

Australia & New Zealand Pancreas Transplant Registry Report 1984-2004

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



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Summary

- ▲ 301 Pancreas transplants have been performed in Australia and New Zealand (ANZ) in 1984-2004.
- ▲ The annual average number of transplants has increased from 7 in 1984-1993 to 21 in 1994-2003.
- ▲ In 2004, 33 transplants were performed: Auckland (2), Monash (8) and Westmead (23). Transplant by category: SPK (25), PAK (3), PTA (2) and ITA (3).

International

- ▲ ANZ constituted of 8% (24 out of 433) to the non-US transplant activity in 2002.
- ▲ One-year SPK Patient survival was slightly higher in ANZ (97%) than in US (95%) and non-US (96%) in 1996-2002.
- ▲ ANZ had similar proportion of SPK to non-US (90%) but less PAK and PTA.
- ▲ ANZ compared favourably with international data on the 1-year Pancreas survival, Patient survival, and Kidney survival.

SPK Patient survival (Figure i)

- ▲ The 1-year, 3-year and 5-year SPK Patient survival was 96%, 94% and 93% in 1984-2003.
- ▲ Recipients had significantly 4 fold lower in Instantaneous relative risk (hazard rate, HR) of death if the operation was performed after 1994.

1-year

- ▲ 95% for BD and 96% for ED.
- ▲ 96% for recipients aged <45 and 92% for those ≥45.
- ▲ Recipients aged less than 45 had a significantly better survival compared to those over 45 with the HR of 0.5.

SPK Kidney graft survival (Figure i)

- ▲ 1-year, 3-year and 5-year was 92%, 90% and 86%.
- ▲ The HR was 2.5 times higher for Kidney graft failure in 1984-1993 compared to 1994-2003.

1-year

- ▲ 83% in 1984-1993 and 94% 1994-2003.
- ▲ 91% for BD and 96% for ED.
- ▲ 92% for the recipients aged <45 and ≥45.

SPK Pancreas graft survival (Figure i)

- ▲ 1-year, 3-year and 5-year Pancreas survival was 86%, 82% and 78% respectively in 1984-2003.

1-year

- ▲ 82% in 1984-1993 and 87% in 1994-2003.
- ▲ HR was 2.5 times significantly higher in 1984-1994 compared to 1993-2003.
- ▲ 84% for BD and 92% for ED.
- ▲ 87% for the recipients aged <45 and 83% for those ≥45.

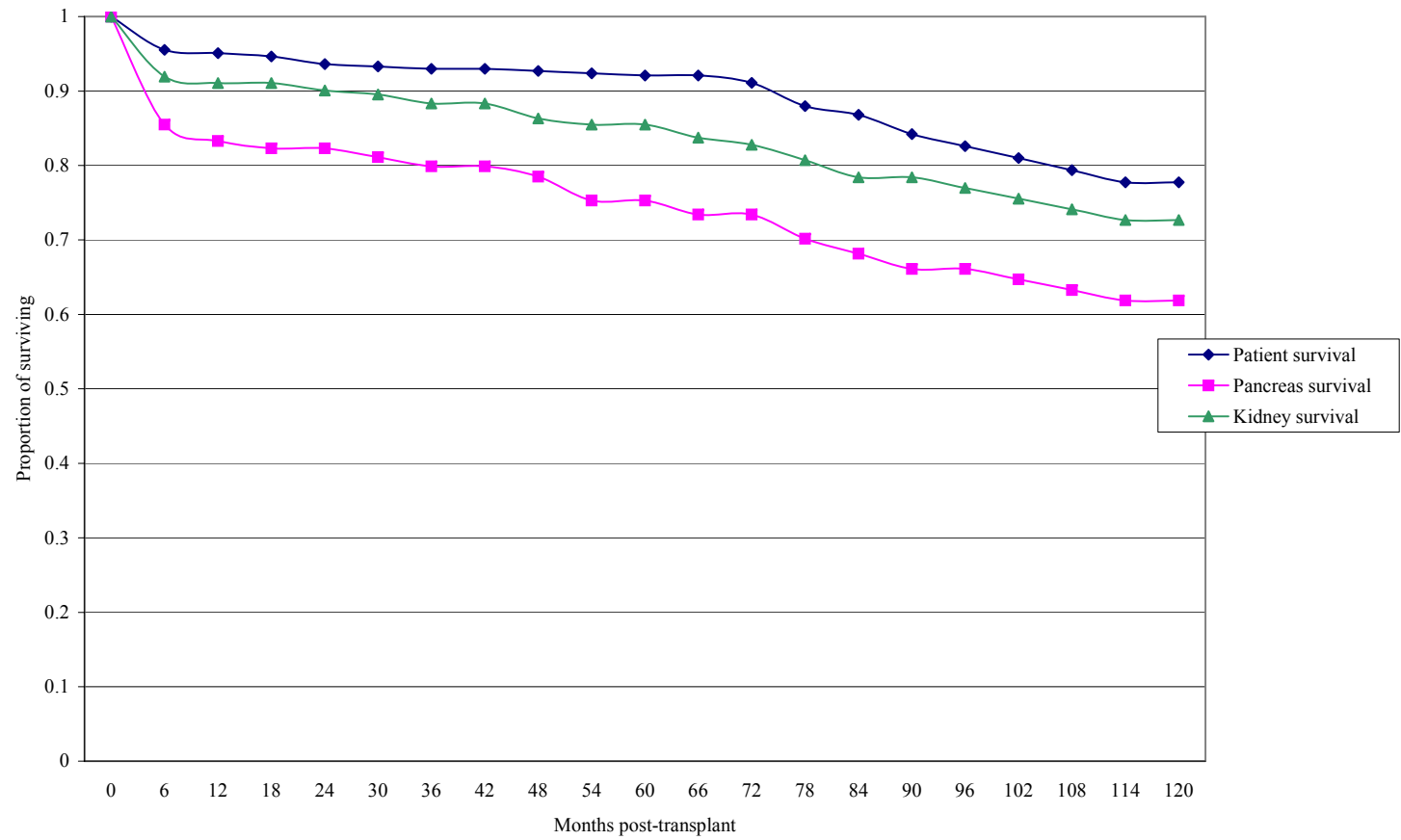
Islet transplant

- ▲ Seven Islet transplant procedures have been performed in 4 patients since 2002.
- ▲ Three recipients received a second transplant have an insulin free survival of 100% and are currently C-peptide positive.

Others

- ▲ The most common known causes of death was Cardio/Cerebrovascular event (50%, 9 out of 18).
- ▲ 64% of kidney and pancreas graft failure was due to thrombosis.
- ▲ Six recipients had a second transplant: SPK (2), SPK followed by PTA (1), ITA (3).

Figure i. SPK Patient survival, Kidney survival and Pancreas survival in Australia and New Zealand, 1984-2003



Introduction


The Australia and New Zealand (ANZ) Pancreas transplant data were obtained from the transplant centers in Auckland Renal Transplant Group (Auckland), Monash Medical Center (Monash) and National Pancreas Transplant Unit at Westmead Hospital (Westmead). Auckland commenced in 1998. Islets were first performed in Westmead in 2002.

There have been 301 pancreas transplants in Australia and New Zealand (ANZ) between November 1984 to December 2003. No activity was recorded in 1986 and 1987. Of these, six had a second transplant.

Analysis

The functioning pancreas grafts are defined as insulin independent recipients. Kidney grafts are defined as functioning if recipients are dialysis free. All causes of death are included in the survival analysis. Patients receiving a second transplant after failure of the first graft are censored for Patient survival for the first graft at the date of the second graft.

The aims of this report are to:

- outline all the transplant activity in 1984-2003
- compare the ANZ data to US and non US (noted by  in the text)

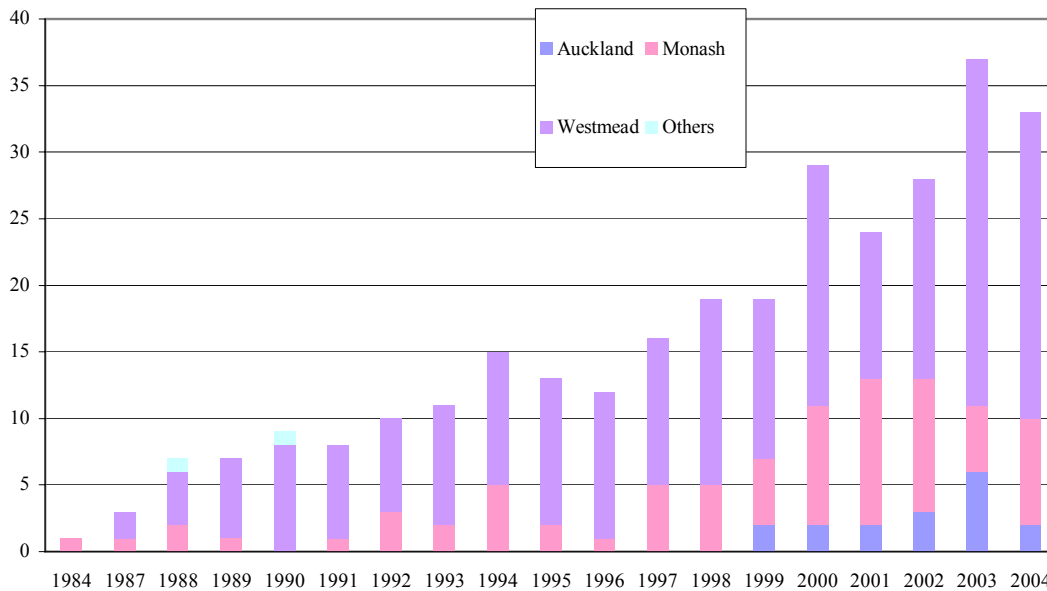
The distribution of Patient survival, Kidney graft survival and Pancreas graft survival was analysed by two periods (1984-1993 and 1994-2003), pancreas duct management (Bladder drained [BD] and Enteric drained [ED]) and two age groups (below 45 and above 45) in Simultaneous pancreas and kidney (SPK) recipients. A brief discussion was made on duct management, causes of deaths, donor age, causes of graft failure, re-transplant, waiting list and number of organ donation.

