WAITING LIST

Overview of Waiting List Activity

Definitions

Patients join the waiting list on the date they are referred to the transplanting center; however, this may occur sometime before their kidneys fail. Patients are therefore classified as “under consideration” until 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 center, who are still undergoing assessment about their medical fitness for pancreas transplant. People referred to a transplanting center 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 center when their kidneys still 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

The patient waiting list activity in the last 3 years for Australia (Westmead and Monash Units) and New Zealand are shown in Tables 1 and 2, respectively. In Australia, although the number of transplants has increased over the last 3 years, the number of patients on the active waiting list has continued to increase.

Distribution of Active Patients by State

Figure 1 and Table 3 show the state and country of residence for people active on the pancreas waiting list, by year and the pancreas transplanting center they were referred to (Australia only).

---

**TABLE 1.**

| Activity                                      | Patients (n) |
|----------------------------------------------|--------------|
| On active list at beginning of y              | 30 49 73     |
| Added to active list during the y             | 74 83 34     |
| Removed from active list during y            | 0 6 6        |
| Pancreas transplants to patients on waiting list<sup>a</sup> | 52 48 50     |
| Kidney only transplants to patients on waiting list | 3 3 5       |
| Transplants performed outside Australia/New Zealand | 0 0 0       |
| Died while active on list                    | 0 2 3        |
| On active waiting list at the end of y       | 49 73 43     |
| Died within 12 mo of removal from list       | 0 0 0        |
| Under consideration but not active on list   | 152 185 196  |
| Referred but declined for pancreas transplantation | 39 57 60   |

<sup>a</sup>Includes 1 combined kidney islet transplant performed in 2017.
New Referrals Received Overtime

Table 4 shows the number of new referrals received by transplanting units in Australia and New Zealand (ANZ) overtime and by state of residence (for Australian units only).

Patient Characteristics for Those Active on the List in 2018

Figures 2 and 3 illustrate the distribution of other characteristics of those active on the waiting list in 2018, including the distribution of blood groups and patient ages.

PANCREAS TRANSPLANT RECIPIENTS

Pancreas Transplant Incidence

A total of 866 solid organ pancreas transplants have been performed in ANZ from 1984 to 2018. Transplants have been performed in Westmead (533), Monash (263), Auckland (62), and Royal Adelaide (4). In 2018, the Royal Adelaide Hospital recommenced pancreas transplantation in South Australia and the Northern Territory using an anti-thymocyte globulin-based steroid-free protocol. There have also been multiorgan transplants, including pancreas at Royal Prince Alfred (1), Royal Melbourne Hospital (1), Queen Elizabeth Hospital (1), and Austin Hospital (1). Figure 4 shows pancreas transplants overtime. The number of transplants has substantially increased in last decade compared with previous years.1,2

In 2018, 56 people received a pancreas transplant, by center this was Monash (20), Westmead (26),...
Royal Adelaide (4), and Auckland (6). The number of transplants in 2018 increased by 8% compared with 2017.2

Not all pancreas transplant operations are undertaken with the same organs. Simultaneous pancreas-kidney (SPK) transplant is the most common operation, representing 99%
of all pancreas transplants in ANZ. From 56 transplants performed in 2018, 53 were SPK, 2 were pancreas after kidney (PAK), and 1 was pancreas transplant alone. PAK operations are done for type 1 diabetic 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 and have good kidney transplant function, but had a pancreas transplant failure, so need a further pancreas transplant. Pancreas transplant alone is a less common operation and occurs very rarely. Its indications include management of patients with hypoglycemic unawareness or brittle diabetes that have failed best medical therapy. On rarer occasions, a multiorgan transplant is undertaken, which includes a pancreas transplant. There was 1 simultaneous pancreas, liver, and kidney transplant which was performed in 2005; 1 liver, pancreas, and intestine transplant in 2012; 1 liver and pancreas transplant in 2016; and 1 liver, kidney, pancreas, stomach, and intestine transplant in 2017. The distribution of operation types is shown in Figure 5, and the number of transplants by operation type is shown in Table 5.

**Patients Transplanted by State**

The states of origin of the people receiving pancreas transplants at each transplant unit in Australia overtime are shown in Table 6.

