than one transplant, their survival is calculated from the date of their first transplant. For these analyses we had complete survival data for 617 patients who had a total of 629 pancreas transplants. We are currently seeking data for the remaining people in the registry. Note that the following survival plots survival proportion on the y-axes does not always start at zero; this is to better demonstrate some observed differences.

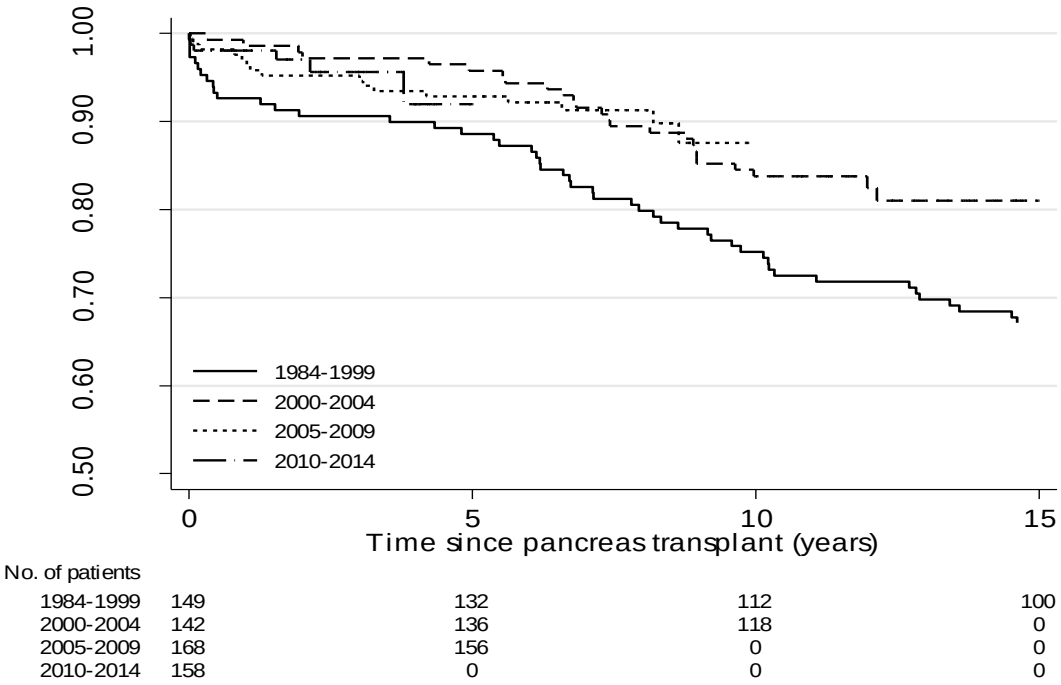
Figure 2.3 shows overall survival following pancreas transplant. There were 5, 363 years of observation, and 113 people died in that time. Survival at 1 year was 96.5%, at 5 years 92.6%, at 10 years 81.3% and at 15 years 74.5%

Figure 2.3: Patient survival following pancreas transplantation in Australia and New Zealand.



Patient survival by era of transplantation is shown in figure 2.4. Survival has improved over time, P=0.03. Survival at 1 year for people transplanted before 2000 was 92.6%; in recent years this has risen to 98.1%. Survival at 5 years was 88.6% for those transplanted before 2000, where for those transplanted after 2005, 5 year survival was 93.1%

Figure 2.4: Patient survival by era of transplantation



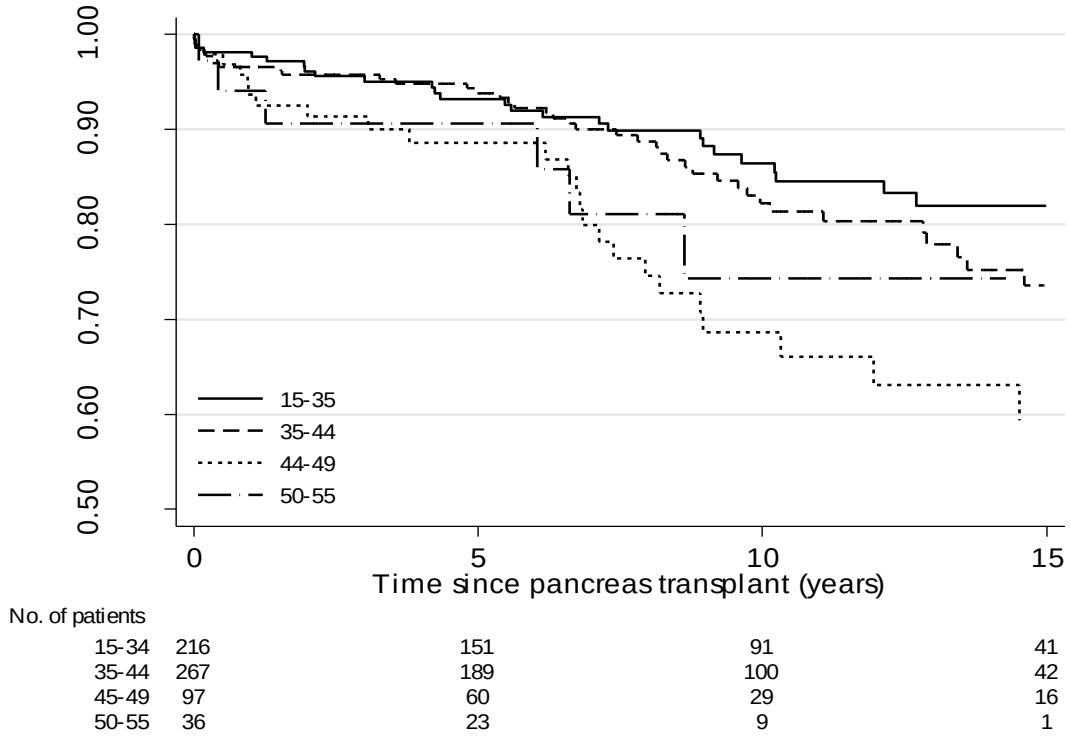
No. of patients

1984-1999	149	132	112	100
2000-2004	142	136	118	0
2005-2009	168	156	0	0
2010-2014	158	0	0	0

Patient survival by age at transplantation is shown in figure 2.5. People that were older at the time of pancreas transplantation had poorer survival than those who were younger, P=0.003. People aged 45 and older at transplantation were over twice as likely to die as those aged 44 or younger. Survival at 1 year for recipients aged <35 years was 98.1%, and for those aged 35-44 was 96.6%, whereas for those aged 45-49 was 93.6% and those 50 or older was 94%. Five year survival for those aged <35 years

was 93.2%, and for those aged 35-44 was 93.8%, whereas for those aged 45-49 was 88.6% and those 50 or older was 90.6%.

Figure 2.5: Patient survival by age at transplantation.



No. of patients

15-34	216	151	91	41
35-44	267	189	100	42
45-49	97	60	29	16
50-55	36	23	9	1

The distribution of patient survival, Pancreas graft survival and Kidney graft survival was analysed overall and by time period (1984-1999, 2000-2004, 2005-2009 and 2010-2014) for all outcomes.

Recipient age at transplantation was also analysed for patient survival, donor age analysed for both pancreas and kidney graft survival and donor BMI was analysed for pancreas graft survival. For graft survival, a patient who died with a functioning transplant was censored at date of death.

Pancreas survival

Pancreas transplant survival was calculated from the time of transplant until the time of return to insulin therapy or pancreatectomy. We calculated both pancreas failure including death with a functioning pancreas and pancreas failure censored for death with a functioning graft. For pancreas graft survival we included all pancreas transplants undertaken, including those who had 2 transplants twice. At the time of this report analysis, we had complete survival records for 629 pancreas transplants in 617 people.