Kaplan-Meier survival curves were used to illustrate the survival distributions. Cox regression models were used to estimate the Instantaneous relative risks (hazard ratios, HR) and their 95% confidence intervals. The HR quantifies differences in survival between groups. The statistical software package, SPSS® for Windows Release 13.0 was used for all analyses.

Number of transplants

Figure 1 illustrates the number of transplants in ANZ between 1984 and 2004. Eighty-one percent of the transplants were performed after 1994 (245 out of 301). The number of average transplants has increased from 7 in 1984-1993 to 23 in 1994-2004. Between 1999-2004, majority of the transplants was performed in Westmead (62%, 105 out of 170) and Monash (48%) and Auckland (10%). In 2004, 33 transplants were performed: Auckland (2, 6%), Monash (8, 24%) and Westmead (23, 70%).

Figure 1. Number of transplants by centers between 1984-2004

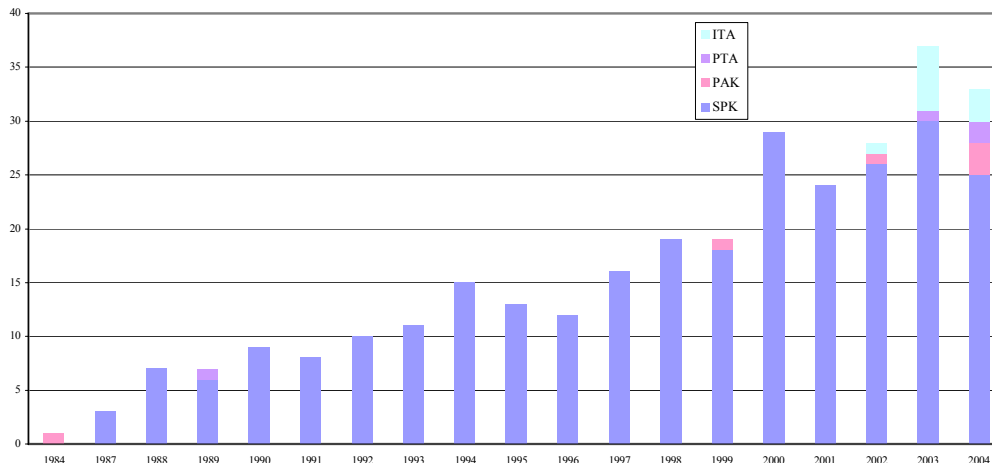


Comparing the global transplant activity in 2002, ANZ constitutes of 8% (24 out of 368) of the non-US cases.

Pancreas Transplant by Category

Figure 2 shows the pancreas transplants by category: Simultaneous pancreas-kidney transplant (SPK), Pancreas after kidney (PAK), Pancreas transplant alone (PTA) and Islets transplant (ITA). SPK is the major pancreas transplants by category in ANZ at 93% (281 out of 301) in 1984-2004. This is followed by ten ITA, six PAK and four PTA.

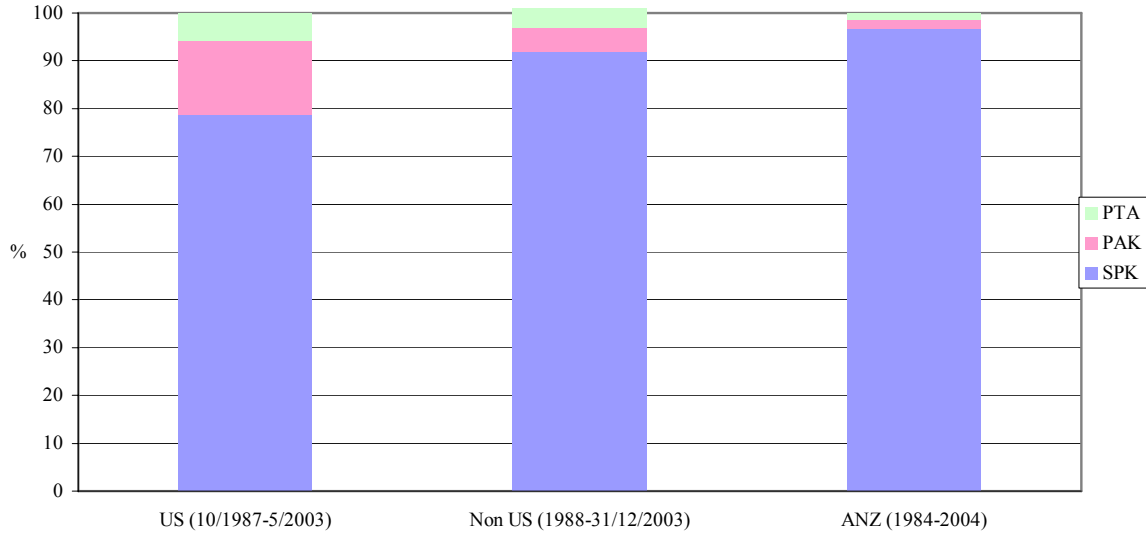
Figure 2. Pancreas transplant by category in Australia and New Zealand, 1984-2004





The proportion of all transplants which were SPK was over 90% in both ANZ (281 out of 291, excluding ten ITA) and non-US (4,336 out of 4,756) but less in US (79%, 11,505 out of 14,605) in 1984-2004 (Figure 3). In 2002, ANZ (4%, 0%) had less PAK and PTA compared to non-US (11%, 6%) and US (26%, 9%).

Figure 3. Pancreas transplant by category (%)



SPK Patient survival

The 1-year, 3-year and 5-year SPK patient survival was 96%, 94% and 93% in 1984-2004 (Figure 4).

Figure 4. Patient survival in ANZ, 1984-2004

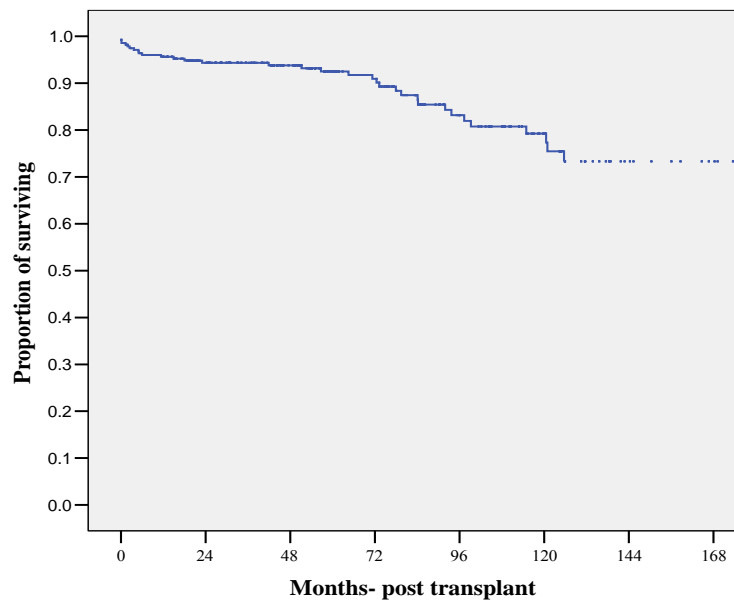


Table 1. Comparison of SPK patient in ANZ, 1984-2004

		No	Hazard ratio (HR)	P value	95% CI
Period	1984-1993	54	3.98	0.002	1.68-9.40
	1994-2003 [#]	200	-	-	-
Duct management	Bladder drained [#]	201	-	-	-
	Enteric drained	53	2.78	0.33	0.36-21.31
Age group	≤44	222	0.38	0.006	0.19-0.76
	≥ 45 [#]	58	-	-	-

[#] Reference group, @ No death

By Pancreas duct management

ED was introduced in ANZ during 2001. There have been 202 BD and 83 ED between 1984-2004 (Figure 6). Twenty-one patients have been converted from BD to ED. Two patients have been converted from ED to BD. The reasons for conversion were pancreas enzyme leak and small bowel loop herniation. The median length of period for conversion was 9.6 months from BD to ED and 0.45 months from ED to BD.