**Demographics of New Pancreas Transplant Recipients**

The characteristics of pancreas transplant recipients in 2018 and in previous years are shown in Table 7. The primary diagnosis causing end-stage kidney disease of recipients during 2018 and historically was type I diabetes. The number of diabetic recipients with other causes of end-stage kidney failure was small. The number of type II diabetics accepted for pancreas transplantation was also small, and none were transplanted in 2018.

The type of pancreas transplants and the types of donors for transplants performed in 2018 are presented in Table 8, stratified by country and sex.

**Balance of Donor and Recipient Characteristics in 2018**

Cross tabulations of donor and recipient blood group and gender for people transplanted in 2018 are displayed in Tables 9 and 10. These distributions remain similar to previous years.1,2

**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 >1 transplant, their survival is calculated from the date of their first transplant.
For these analyses, we had survival data for 846 patients, 20 of whom have received a second pancreas transplant, for a total of 866 pancreas transplants. Note that for the following survival plots, survival proportion on the y-axes does not always start at zero; this is to better demonstrate some observed differences.

Patient survival by era of transplantation is shown in Figure 6. Survival has improved overtime \((P < 0.001)\). Survival at 1 year for people transplanted before 2000 was 92.6%; in recent years, this has risen to 96.8%. Survival at 5 years was 88.5% for those transplanted before 2000, where for those transplanted in 2010 or later, 5-year survival was 93.7%.

Patient survival by age at transplantation is shown in Figure 7. People who were older at the time of pancreas transplantation had poorer survival than those who were younger \((P = 0.02)\). Survival at 1 year for recipients aged <35 years was 97.0% and for those aged 35–44 years was 96.5%, whereas for those aged 45–49 years was 94.8% and for those 50 years or older was 96.6%. Survival at 5 years for those aged <35 years was 92.5% and for those aged 35–44 years was 94.0%, whereas for those aged 45–49 years was 90.6% and for those 50 years or older was 92.9%. The greater survival for the 50 years and older group may be because these recipients are a more highly selected population.

Pancreas Survival

Pancreas transplant survival was calculated from the time of transplant until the time of permanent return to insulin therapy or pancreatectomy. We calculated both pancreas failure, including death with a functioning pancreas and pancreas failure censored at death with a functioning transplant. For pancreas transplant survival, we included all pancreas