Figure 2.6 shows pancreas survival censored for death. Over 4,408 years of observation, there were 136 pancreas graft failures (excluding people who died with a functioning transplant). Overall, 1 year pancreas graft survival was 86.3%, and 5 year survival 81%, and 10 year survival 77%.

Figure 2.7 shows pancreas survival including death with a functioning pancreas. Over the same observation time there were an additional 84 recipients who died with their pancreas still functioning. One, 5 and 10 year survival were 84.2%, 76.3% and 63.6% respectively.

Figure 2.6: Pancreas transplant survival, excluding death with a functioning pancreas graft.

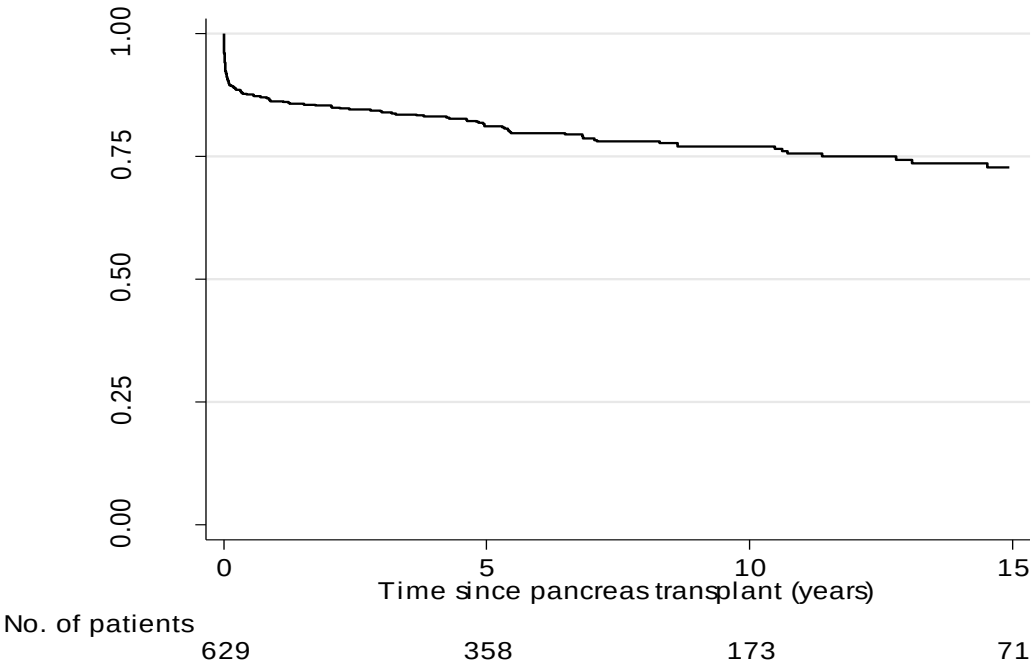
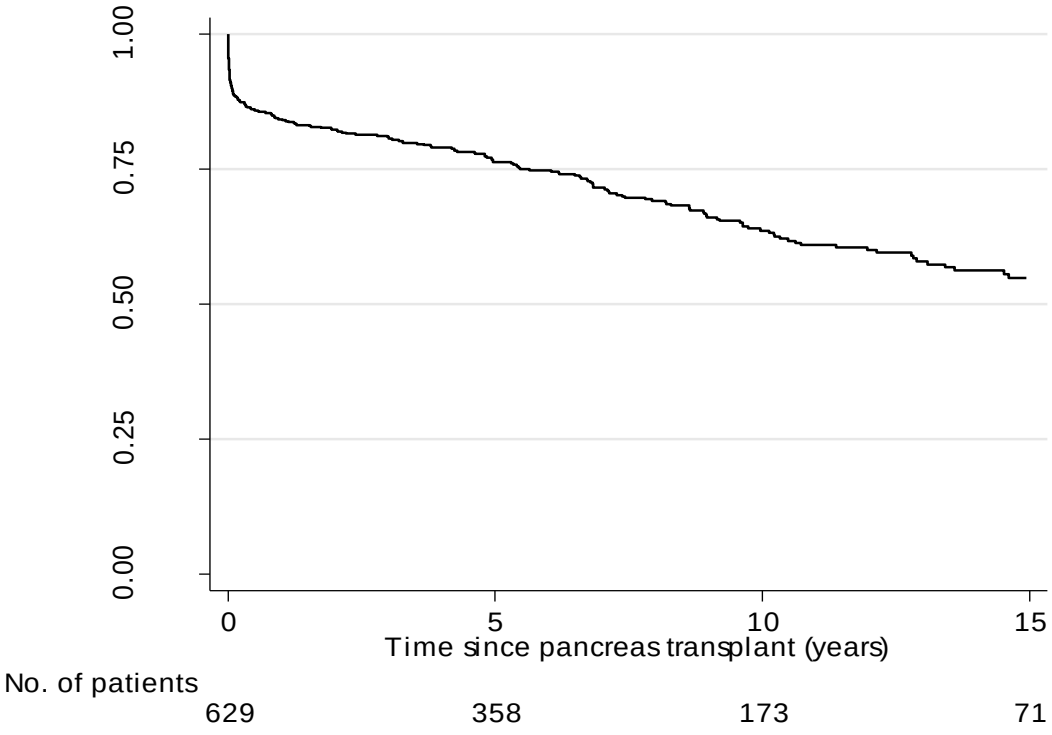
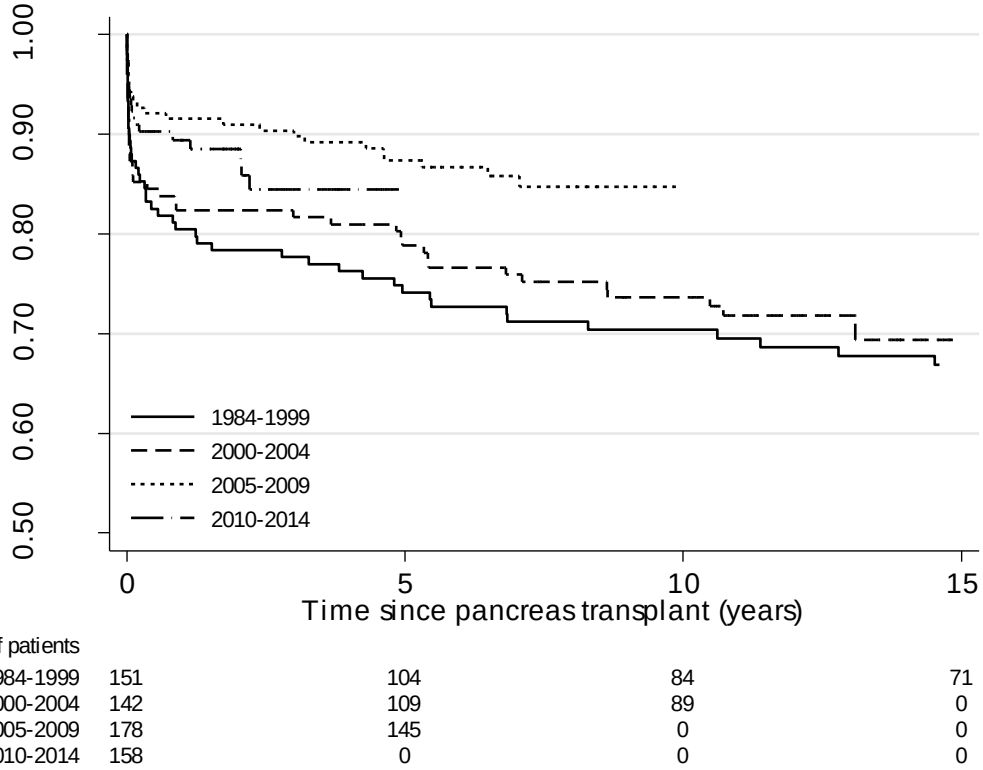


Figure 2.7: Pancreas transplant survival, including death with a functioning pancreas graft.