For patients with no duct conversion, the one-year SPK survival for BD and ED pancreas was 94% and 98% respectively (Figure 7). The 3-year and 5- year SPK BD patient survival were 92% and 91% respectively.

During 1999-2003, ANZ had a higher SPK 1-year Patient survival for both BD and ED (98%) compared to US and Non-US (Table 2).

Figure 6. Pancreas duct management in ANZ, 1984-2004

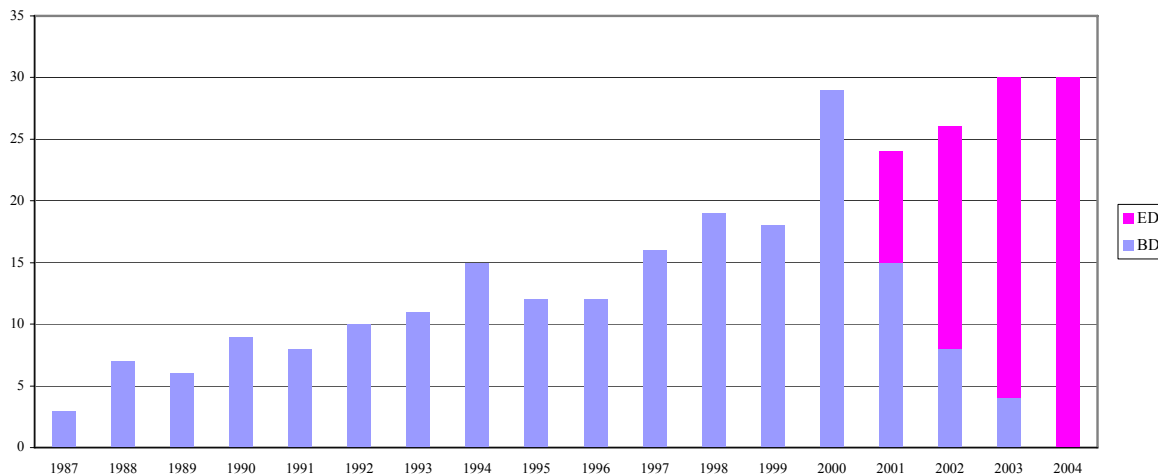


Figure 7. SPK Bladder drained Patient survival in ANZ, 1984-2003

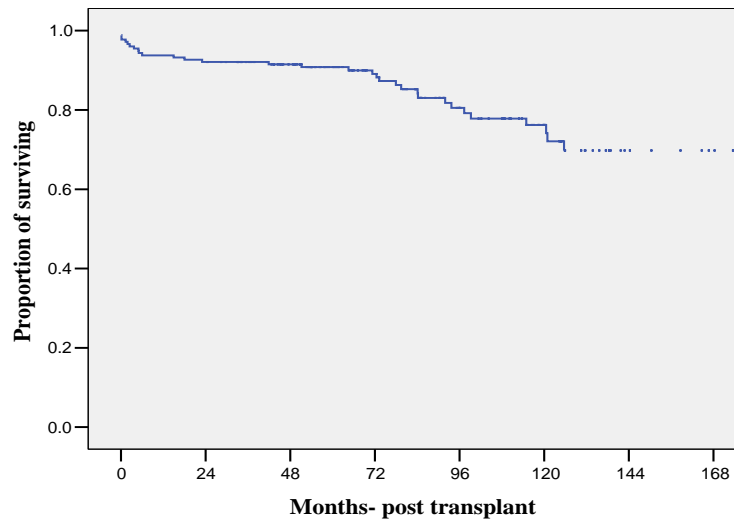


Table 2. Comparison of 1-year SPK Patient survival in ANZ, US and non-US in 1999-2003*

	ANZ+	US	Non US
BD	98 (59)	94 (797)	96 (212)
ED	98 (59)	95 (2,902)	98 (1607)

* Number of cases in bracket, + Exclude cases with a conversion in the duct management

By Age groups

Sixty-five percent of recipients were aged below 40 with the mean age of 38.2 (standard deviation 7.18) (Figure 8). One-year SPK Patient survival rate was 97% and 91% for the recipient aged below and above 45 respectively (Figure 9). SPK recipients aged less than 45 had a significantly better survival compared to those over 45 with the HR of 0.4 (P<0.01) (Table 1).

Figure 8. Age distribution of SPK recipients

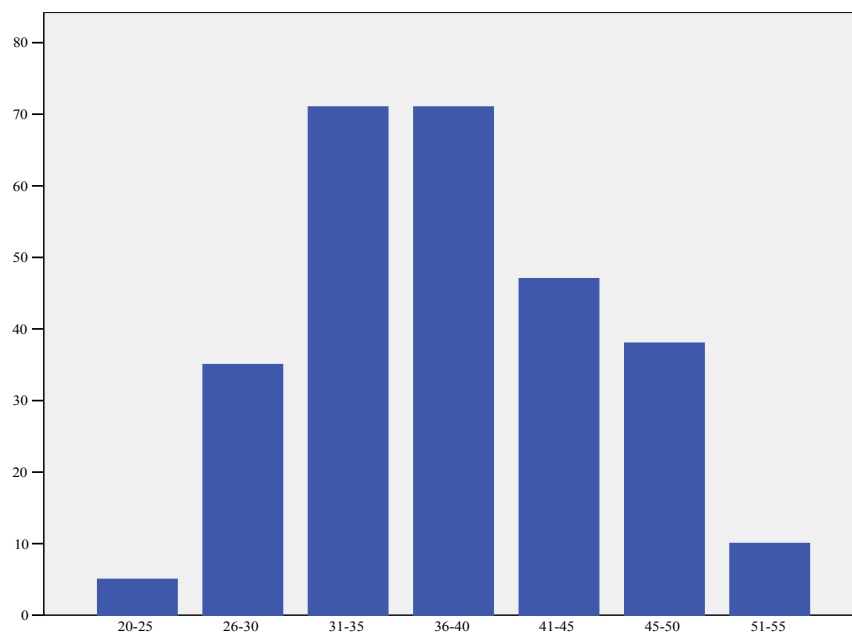
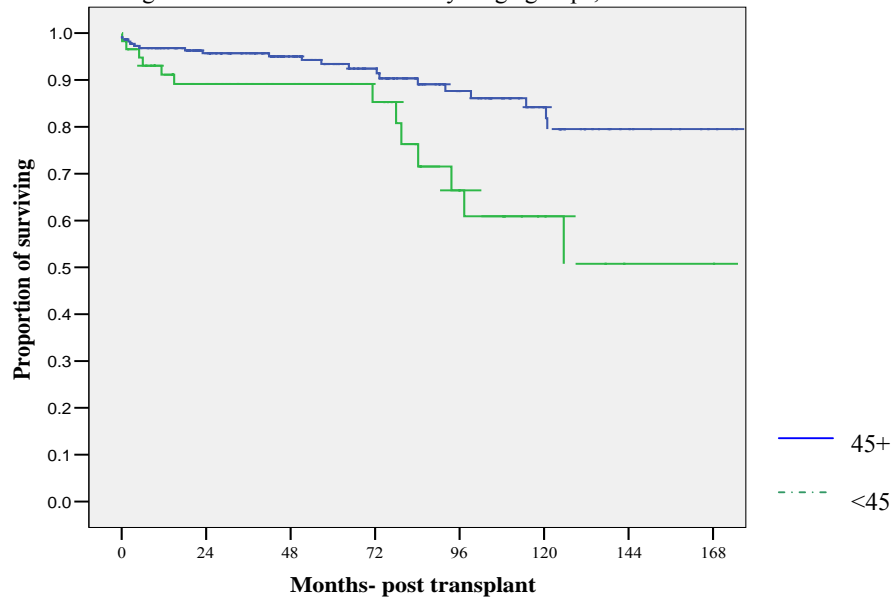


Figure 9. SPK Patient survival by 2 age groups, 1984-2004

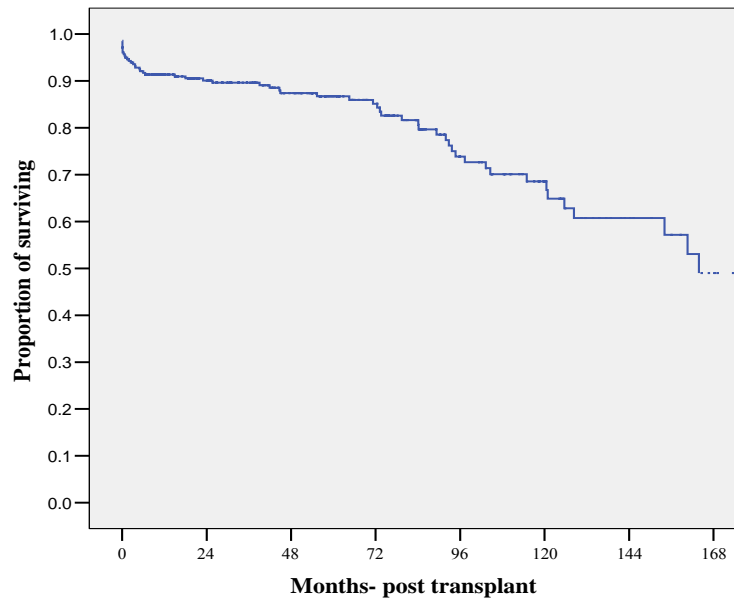


ANZ data was similar to the US data (1999-2003) that SPK recipients aged less than 45 has a lower HR ($P < 0.05$).