| Year | Westmead | Monash | Royal Adelaide | New Zealand | Total |
|------|----------|--------|----------------|-------------|-------|
|      | SPK | PAK | PTA | SPK | PAK | PTA | All | All | All |
| 2018 | 24 (43) | 2 (4) | 0 (0) | 20 (36) | 0 (0) | 0 (0) | 4 (7) | 6 (11) | 56 |
| 2017 | 30 (59) | 0 (0) | 0 (0) | 16 (31) | 1 (2) | 0 (0) | 0 (0) | 4 (8) | 51 |
| 2016 | 26 (47) | 3 (5) | 0 (0) | 20 (36) | 1 (2) | 1 (2) | 0 (0) | 4 (7) | 55 |
| 2015 | 27 (54) | 1 (2) | 0 (0) | 18 (36) | 1 (2) | 0 (0) | 0 (0) | 3 (6) | 50 |
| 2014 | 28 (62) | 0 (0) | 0 (0) | 15 (33) | 0 (0) | 0 (0) | 0 (0) | 2 (4) | 45 |
| 2013 | 20 (57) | 0 (0) | 0 (0) | 14 (40) | 0 (0) | 0 (0) | 0 (0) | 1 (3) | 35 |
| 2012 | 28 (72) | 0 (0) | 0 (0) | 9 (23) | 0 (0) | 0 (0) | 0 (0) | 2 (5) | 39 |
| 2011 | 19 (66) | 0 (0) | 0 (0) | 7 (24) | 0 (0) | 0 (0) | 0 (0) | 3 (10) | 29 |
| 2010 | 19 (53) | 0 (0) | 0 (0) | 14 (39) | 0 (0) | 0 (0) | 0 (0) | 3 (8) | 36 |
| 2009 | 22 (56) | 0 (0) | 0 (0) | 14 (36) | 1 (3) | 0 (0) | 0 (0) | 2 (5) | 39 |
| 2008 | 20 (56) | 0 (0) | 0 (0) | 12 (33) | 0 (0) | 0 (0) | 0 (0) | 4 (11) | 36 |
| 2007 | 16 (55) | 2 (7) | 1 (3) | 9 (31) | 0 (0) | 0 (0) | 0 (0) | 1 (3) | 29 |
| 2006 | 25 (64) | 0 (0) | 0 (0) | 8 (21) | 0 (0) | 0 (0) | 0 (0) | 6 (15) | 39 |
| 2005 | 21 (62) | 2 (6) | 1 (3) | 8 (24) | 0 (0) | 0 (0) | 0 (0) | 2 (6) | 34 |
| 2004 | 15 (52) | 2 (7) | 2 (7) | 8 (28) | 0 (0) | 0 (0) | 0 (0) | 2 (7) | 29 |
| 2003 | 19 (61) | 0 (0) | 1 (3) | 5 (16) | 0 (0) | 0 (0) | 0 (0) | 6 (19) | 31 |
| 2002 | 15 (56) | 1 (4) | 0 (0) | 9 (33) | 0 (0) | 0 (0) | 0 (0) | 2 (7) | 27 |
| 2001 | 11 (46) | 0 (0) | 0 (0) | 10 (42) | 0 (0) | 0 (0) | 0 (0) | 3 (13) | 24 |
| 2000 | 18 (62) | 0 (0) | 0 (0) | 8 (28) | 0 (0) | 0 (0) | 0 (0) | 3 (10) | 29 |
| 1999 | 11 (58) | 1 (5) | 0 (0) | 5 (26) | 0 (0) | 0 (0) | 0 (0) | 2 (11) | 19 |
| 1998 | 14 (74) | 0 (0) | 0 (0) | 4 (21) | 0 (0) | 0 (0) | 0 (0) | 1 (5) | 19 |
| 1997 | 11 (69) | 0 (0) | 0 (0) | 5 (31) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 16 |
| 1996 | 11 (92) | 0 (0) | 0 (0) | 1 (8) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 12 |
| 1995 | 11 (85) | 0 (0) | 0 (0) | 2 (15) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 13 |
| 1994 | 10 (67) | 0 (0) | 0 (0) | 5 (33) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 15 |
| 1993 | 9 (82) | 0 (0) | 0 (0) | 2 (18) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 11 |
| 1992 | 7 (70) | 0 (0) | 0 (0) | 3 (30) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 10 |
| 1991 | 7 (88) | 0 (0) | 0 (0) | 1 (13) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 8 |
| 1990 | 8 (100) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 8 |
| 1989 | 5 (71) | 0 (0) | 1 (14) | 1 (14) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 7 |
| 1988 | 4 (67) | 0 (0) | 0 (0) | 2 (23) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 6 |
| 1987 | 2 (67) | 0 (0) | 0 (0) | 1 (33) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 3 |
| 1986 | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 |
| 1985 | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 |
| 1984 | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 1 (100) | 0 (0) | 0 (0) | 0 (0) | 1 |
| Total | 513 (60) | 14 (2) | 6 (<1) | 256 (30) | 5 (<1) | 1 (<1) | 4 (<1) | 62 (7) | 861 |

The above table excludes the four transplants performed in Australia outside of Westmead, Monash, or Royal Adelaide in 1988, 1990, 2005, and 2017. The above table also excludes 1 combined liver-pancreas transplant performed at Monash in 2016.

PAK, pancreas after kidney; PTA, pancreas transplant alone; SPK, simultaneous pancreas-kidney.
Transplantation undertaken, including those who had received a pancreas transplant twice (20 patients). At the time of this report, we had survival records for 866 pancreas transplants. Survival of pancreas transplants has changed overtime, as shown in Figure 8. Survival improved markedly over time ($P=0.007$). For those transplanted before 2000, 1-year pancreas transplant survival was 82.3% and 5-year survival 76.6%. For those transplanted in 2010 or later, 1-year survival was 93.5% and 5-year survival 88.0%.