Survival of pancreas transplants varied over time, with survival markedly improving over time, P=0.01. For those transplanted in more recent years, risk of transplant loss was over 36% lower than those transplanted before 2000. This is shown in figure 2.8. Before 2000, 1 year pancreas survival was 80.5%, and 5 year survival 74%. For those transplanted after 2005, 1 year survival was 91.5% and 5 year survival 87.3%.

Figure 2.8: pancreas transplant survival over time (censored for death)

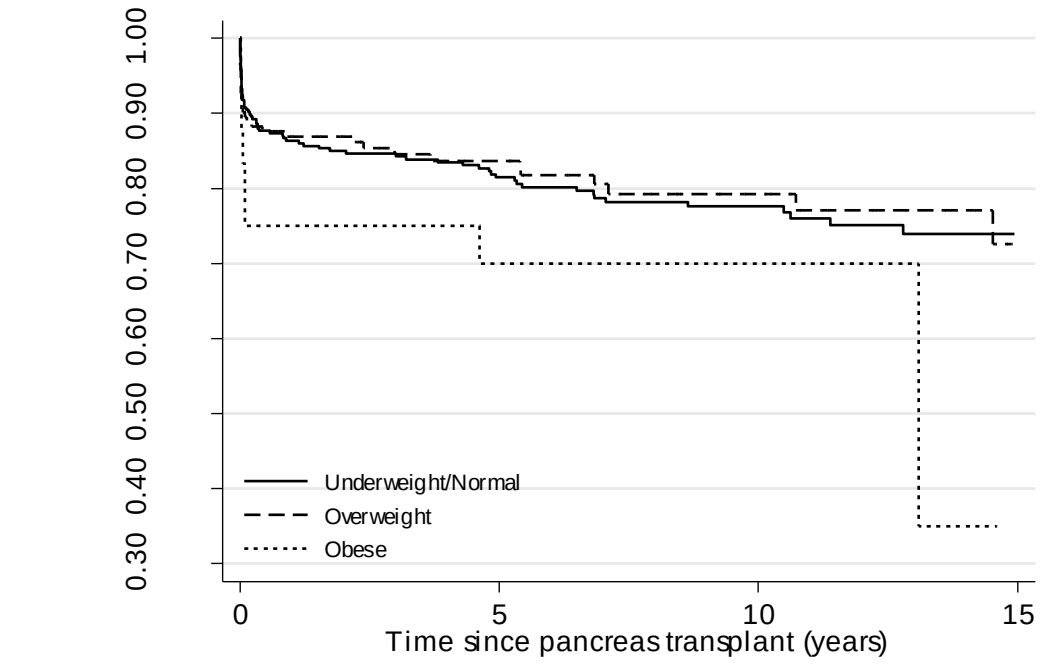


No. of patients

1984-1999	151	104	84	71
2000-2004	142	109	89	0
2005-2009	178	145	0	0
2010-2014	158	0	0	0

Figures 2.9 and 2.10 investigate the effect of donor factors on pancreas survival. We have data for donor BMI for 516 donations. The majority of donors (64%) were in either underweight or normal (BMI <25). However, 32% were overweight (BMI 25-29) and 4% were obese (BMI 30+). While Figure 2.9 suggests separation of survival curves, there was no difference statistically, P=0.35.

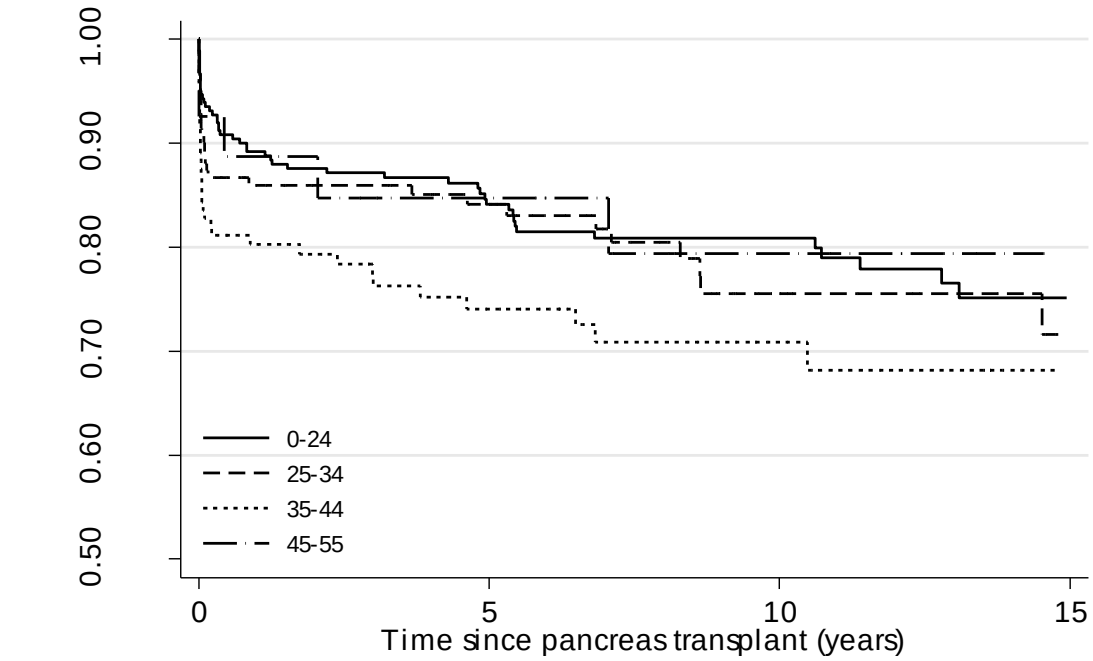
Figure 2.9: Pancreas survival censored for death with pancreas function, by donor BMI



No. of patients				
Underweight/Normal	329	195	102	38
Overweight	163	92	41	12
Obese	24	14	4	0

We have data for donor age for 572 pancreas donors. The survival curves appear poorer for donors aged 35-44 compared with those 45 and older, or younger donors, but this difference was not statistically significant, P= 0.11.

Figure 2.10: Pancreas transplant survival, censored for death with function, by donor age.



No. of patients

0-24	263	164	91	39
25-34	154	83	33	15
35-44	128	64	28	4
45-55	27	18	10	3

Pancreas transplant prevalence

We calculated the point prevalence of people living in Australia and New Zealand who were alive with a functioning transplant on 31st December each year for the last 3 years (table 2.7). There was some variation in the completeness of data for different states. These calculations do not include people still alive, who had a failed pancreas transplant.

Table 2.7: People alive with a functioning pancreas transplant in Australia and New Zealand by year and residence, at years end.

State of residence	**2012**	**2013**	**2014**
New South Wales	114	107	104
Victoria	124	121	118
Queensland	96	91	89
South Australia	25	25	25
West Australia	29	26	24
Tasmania	17	17	17
Australian Capital Territory	13	12	12
Northern Territory	2	2	2
New Zealand	40	37	34
Unknown	**0**	**0**	**0**
Total	**460**	**438**	**425**

Kidney transplant survival

Kidney transplant survival was calculated for those who received SPK transplants, from the time of transplantation until the time of return to dialysis. We calculated both kidney failure including death with a functioning kidney and kidney failure censored for death with a functioning graft. For kidney graft survival we included only SPK transplants and excluded PAK transplant recipients. We had complete survival records for 609 SPK transplant recipients.