Kidney graft survival

For SPK, the 1-year, 3-year and 5-year kidney survival was 91%, 90% and 87% respectively (Figure 10) in 1984-2004.

Figure 10. Kidney graft survival in ANZ, 1984-2004



The 1-year kidney survival was slightly higher in ANZ (95%) and non-US (94%) compared to the US for the SPK recipient for the period of 1999-2003.

Table 3. Comparison of SPK Kidney graft survival in ANZ, 1984-2003

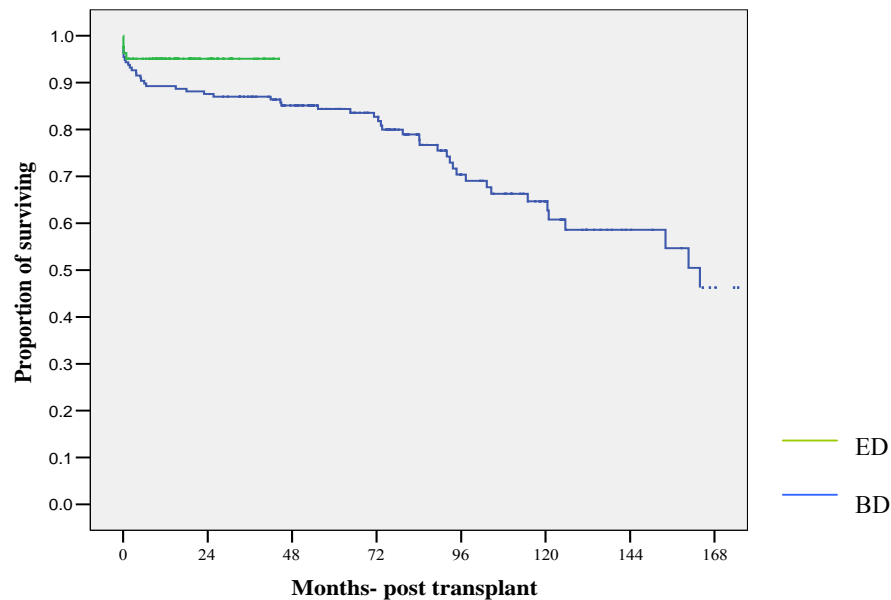
		No	Hazard ratio (HR)	P value	95% CI
Period	1984-1993	54	2.49	0.006	1.30-4.76
	1994-2003 [#]	200	-	-	-
Duct management	Bladder drained [#]	201	-	-	-
	Enteric drained	53	2.41	0.234	0.56-10.30
Age group	≤44	197	0.78	0.48	0.39-1.56
	≥ 45 [#]	50	-	-	-

[#] Reference group

By Pancreas duct management

One-year Kidney survival was 89% for BD and 95% for ED in SPK recipients during 1984-2004 (Figure 13).

Figure 13. Kidney survival for SPK patient by Pancreas duct management in ANZ, 1984-2004



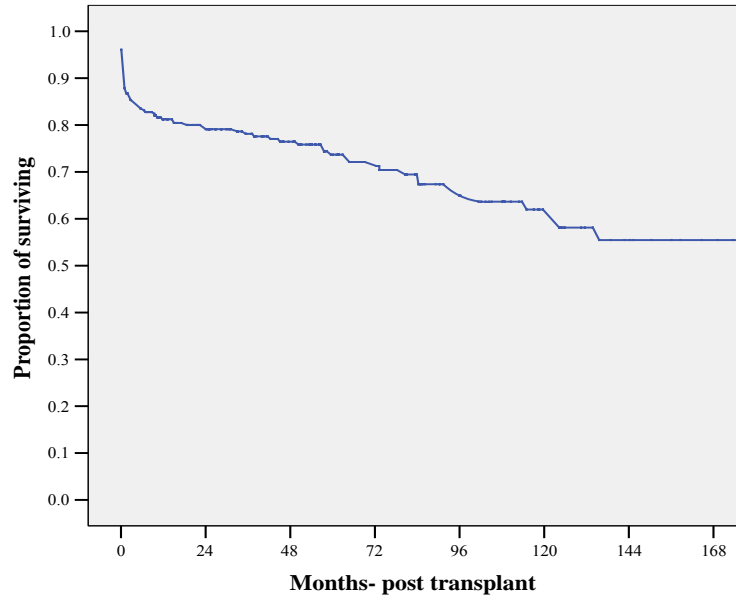
By Age groups

One-year Kidney survival in SPK recipients was 91% for the recipients aged below and above 45 in 1984-2004.

Pancreas graft survival

The 1-year, 3-year and 5-year Pancreas survival was 81%, 78% and 74% respectively in 1984-2004 (Figure 14).

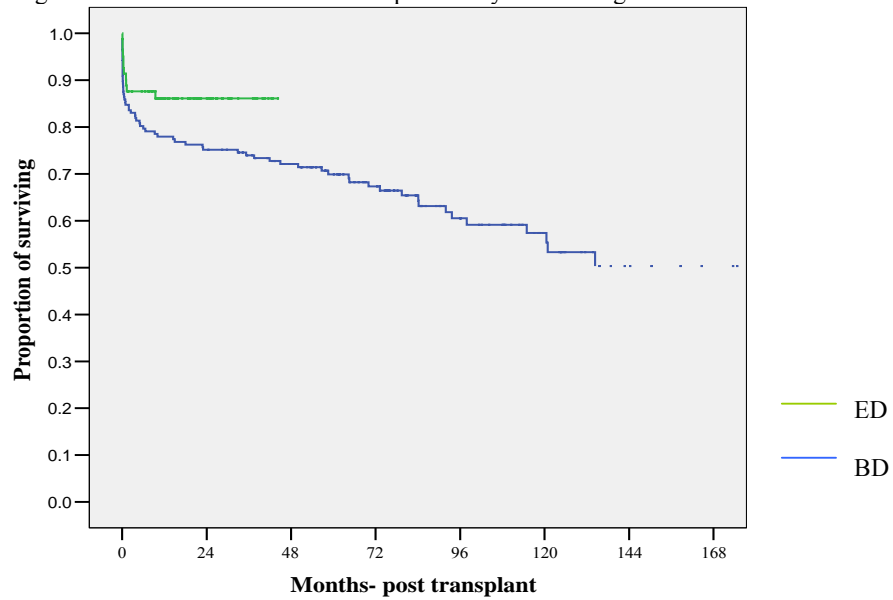
Figure 14. Pancreas graft survival in SPK recipients in ANZ, 1984-2004



By Pancreas duct management

Figure 16 shows the Pancreas survival for SPK patients by duct management in 1984-2003. The 1-year Pancreas survival was 78% for BD and 86% for ED. The 3-year and 5-year Pancreas survival was 74% and 70% for BD. There was no significant difference in the pancreas survival between BD and ED.

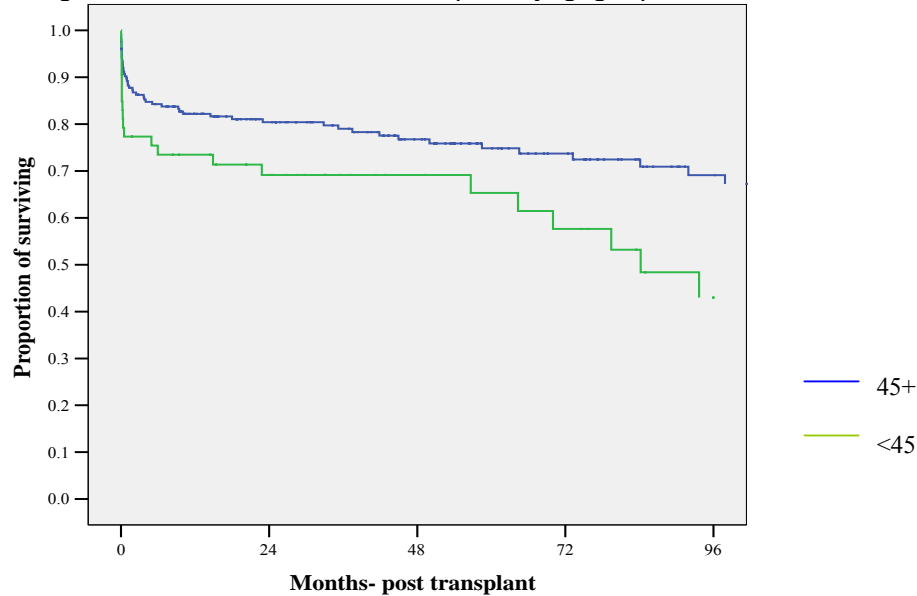
Figure 16. Pancreas survival for SPK patients by duct management in 1984-2004



By Age groups

Figure 17 shows the Pancreas survival for SPK recipients by two age groups in 1984-2004. The 1-year, 3-year and 5-year Pancreas survival for SPK patients was 82%, 79% and 75% for recipients aged below 44. For those aged over 45, the 1-year, 3-year and 5-year Pancreas survival was 74%, 69% and 69%.