Pancreas transplant survival by donor body mass index (BMI) is presented in Figure 9. Most donors (64%) were either underweight or normal (BMI < 25). However, 31% were overweight (BMI 25–29) and 4% were obese (BMI 30+). While Figure 9 suggests separation of survival curves, there was no statistical association between donor BMI and pancreas survival ($P=0.6$). Pancreas transplant survival at 1 year was 91.0% for transplants where the donor was underweight/normal BMI, 90.1% for transplants where the donor was overweight, and 86.1% where the donor was obese.

Pancreas transplant survival by donor age is presented in Figure 10. The survival curves are poorer for donors aged 35–44 years compared with those 45 and older or younger donors ($P=0.03$). We can only hypothesis that any difference

### TABLE 6.

| State of residence, n (row %) | Y | NSW | VIC | QLD | WA | SA | TAS | ACT | NT | Total |
|------------------------------|----|-----|-----|-----|----|----|-----|-----|----|-------|
| Westmead (NSW)               | 2018 | 15 (58) | 0 (0) | 6 (23) | 3 (12) | 2 (8) | 0 (0) | 0 (0) | 0 (0) | 26 |
| 2017 | 14 (47) | 0 (0) | 11 (37) | 2 (7) | 1 (3) | 0 (0) | 2 (7) | 0 (0) | 0 (0) | 30 |
| 2016 | 12 (41) | 0 (0) | 10 (34) | 5 (17) | 2 (7) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 29 |
| Monash (VIC)                 | 2018 | 0 (0) | 17 (53) | 0 (0) | 0 (0) | 2 (10) | 1 (5) | 0 (0) | 0 (0) | 20 |
| 2017 | 0 (0) | 18 (42) | 0 (0) | 0 (0) | 2 (12) | 1 (6) | 0 (0) | 0 (0) | 0 (0) | 17 |
| 2016 | 0 (0) | 16 (69) | 0 (0) | 0 (0) | 6 (26) | 1 (4) | 0 (0) | 0 (0) | 0 (0) | 23 |
| Royal Adelaide (SA)          | 2018 | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 4 (100) | 0 (0) | 0 (0) | 0 (0) | 4 |
| 2017 | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 |
| 2016 | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 |
| Auckland (NZ)                | 2018 | 0 (0) | 0 (0) | 0 (0) | 1 (4) | 4 (100) | 0 (0) | 0 (0) | 0 (0) | 6 |
| 2017 | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 4 |
| 2016 | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 4 |

### TABLE 7.

| Demographics and characteristics of pancreas transplant recipients | Patients, n (column %) | 2018 | 1984–2017 | Total |
|------------------------------------------------------------------|------------------------|------|-----------|-------|
| Age category                                                     | Median (IQR)           | 40 (35, 44) | 39 (33, 44) | 39 (33, 44) |
| 0–34                                                             | 10 (17)                | 262 (32) | 272 (31) |
| 35–44                                                            | 33 (58)                | 360 (44) | 393 (45) |
| 45–50                                                            | 9 (16)                 | 133 (16) | 142 (16) |
| 50+                                                              | 4 (7)                  | 55 (6)   | 59 (6)   |
| Sex                                                               | Female                 | 26 (46) | 377 (46) | 403 (46) |
| Male                                                             | 30 (53)                | 433 (53) | 463 (53) |
| Cause of end-stage kidney disease                                | Diabetes type 1        | 53 (94) | 792 (97) | 845 (97) |
|                                                                | Diabetes type 2        | 0 (0)   | 1 (<1)   | 1 (<1)   |
|                                                                | Hemolytic uremic syndrome | 0 (0) | 1 (<1) | 1 (<1) |
|                                                                | Intestinal nephritis | 0 (0)   | 1 (<1)   | 1 (<1)   |
|                                                                | Wegener’s granulomatosis | 0 (0) | 1 (<1) | 1 (<1) |
|                                                                | No kidney disease*     | 3 (5)   | 14 (1)   | 17 (1)   |
| Ethnicity*                                                       | Indigenous Australian | 0 (0)   | 2 (<1)   | 2 (<1)   |
|                                                                | Maori                  | 0 (0)   | 5 (<1)   | 5 (<1)   |
|                                                                | Pacific islander       | 4 (7)   | 5 (<1)   | 9 (1)    |
|                                                                | White                  | 49 (87) | 772 (95) | 821 (94) |
|                                                                | North Asian            | 0 (0)   | 3 (<1)   | 3 (<1)   |
|                                                                | South-East Asian       | 0 (0)   | 0 (0)   | 0 (0)   |
|                                                                | Southern and Central Asian | 3 (5) | 14 (1) | 17 (1) |
|                                                                | North African and Middle Eastern | 0 (0) | 9 (1) | 9 (1) |
| Blood group                                                      | O          | 27 (48) | 379 (46) | 406 (46) |
|                                                                | A          | 21 (37) | 318 (39) | 339 (39) |
|                                                                | B          | 4 (7)   | 76 (9)   | 80 (9)   |
|                                                                | AB         | 4 (7)   | 37 (4)   | 41 (4)   |
|                                                                | Total       | 56      | 810      | 866      |