Figure 2.11 shows kidney survival censored for death. Over 4,836 years of observation, there were 66 kidney graft failures (excluding people who died with a functioning transplant). Overall, 1 year kidney graft survival was 96.7%, and 5 year survival 92.8%, and 10 year survival 87.1%.

Figure 2.12 shows kidney survival including death with a functioning kidney. Over the same observation time there were an additional 67 recipients who died with their kidney still functioning. One, 5 and 10 year survival were 94.1%, 87.3% and 73.5% respectively.

Figure 2.11: Kidney transplant survival, censored for death with kidney function, for people receiving SPK transplants.

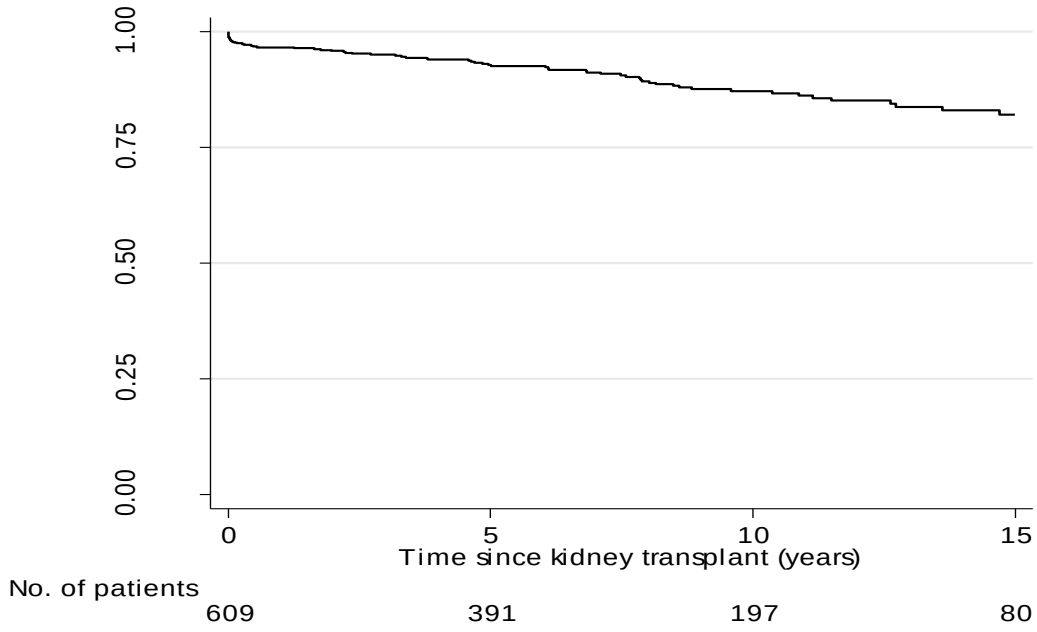
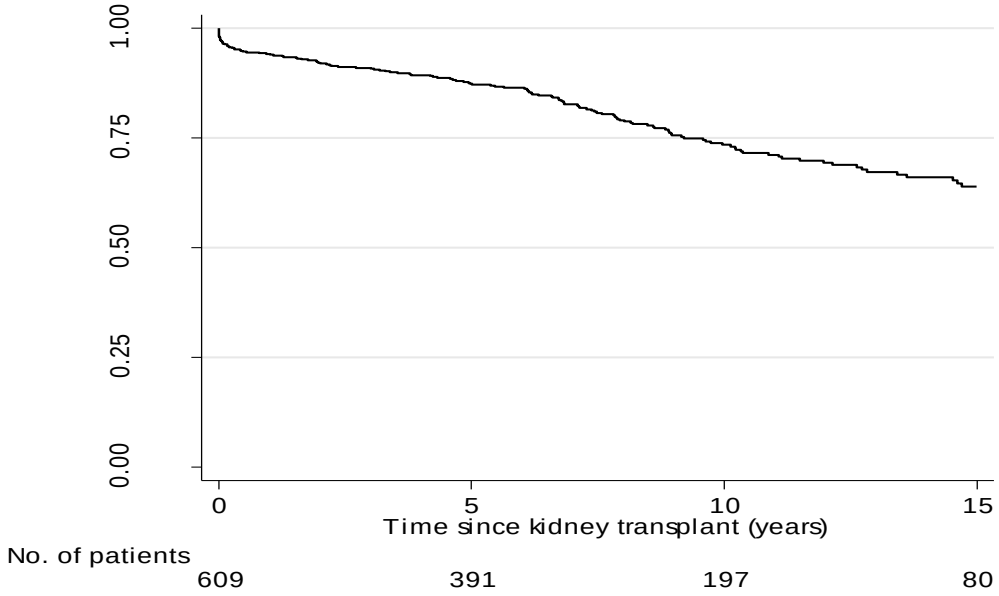
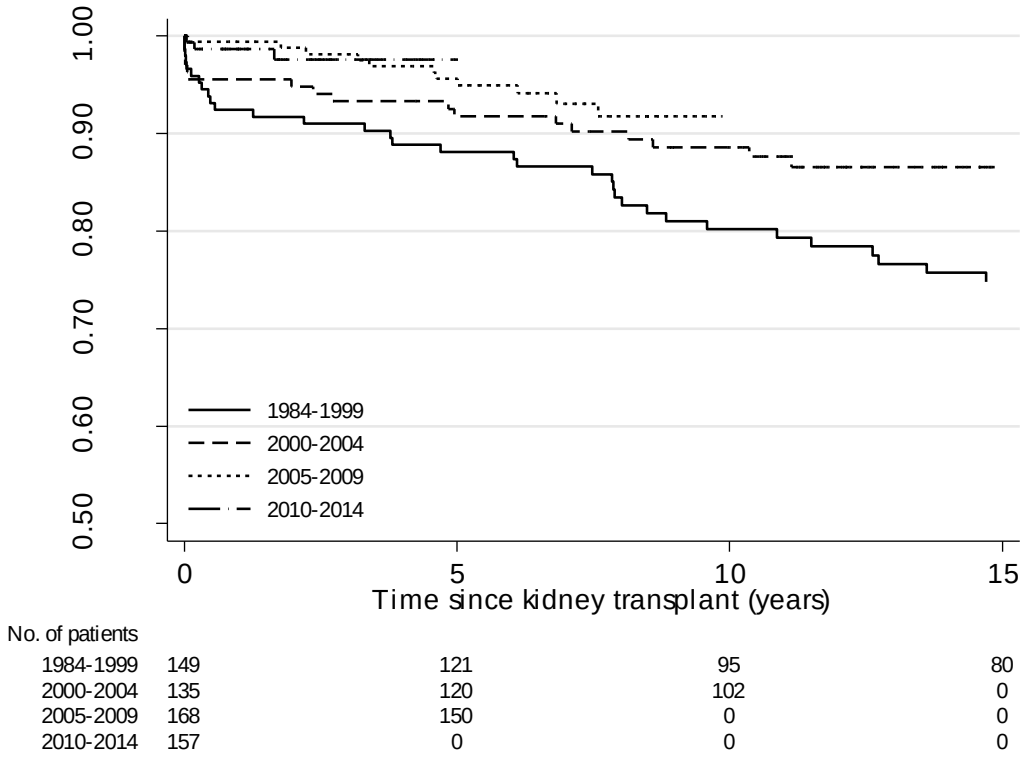


Figure 2.12: Kidney transplant survival, including death with kidney function, for people receiving SPK transplants.