Figure 17. Pancreas survival for SPK recipients by age groups in 1984-2004



By donor characteristics

Between 1984-2003, pancreas graft survival was significantly related with the advance of donor age, and three times higher from donors who had not received DDAVP/ Pitressin to those who did (ANZDOR Report 2004:40-41). No statistically significance was found between donor gender, status of smoking, cause of death, terminal creatinine and terminal urea.

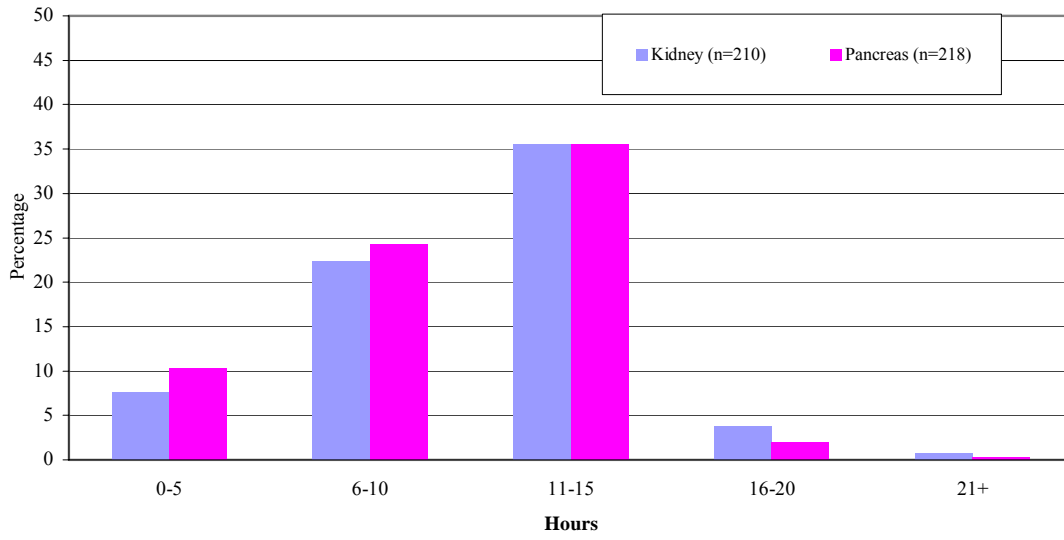
Pancreas duct management

One-year pancreas graft survival was 78% and 86% for BD and ED respectively.

Preservation time

The mean ischaemic time was 11-12 hours (standard deviation: 4 hours) for both kidney and pancreas.

Figure . Ischaemic time for Kidney and Pancreas graft, 1984-2004

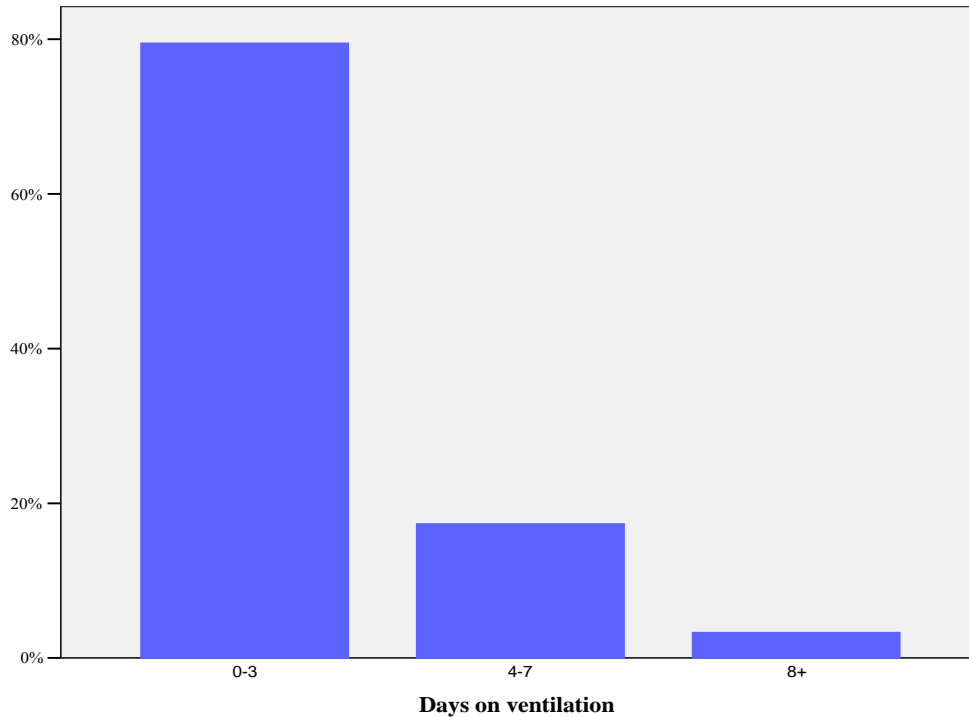


The mean ischaemic time was 11 ± 3 hours compared to 14 ± 4 hours in US for the SPK recipient for the period of 1998-2003.

Donor days on ventilation

The average length of donors on ventilation was 2.4 days (standard deviation: 2.1). Eighty percent of donors were on ventilation less than 3 days (Figure).

Figure . Days on ventilation in donors, 1984-2004

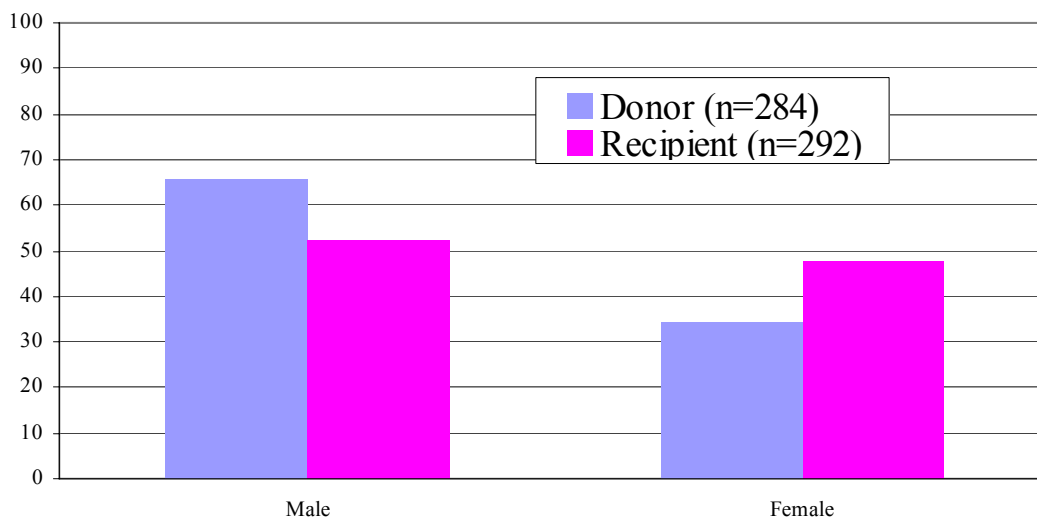


Demographics

Gender

Sixty-six percent of donors were male compared to 52% in the recipients (Figure).

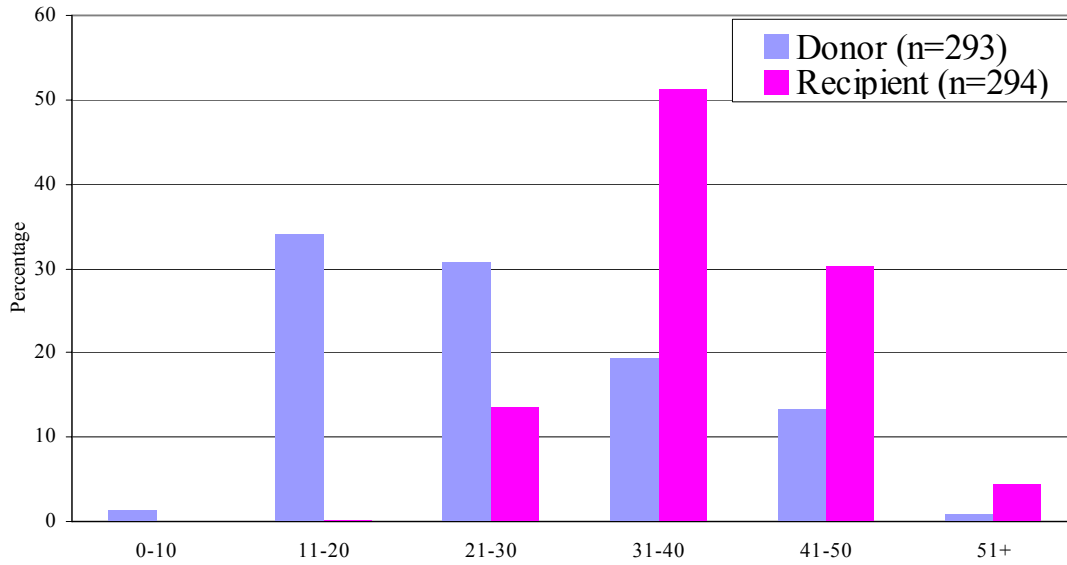
Figure . Gender in Donor and recipients, 1984-2004



Age groups

Figure illustrates the distribution of six age groups in both donor and recipients. The age range for the donors was between 6 to 61 years. It was between 20 to 60 in the recipients. The median age was 23 years (standard deviation: 10.5) and 37 years (standard deviation: 7.17) for the donors and recipients respectively. Majority of the donors and recipients were aged less than 40.

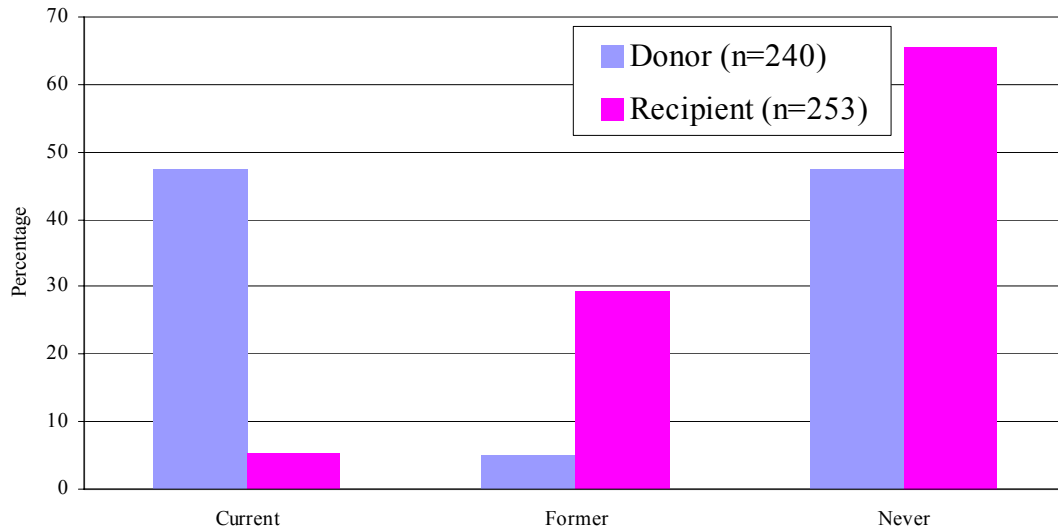
Figure . Age groups in Donor and recipients, 1984-2004



Smoking

Majority of the recipients had never smoked (65%, 100 out of 253) compared to 48% in the recipients (Figure). Over forty percent of the recipients were current smokers.

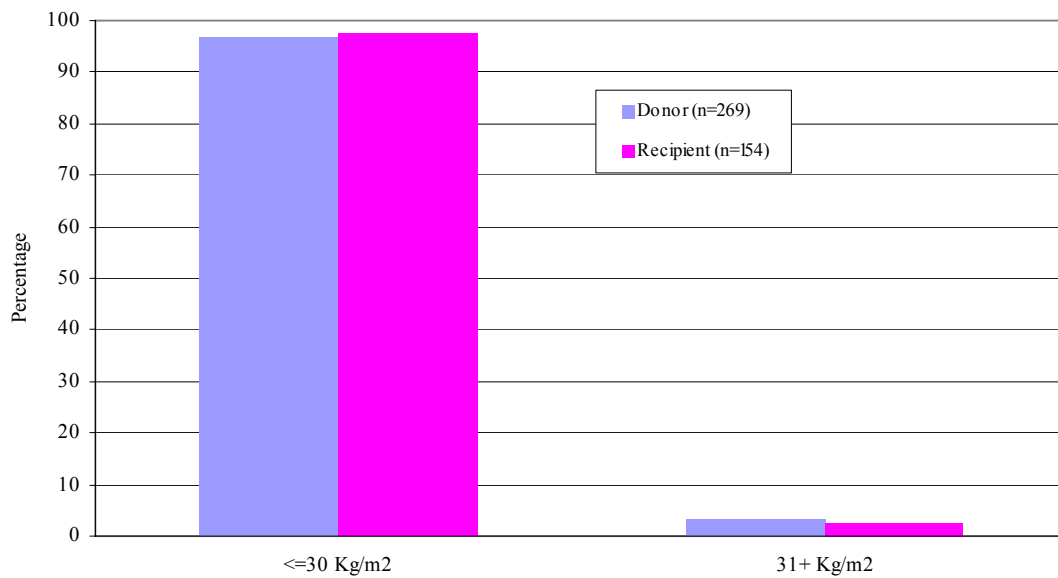
Figure . Smoking status in Donor and recipients, 1984-2004



Body Mass Index (BMI)

Over ninety-five percent of the recipients and donors had the BMI less than 30 Kg/m² (Figure).

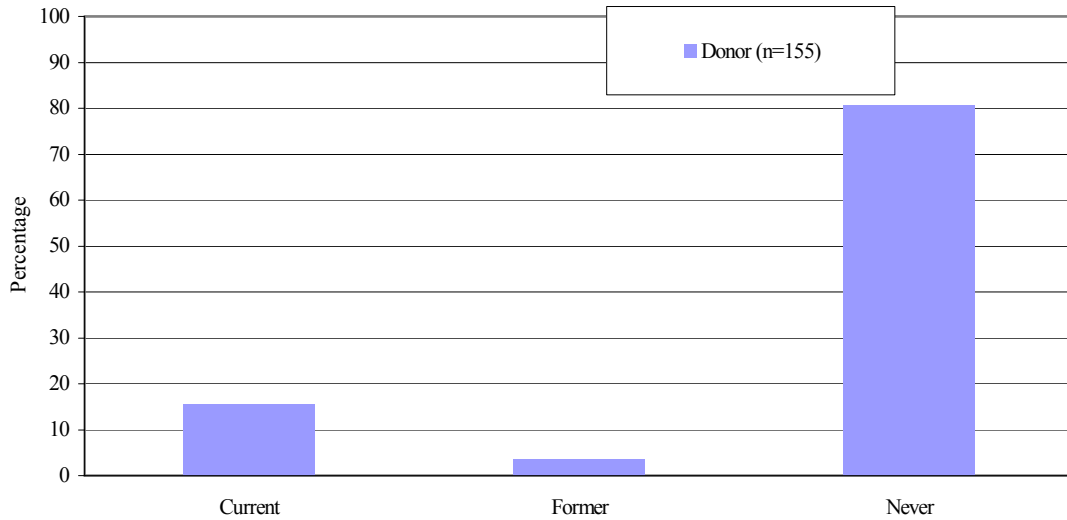
Figure . BMI in Donor and recipients, 1984-2004



Alcohol status in donor

Over eighty percent of the donors had never consume alcohol (Figure).

Figure . Alcohol consumption in Donor , 1984-2004

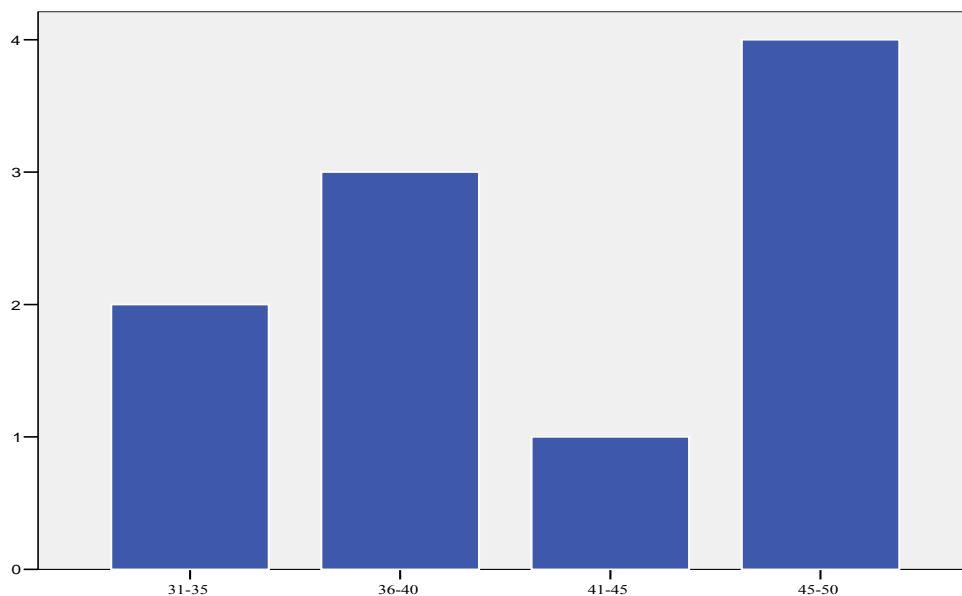


Islet transplant

Since 2002, ten Islet transplant procedures have been performed in 6 patients with 100% of patient survival. Figure 18 shows the Islet recipient by age group. The mean age of Islet recipient at transplant was 42.4 (standard deviation: 7.0). There were an equal proportion of recipients in both sexes. The average length of Type I Diabetes to transplant was 22 year (standard deviation: 5.6 years).