Kidney survival improved over time, with longer survival for those transplanted in more recent years, P=0.01. For those transplanted before 2000, kidney transplant survival was 92.4% at 1 year and 88% at 5 years but was 99.4% at 1 year and 95.6% at 5 years for those transplanted after 2005. This era effect was even stronger when considering kidney failure including death with kidney function, P=0.001. For those transplanted before 2000, survival was 87.9% at 1 year and 81.2% at 5 years, but was 96.4% at 1 year and 89.2% at 5 years after 2005. These findings are shown in figures 2.13 and 2.14

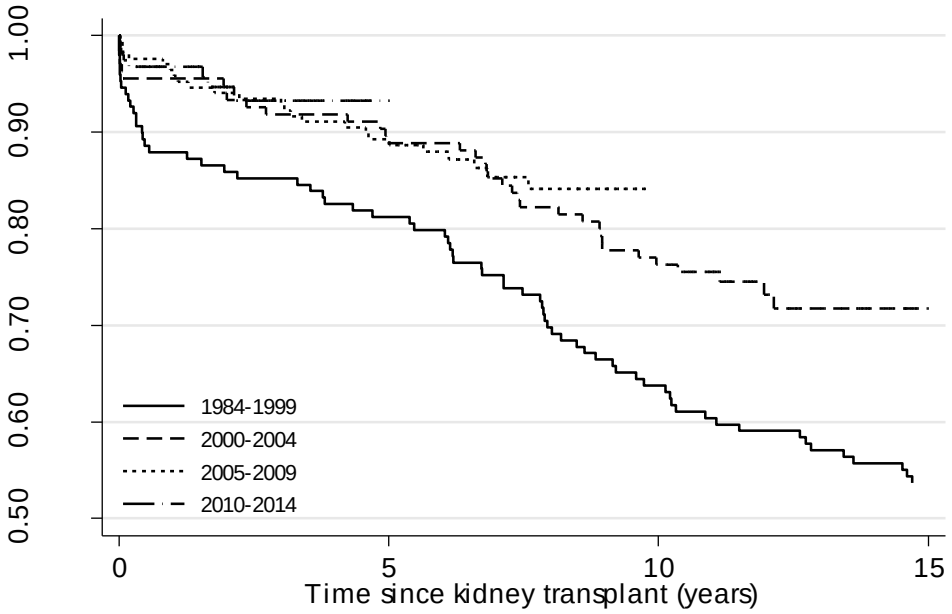
Figure 2.13: Kidney transplant survival, censored for death, for SPK recipients over time



No. of patients

1984-1999	149	121	95	80
2000-2004	135	120	102	0
2005-2009	168	150	0	0
2010-2014	157	0	0	0

Figure 2.14: Kidney transplant survival, including death with a functioning kidney, for SPK recipients over time



No. of patients

1984-1999	149	121	95	80
2000-2004	135	120	102	0
2005-2009	168	150	0	0
2010-2014	157	0	0	0

Immunosuppression and rejection

We planned analyses in this section to document use of immunosuppression in pancreas transplantation over time. We also planned to investigate rejection rates, and donor and recipient characteristics that might impact these.

However, in preparing the data it became clear that over time data definitions and data recording were not consistent. During 2015 we are working to improve data quality such that we can report these analyses in the 2016 report.

Pancreas transplant operative data

Characteristics of the pancreas transplant operations for 2014, previous years, and overall are shown in table 2.8 below.

Table 2.8: Descriptive characteristics of pancreas transplant operations

Characteristic	2014	1984-2013	total
Pancreas graft			
Cold ischaemic time, hours			
Mean (sd)	10(3.6)	10(7.1)	10(3.3)
Median (range)	9(5-22)	11(5-22)	11(5-22)
Warm ischaemic time, minutes			
Mean (sd)	18(7.0)	14(0)	16(4.6)
Median (range)	18(13-23)	14(0-14)	14(13-22)
Anastomosis time, minutes			
Mean (sd)	30(5.8)	29(9.4)	29(9.1)
Median (range)	29(14-70)	29(14-70)	29(14-70)
Exocrine drainage			
Enteric, n (%)	43(95.6%)	348(59.5%)	391(62.1%)
Bladder, n (%)	0	132(22.6%)	132(21%)
Unknown	2(4.4%)	105(17.9%)	107(17%)
Kidney graft			
Cold ischaemic time			
Mean (sd)	8(2.6)	10(7)	10(6.7)
Median (range)	8(5-22)	10(5-22)	10(5-22)
Warm ischaemic time			
Mean (sd)	18(7)	14(0)	16(4.6)
Median (range)	18(13-23)	14(0-14)	14(13-23)
Anastomosis time			
Mean (sd)	32(7)	32(9)	32(8)
Median (range)	32(22-55)	32(11-63)	32(11-63)
Kidney donor arteries			
1	39	388	427
2	3	34	37
More than 2	0	4	4
Unknown	3	159	162

To investigate how much the total cold ischaemic time varied dependant on the donor state, and distance travelled to the transplanting centre, table 2.10 displays a cross tabulation of donor state of origin with transplanting centre.

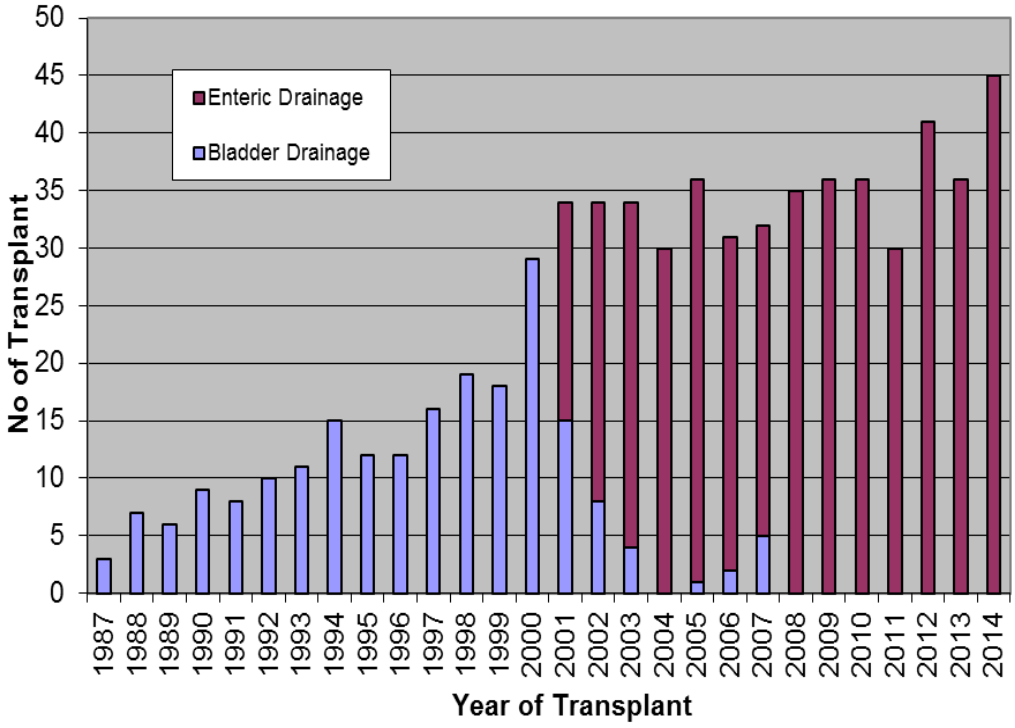
Table 2.9: Comparison of cold ischaemic time of Pancreas grafts by donor state, for Australian pancreas transplants 2014

Donor state of origin	Number	Cold ischaemic time, hours (mean, sd)	
		Westmead (NSW)	Monash (Vic)
New South Wales	12	9.1(1.4)	9(0)
Victoria	13	10(4.2)	7.1(1)
Queensland	3	12.3(1.1)	-
South Australia	5	12(3.3)	-
West Australia	4	11(1.1)	21(0)
Tasmania	2	-	8(0)
Australian Capital Territory	6	12(2.1)	
Northern Territory	0	-	-
Total	45		

Surgical technique

Exocrine drainage of the pancreas graft has changed over time. Enteric Drainage of the pancreas was first used in Australia and New Zealand during 2001. Figure 2.15 illustrates the number of transplants by pancreas duct management. All pancreas transplants over the last 7 years used enteric drainage of the pancreas duct.