To date, four recipients received a second transplant. Fifty percent of the recipients are insulin free. Compliance is the major concern for the remaining recipients with one lost to follow up at 6 months. Two recipients are waiting for the second transplant.

Figure 18. Islet recipient by age groups at transplant, 2002-2004

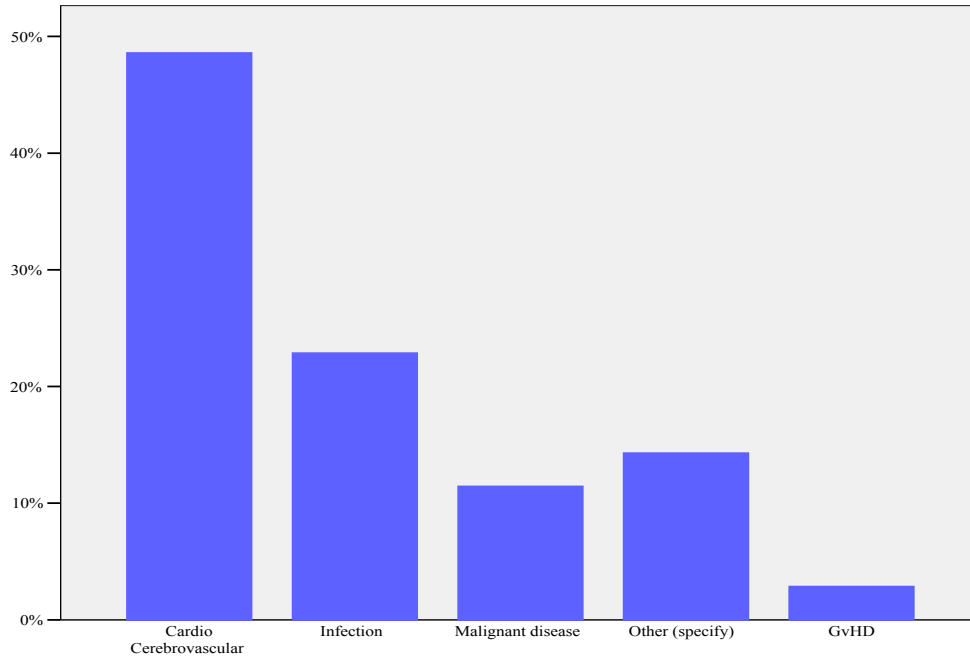


The number of Islet transplant was 280 worldwide in 1990-2000.

Death

Figure shows the causes of death after transplant for recipients in 1984-2004. The common known causes of death were Cardio/Cerebrovascular event (49%, 17 out of 35) and infection (23%).

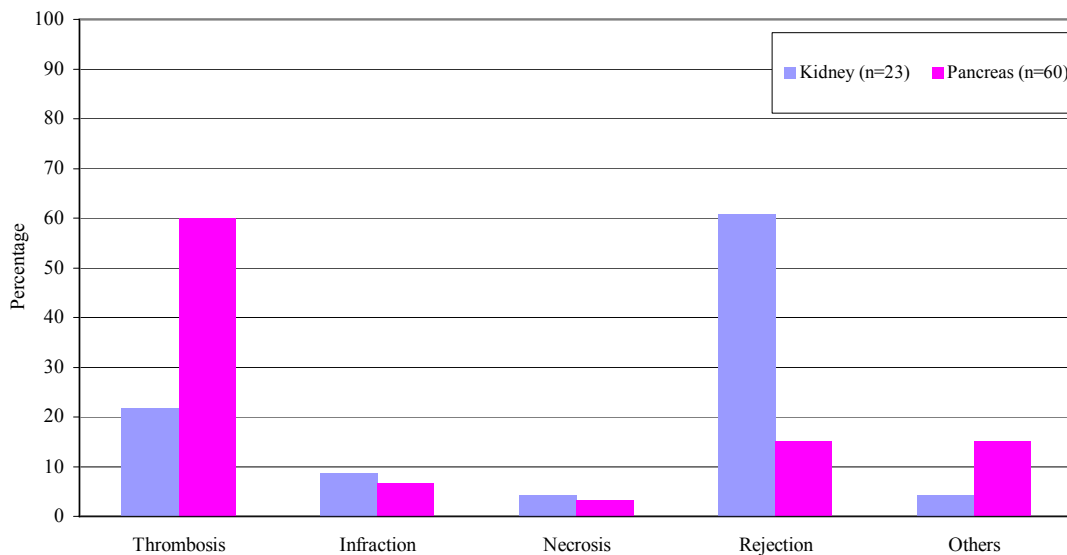
Figure . Number of known causes of death after transplant, 1984-2004



Reasons for graft failure

Sixty percent (36 out of 60) of pancreas graft failure were due to thrombosis in 1984-2004 (Figure). This was followed by rejection (15%). The major cause of kidney graft failure was rejection (61%, 14 out of 23) and thrombosis (22%).

Figure . Reasons for graft failure



Thrombosis was also the most common reason for graft failure in US, 1999-2003 (60%).

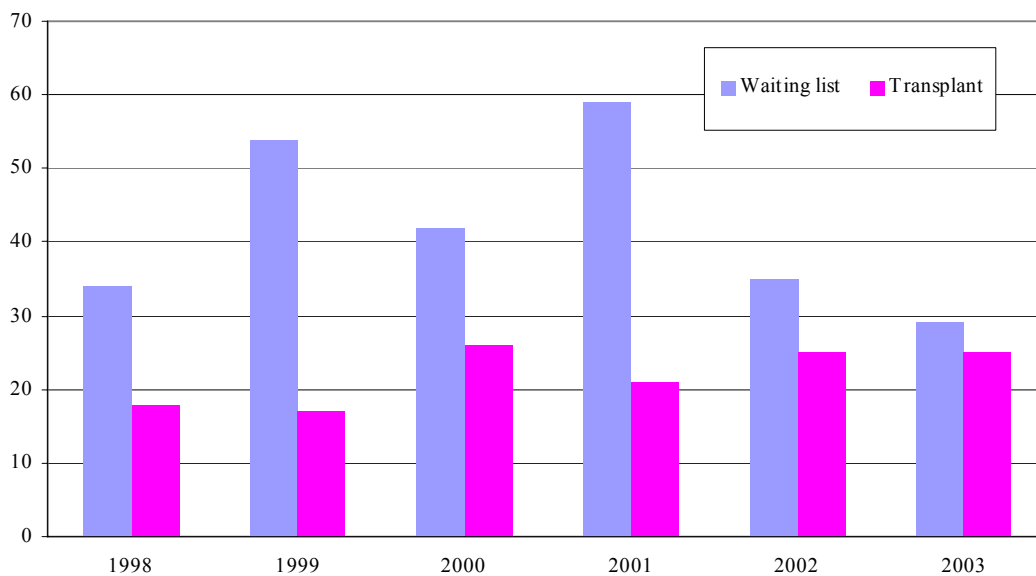
Re-transplant

Six recipients had a second transplant. Two pancreas recipients had a second SPK and one had a SPK followed by PTA. Four out of six were ITA recipients received the second Islet infusion within six months after the first transplant.

Waiting time

In 2003, the number of recipients on the active Kidney Pancreas Transplant waiting list was 29 and 4 in Australia and New Zealand respectively (ANZOD 2004 Report). The number of patients on Islet Transplant Waiting list was 8 (Figure 21). The average waiting time for patients transplanted with cadaver pancreas was 1.9 years (33 patients) and 1.4 years (4 patients) for islets.

Figure 21. Waiting list for Pancreas transplant in Australia

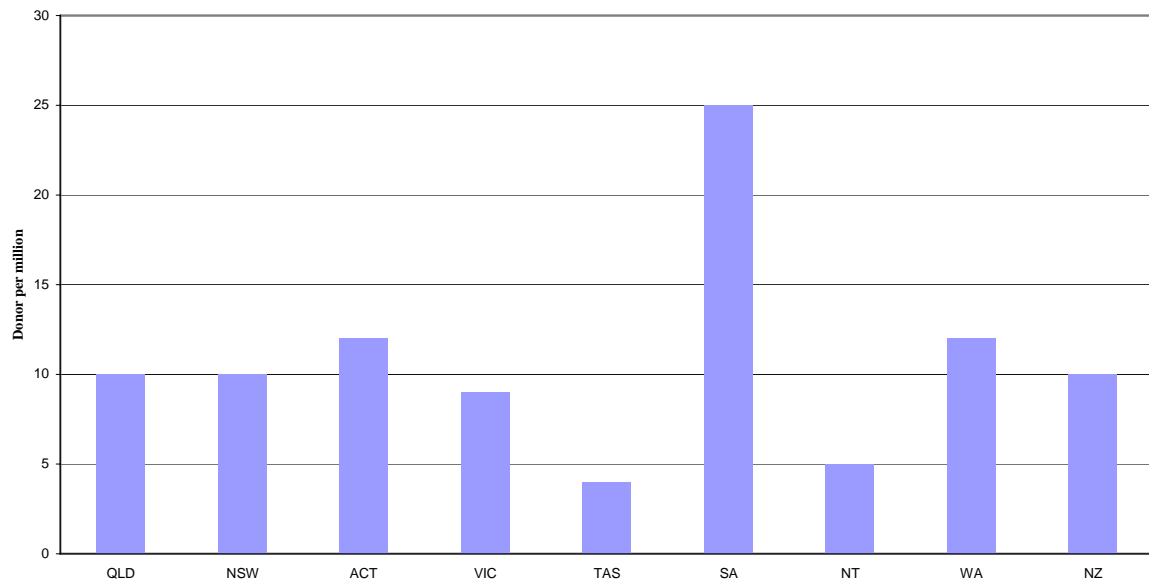


Source: ANZOD Registry Report 2003

Organ donation and exchange

In 2004, the number of organ donors was 218 (11 per million of population [dpmp]) and 40 (10 dpmp) in Australia and New Zealand respectively (Australian and New Zealand Organ Donation Registry, Summary of Organ Donation 2004) (Figure 22). In Australia, the donor rate ranged from 25dpmp in South Australia to 4dpmp in Tasmania.

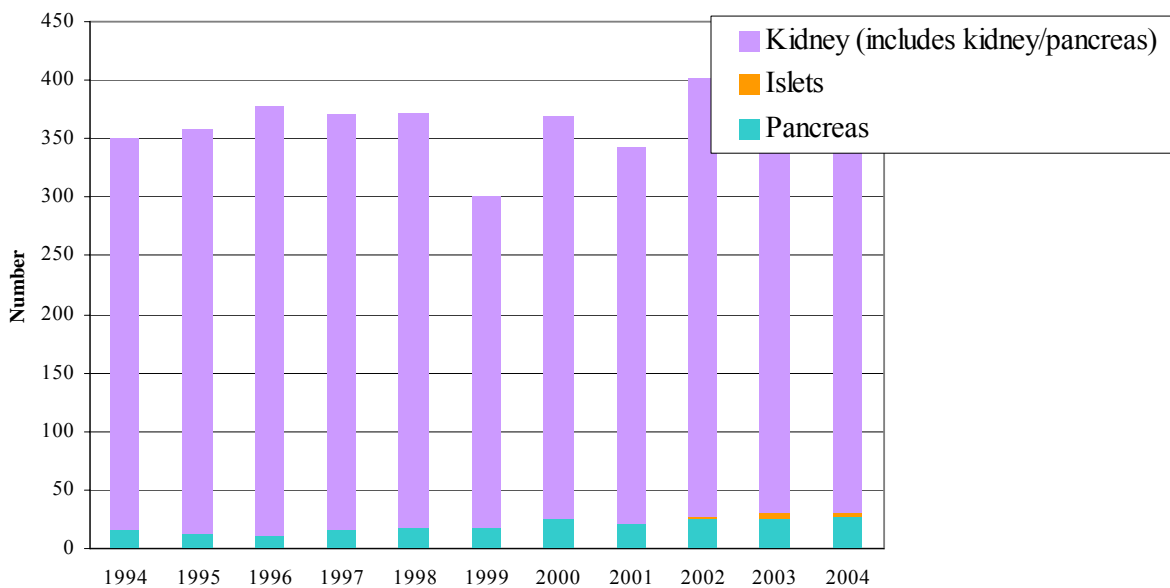
Figure 22. Number of donor per million of population in Australia and New Zealand in 2004



Source: ANZOD Registry Report 2004

During 1994 to 2004, the average number of donated cadaver pancreases and kidneys was 20 and 343 respectively (Figure). The donation of islets was first made in 2003 with a total of six.

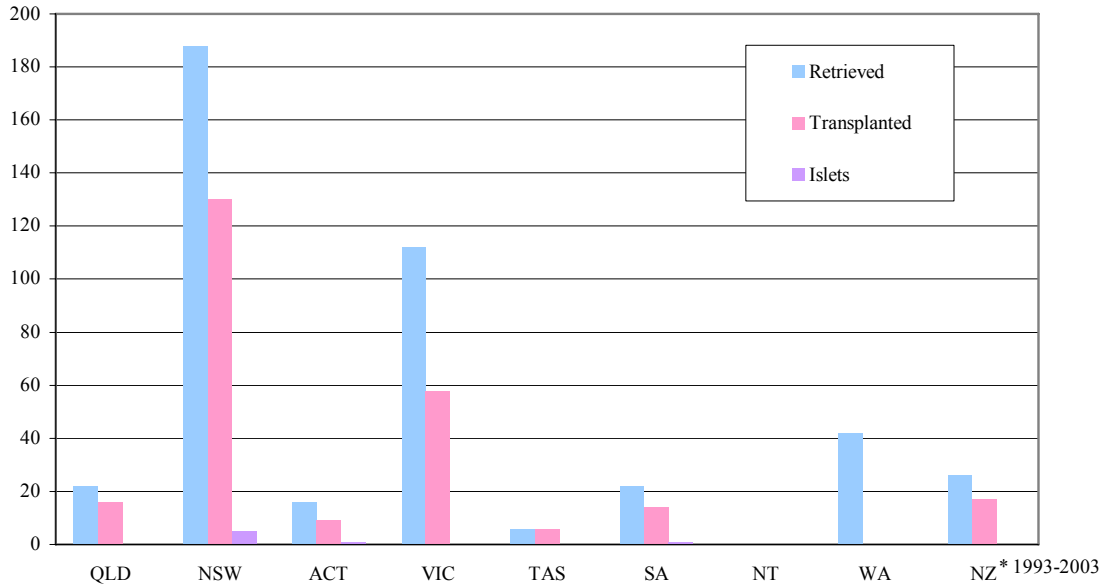
Figure . Annual number of donated kidney, pancreas and islets in Australia, 1994-2004



Source: ANZOD Registry Report 2004

Figure 24 shows the number of pancreas transplant retrieved and transplant by Australia States and New Zealand in 1989-2003. The proportion of pancreas retrieved to transplant was 57% in Australia and 65% in New Zealand. In Australia, this ranged from 52% in Victoria to 100% in Tasmania.

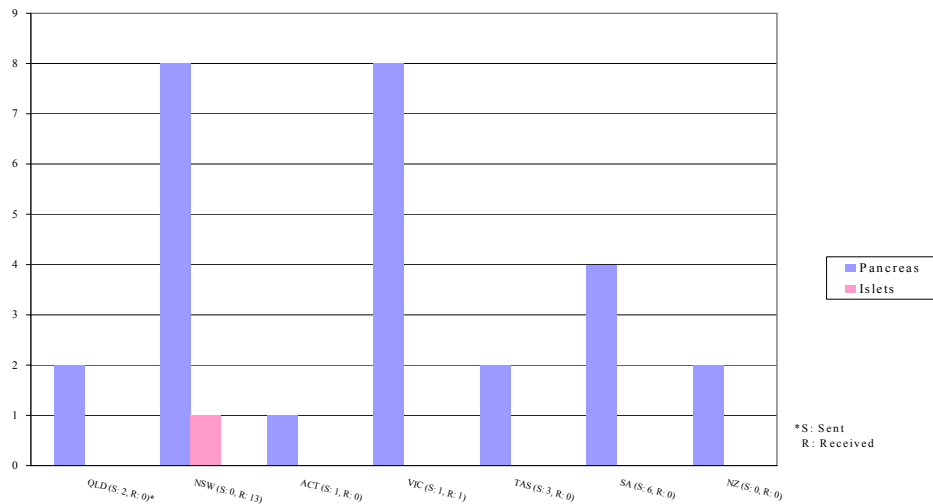
Figure 24. Number of pancreas transplanted and retrieved by Australian States and New Zealand, 1989-2003



Source: ANZOD Registry Report 2004

The exchange of pancreas between States and New Zealand in 2001-2002 was illustrated in Figure 25. NSW received almost all the Pancreas donated by all the States in Australia.

Figure 25. The exchange of pancreas between States and New Zealand in 2001-2002



Source: ANZOD Registry Report 2004

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