Figure 2.15: Change in management of exocrine drainage of the pancreas over time



The site of donor vessel anastomoses onto the recipient vessels is dependent on many things, including but not limited to surgeon's preference, surgical ease of access, length and relative calibre of donor

vessels. The sites of anastomosis for donor arteries and veins are displayed in figures 2.16 and 2.17 below.

Figure 2.16 Site of donor artery anastomosis onto recipient vessel

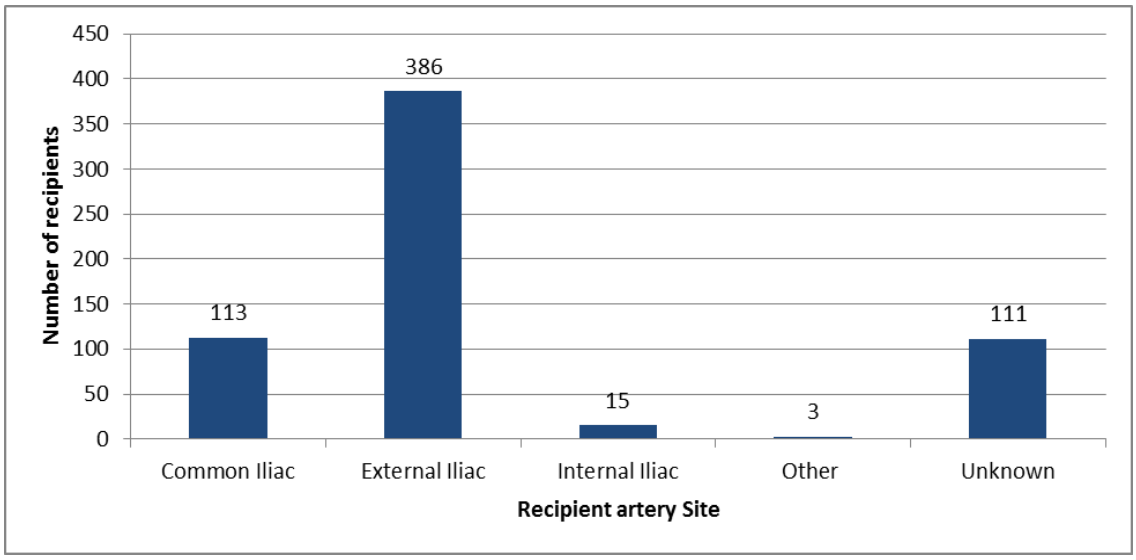
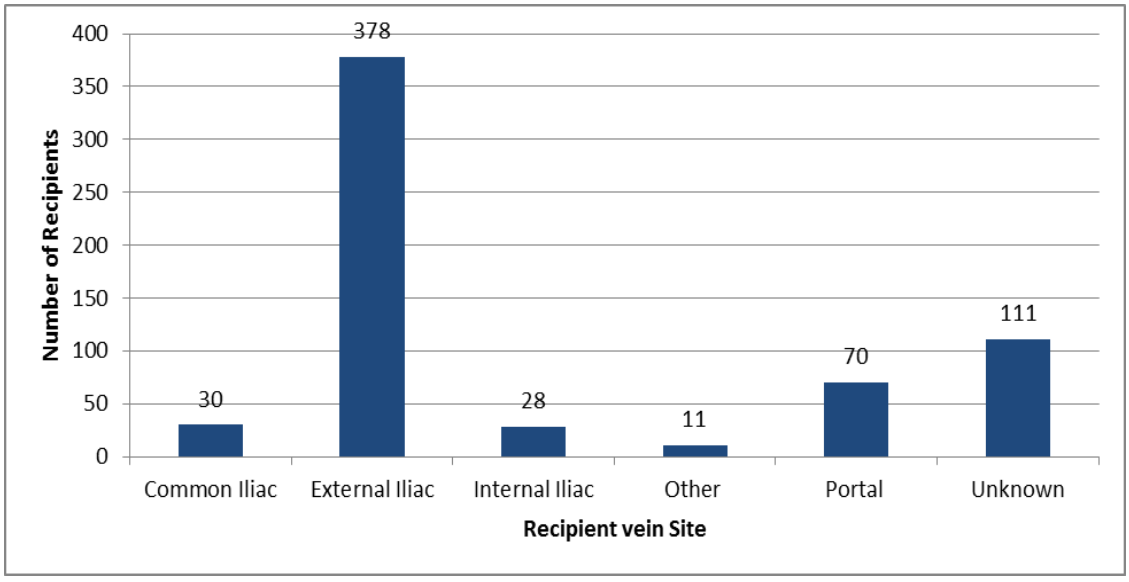


Figure 2.17 Site of donor vein anastomosis onto recipient vessel



The immunological matching of donor-recipient pairs is shown in table 2. 10, and the CMV and EBV matching is illustrated in table 2.11.

Table 2.10: Immunological cross-matching of donor recipient pairs

Crossmatch	Sample	
	Current	Peak
CDC		
Negative	485	469
T-cell positive	0	2
B-cell positive	3	4
DTT negative	1	1
Unknown	139	152
Panel Reactive Antibodies %		
Mean (sd)	7.6 (14.4)	15.3 (21.2)
0-24	6.5(10.6)	14(20)
25-49	8.4(17.4)	16.4(21.8)
50+	*	*

* Data missing

Table 2.11: Infectious disease cross-matching of donor recipient pairs

Number (%)	Donor		
Recipient	Serology IgG		
CMV IgG	positive	negative	unknown
positive	10 (22)	1 (2)	0
negative	0	3 (7)	0
unknown	22 (49)	7 (16)	2 (4)
EBV IgG			
positive	12 (27)	0	1 (2)
negative	0	0	0
unknown	25 (56)	1 (2)	6 (13)

Chapter 3: Pancreas donors

This chapter gives an overview of donors in 2014 and over time. Donor eligibility criteria guidelines are available in the TSANZ consensus statement http://www.tsanz.com.au/organallocationprotocols/ , but briefly require donors to be over 25kg, and up to the age of 45, without known diabetes mellitus or pancreatic trauma, or history of alcoholism or pancreatic trauma. Donation after cardiac death may be considered up to the age of 35.

Donor BMI is perceived as impacting recipient outcomes. Obese donors are more likely to have fatty pancreas, which results in more difficult surgery and increased post –operative complications, and suboptimal insulin secretion. Alcohol consumption is defined by a history of consumption of more than 40g/day. We have donor data for 628/658 donors.

Table 3.1 describes pancreas donor characteristics in Australia and New Zealand to date.

Table 3.1: Demographics and characteristics of pancreas transplant donors

Recipient characteristics	2014 N (%)	1984-2013 N (%)	Total N (%)
Total	45	613	658
Age, years (n= 572)			
Mean (sd)	30.6 (8.4)	27.2 (10.0)	27.4 (9.9)
0-24	8 (18)	255 (44)	263 (42)
25-34	23 (51)	131 (22)	154 (24)

35-44	10 (22)	118 (20)	128 (20)
45 and up	2 (4)	25 (4)	27 (4)
Missing	2 (4)	55 (9)	57 (9)
Sex			
Male	22 (49)	321 (55)	343 (55)
Female	21 (47)	206 (35)	227 (36)
Unknown	2 (4)	56 (10)	58 (9)
Donor height, m, mean (sd) (n=525)	1.73 (1.17)	1.72 (1.09)	1.73 (1.10)
Donor weight, kg mean (sd) (n = 524)	71.0 (11.6)	71.7 (15.8)	71.7 (15.6)
BMI, kg/m^2 mean (sd)			
Underweight <18.5	1 (2)	20 (3)	21 (3)
Normal Weight 18.5-25	22 (49)	286 (49)	308 (49)
Overweight 26-29	15 (33)	148 (25)	163 (26)
Obese 30+	1 (2)	23 (4)	24 (4)
Unknown	6 (13)	106 (18)	112 (18)
Donor type			
Brain Dead (DBD)	43 (95)	581 (100)	624 (99)
Circulatory death (DCD)	2 (4)	2 (<1)	4 (1)
Donor mode of death			
Cerebral Hypoxia / Ischaemia	11 (24)	45 (8)	56 (9)
Cerebral Infarct	2 (4)	15 (3)	17 (3)
Intracranial Haemorrhage	7 (16)	99 (17)	106 (17)
Non-Neurological Condition	2 (4)	13 (2)	15 (2)
Other Neurological Condition	0 (0)	9 (2)	9 (1)
Traumatic Brain Injury	20 (44)	337 (58)	357 (57)
Unknown	3 (7)	64 (11)	67 (11)
Days ventilated prior to donation, mean (sd) (n=448)	3.1 (2.1)	2.3 (1.8)	2.4 (1.8)
Alcohol consumption			
Current	2 (4)	28 (5)	30 (5)
Former	0 (0)	4 (1)	4 (1)
Never	39 (87)	363 (62)	402 (64)
Unknown	4 (9)	188 (32)	192 (31)
Smoking history			

Current	5 (11)	131 (22)	136 (22)
Former	2 (4)	19 (3)	21 (3)
Never	35 (78)	317 (54)	352 (56)
Unknown	0 (0)	15 (3)	15 (2)
Cultural and Ethnic Group*			
White	2	144	146
North East Asian (Chinese)	0	1	1
South East Asian	0	97	97
South and Central Asian (Indian)	0	2	2
Middle Eastern or North African	0	1	1
Indigenous Australian or Torres Strait Islander	0	0	0
Maori and Pacific Islander	0	4	4
Other	0	5	5
Unknown	43	331	374
Blood group			
A	17 (38)	192 (33)	209 (33)
O	19 (42)	197 (34)	216 (34)
B	8 (18)	41 (7)	49 (8)
AB	1 (2)	16 (3)	17 (3)
Unknown	0 (0)	137 (24)	137 (22)
Kidney biopsy (retrieval or implantation)			
Performed	24 (53)	107 (18)	131 (21)
Not performed	21 (47)	447 (76)	468 (75)
Unknown	0 (0)	29 (5)	29 (5)
CMV serology			
IgG positive	32 (71)	329 (56)	361 (58)
IgG negative	11 (24)	155 (27)	166 (26)
Unknown	2 (4)	99 (17)	101 (16)
Terminal glucose (n=353)	8.4 (2.3)	8.3 (3.0)	8.3 (3.0)
Terminal amylase (n=302)	100.2 (192.7)	93.2(138.6)	93.9 (143.9)
Terminal Creatinine (n=544)	70.0 (24.5)	80.8 (47.1)	80.0 (45.9)

* Classified according to the Australian Bureau of Statistics standard classification, 2nd Edition; http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1249.02011?OpenDocument

The distribution of donor states of origin is shown in tables 3.2 and 3.3, stratified by transplanting unit.

Table 3.2: Distribution of state of residence of pancreas donors in Australia over time at Westmead national pancreas transplant unit (NSW)

State of residence	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	Total
2014	11	2	3	5	3	4	-	-	28
2013	7	-	2	5	4	-	2	-	20
2012	12	2	4	5	3	1	1	-	28
2011	7	3	2	3	3	-	1	-	19
2010	12	1	1	3	1	-	1	-	19
Total	49	8	12	21	15	5	5	0	114

Table 3.3: Distribution of state of residence of pancreas donors in Australia over time at Monash pancreas transplant unit (VIC)

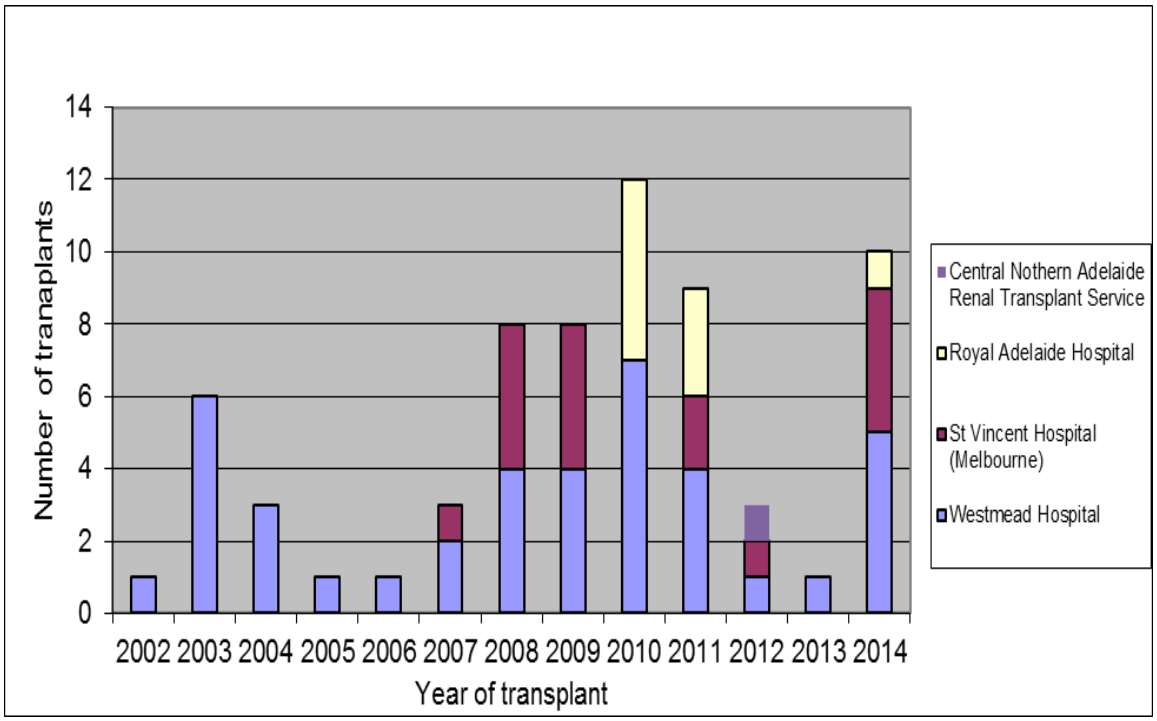
State of residence	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	Total
2014	1	11	-	-	1	2	-	-	15
2013	6	6	-	-	-	1	-	-	13
2012	4	5	-	-	-	-	-	-	9
2011	1	4	-	-	-	2	-	-	7
2010	2	11	-	-	-	1	-	-	14
Total	14	37	0	0	1	6	0	0	58

Chapter 4 Islet cell transplants

Data for islet transplant donors and recipients in Australia is still sparse. The islet transplant program started in 2002. There is no islet transplant program in New Zealand.

Figure 4.1 illustrates the number of islet cell transplants in Australia between 2002 and 2014. The transplants were performed in Westmead (40), St Vincent's (16), Royal Adelaide (9) and Central North Adelaide (1) Hospitals. In 2014, 5 transplants were performed at Westmead, 4 at St Vincent's and 1 at the Royal Adelaide.

Figure 4.1: Islets transplantation in Australia over time, stratified by centre.



Characteristics of Islet recipients and there donors are shown in table 4.1

Table 4.1: characteristics of islet cell transplant recipients in Australia.

Recipient characteristics	2014 N (%)	1984-2013 N (%)	Total * N (%)
Total	5	39	44
Recipient age, years			
Mean (sd)	50.4 (11.5)	48.0 (9.5)	48.2 (9.6)
Recipient Sex			
Male	2 (40)	15 (38)	17 (39)
Female	3 (60)	24 (62)	27 (61)
Number of transplants per recipient			
1	-	-	7 33)
2	-	-	6 (29)
3	-	-	7 (33)
4	-	-	1 (5)
Insulin dependent post transplant			
Yes	1 (20)	9 (23)	10 (23)_
No	4 (80)	22 (56)	36 (59)
Unknown	0 (0)	8 (21)	8 (18)
State of residence			
New South Wales	5(100)	17 (44)	22 (50)
Victoria	0	9 (23)	9 (20)
Queensland	0	2 (5)	2 (5)
South Australia	0	4 (10)	4 (9)
West Australia	0	4 (10)	4 (9)
Tasmania	0	0	0
Australian Capital Territory	0	2 (5)	2 (5)
Northern Territory	0	0	0
Donor age mean (SD)	50.6 (7.3)	44.5 (12.8)	45.3 (12.4)
Donor sex			
Male	2 (40)	21 (54)	23 (52)
Female	2 (40)	14 (36)	16 (36)
Unknown	1 (20)	4 (10)	5 (11)

*we have data for 44/66 islet transplants that have been done in Australia.

Appendices

The following abstracts were submitted for the International Pancreas and Islet Transplant Association, International Xenotransplantation Association and Cell Transplant Society joint congress (IPITA-IXA-CTS), due to occur in Melbourne November 2015, using ANZIPTR data on behalf of ANZIPTR and contributors.

Abstract 1: donor characteristics

Donor characteristics of pancreas transplants in Australia and New Zealand: a cohort study 1984-2014

Xi (Alex) Peng[1], Patrick Kelly[1], Angela Webster[1,2], on behalf of ANZIPTR and contributors[2].

[1]Sydney School of Public Health, The University of Sydney, Sydney, Australia; [2]Centre for Transplant and Renal Research, Westmead Hospital, Sydney, Australia

Introduction Pancreas transplantation was first conducted in Australian and New Zealand (ANZ) in 1984. The aim of this study is to describe the characteristics of pancreas donors in ANZ since 1984 and to examine changes over time.

Methods Data from the Australia and New Zealand Islet and Pancreas Transplant Registry (ANZIPTR) were used to investigate donor characteristics: sex, age, BMI, smoking status, blood group, positive cytomegalovirus (CMV) and Epstein-Barr virus (EBV) status, hypertension, number of arteries, multiple organ donation, and cause of death. Categorical and continuous characteristics were summarised as proportions and means respectively. Changes over time were assessed using Pearson Chi-square tests (or Fishers Exact tests if required) and ANOVA. Summaries and analyses over time were based on categorising year of transplant into the following periods: 1984-1994 and then five year periods; 1995-1999, 2000-2004, 2005-2009, and 2010-2014.

Results There were 627 pancreas transplants reported from 1984 to 2014 in ANZ, of which 583 were conducted in Australia and 44 in New Zealand. Donors' average age has increased from 26.6 years from 1984-94 to 28.5 years in 2010-14 (p=0.02). Average BMI has increased from 22.8 kg/m^2 to 24.0 kg/m^2 (p=0.01), with the percentage being

overweight or obese increasing from 18% to 39%. The proportion of donors with hypertension and who smoke has decreased substantially over time, from 16% to 1% (p<0.001) and from 54% to 15% (p<0.001), respectively. Positive EBV status has increased over time (70% to 90%; p<0.001), whereas CMV status has remained constant across the period (p =0.68), with 69% being positive. Donor blood groups have also remained constant, with 46% being type 0 and 41% being type A. Donors' cause of donor death has changed over time (p=0.003), with an increase in deaths due to cerebral hypoxia/ischaemia (from 2% to 16%) and a reduction in intracranial haemorrhage deaths (from 39% to 14%). Traumatic brain injury remains the most common cause of death (50% to70% of deaths).

Conclusions: Many donor characteristics have changed over time. Donors have become older and fatter but are now much less likely to have hypertension or to be a smoker. Positive EBV status has increased but CMV status appears stable. Donors' cause of death has also changed

Abstract 2: Recipient and graft survival

Recipient and pancreas graft survival after simultaneous kidney-pancreas transplantation in Australia and New Zealand: a cohort study 1984-2014

Xi (Alex) Peng[1], Patrick Kelly[1], Angela Webster[1,2], on behalf of ANZIPTR and contributors[2].

[1]Sydney School of Public Health, The University of Sydney, Sydney, Australia; [2]Centre for Transplant and Renal Research, Westmead Hospital, Sydney, Australia

Introduction We aimed to evaluate the survival and pancreas graft failure for simultaneous kidney-pancreas recipients (SPK) transplant in Australia and New Zealand (ANZ).

Methods Data from the Australia and New Zealand Islet and Pancreas Transplant Registry (ANZIPTR) were used to analyse the time to pancreas graft failure and time to death (any cause), since SPK transplant. We included all SPK recipients from 1984 to the end of 2014. Graft failure was defined as the first of either pancreatectomy, return to insulin dependence or death. Recipients were otherwise censored at last known follow-up. Time to graft failure and time to death were summarised using Kaplan-Meier survival curves. We investigated potential risk factors for poor outcome using Cox proportional hazard regression models, and generated Hazard ratios (HR, with 95%CI). We considered recipient year of transplant, sex, age, BMI, comorbidity (chronic lung disease, coronary artery disease, peripheral vascular disease, cerebrovascular disease), time since starting renal replacement therapy, and donor factors age and BMI.

Results There were 627 SPK transplants from 1984 to 2014. The maximum follow-up time was 26.9 years, with a total of 5370 years of observation. Over this period there were 119 (19%) deaths and 214 (34%) pancreas failures (80 of which were due to death). Approximately half (n=331; 53%) of the recipients were male, the average age was 38.7 (SD 7.3) years, average BMI was 24.2 (SD 3.6) kg/m2 , the average number of years on renal replacement therapy prior to SPK transplant was 1.5 (SD 1.9) and 21% had at least one comorbidity. The average donor age was 27.5 (SD 10.0) years, with an average BMI of 24.0 (SD 3.4) kg/m2.

Patient survival was 97% at 1 year, 93% at 5 years, 81% at 10 years, 69% at 15 years and 64% at 20 years. Survival has substantially improved since the first SPK transplants in ANZ. After adjusting for all other listed factors, the risk of dying decreased by 48% for patients receiving a SPK transplant in 2010-2014 compared to 1989-1994 (HR=0.52; p<0.01). Recipient age was also associated with death, with a 4% increase in death for every year older at transplantation (HR =1.04; p=0.04). There was no evidence of increased risk of death with any of the other factors (p>0.05).

Pancreas transplant survival was 84% at 1 year, 76% at 5 years, 64% at 10 years, 56% at 15 years and 50% at 20 years. Risk of pancreas failure substantially decreased since the first SPK transplant in ANZ: graft failure decreased 40% between 1989-1994 and 2010-2014 (HR=0.60; p<0.02). However, after adjusting for other potential risk factors, the only factor increasing risk of pancreas failure was donor age: the risk of graft failure increased by 2% for every year the donor is older (HR =1.02; p=0.03). There was some evidence that time on renal replacement therapy (RRT) is also associated with graft failure (p=0.08), with longer RRT associated with higher risk of graft failure.

Conclusion There has been substantial improvement in patient survival and a substantial reduction in the risk of pancreas failure since SPK first began in ANZ.