*Ethnicity classified according to the Australian Bureau of Statistics standard classification, second edition; http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1249.02011.

*Includes 11 pancreas transplants after kidney (PAK) and 6 pancreas transplants alone (PTA). IQR, interquartile range.

### TABLE 8.

| Transplant and donor types in 2018 by country and sex | Australia | New Zealand | Overall |
|------------------------------------------------------|-----------|-------------|---------|
|                                                      | Female    | Male        | Female  | Male    | Female  | Male    | Total   |
| Pancreas alone                                      | 2         | 1           | 0       | 0       | 2       | 1       | 3       |
| DBD                                                  | 2         | 1           | 0       | 0       | 2       | 1       | 3       |
| DCD                                                  | 0         | 0           | 0       | 0       | 0       | 0       | 0       |
| SPK                                                  | 15        | 32          | 2       | 4       | 17      | 36      | 53      |
| DBD                                                  | 14        | 31          | 2       | 4       | 16      | 35      | 51      |
| DCD                                                  | 1         | 1           | 0       | 0       | 1       | 1       | 2       |

DBD, donor after brain death; DCD, donor after circulatory death; SPK, simultaneous pancreas-kidney.

### TABLE 9.

| Cross tabulation of recipient and donor blood groups for 2018 |
|--------------------------------------------------------------|
| Recipient blood group | O | A | B | AB | Total |
|-----------------------|---|---|---|----|-------|
| O                     | 27 (100) | 0 (0) | 0 (0) | 0 (0) | 27 |
| A                     | 1 (4) | 20 (95) | 0 (0) | 0 (0) | 21 |
| B                     | 0 (0) | 0 (0) | 4 (100) | 0 (0) | 4 |
| AB                    | 0 (0) | 2 (50) | 0 (0) | 2 (50) | 4 |
| Total                 | 28 (50) | 22 (39) | 4 (7) | 2 (3) | 56 |

### TABLE 10.

| Cross tabulation of recipient and donor sex for 2018 |
|-----------------------------------------------------|
| Donor sex, n (row %) |
|----------------------|------------------|------------------|------------------|
| Recipient sex        | Female | Male | Total |
|----------------------|--------|------|-------|
| Female               | 8 (30) | 18 (69) | 26   |
| Male                 | 11 (38) | 19 (63) | 30   |
| Total                | 19 (33) | 37 (66) | 56   |

McNemar’s test for difference, $P=0.2$.
may be due to donors over 45 being a more highly selected group, compared with the donors aged 35–44 years. Pancreas transplant survival at 1 year was 92.5% for transplants from donors aged 0–24 years, 90.1% for donors aged 25–34 years, 85.9% for donors aged 35–44 years, and 93.8% for donors aged 45+ years.

Pancreas graft survival at 1 and 5 years post transplant, censored at death and stratified by country and era of transplantation is presented in Table 11.

### Prevalence of Functioning Pancreas Transplants

We calculated the point prevalence of people living in ANZ, who were alive with a functioning transplant on 31 December each year for the last 5 years (Table 12). The below numbers exclude people still alive, but whose pancreas transplant has failed. The number of functioning transplants is remaining steady overtime, possibly because recipients of early transplants are aging (with increased deaths and pancreas transplant failures), which is being offset by the increase in new transplants performed.

### 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 at death with a functioning graft. For kidney transplant survival, we included only SPK transplants and excluded PAK transplant recipients. We had survival records for 835 SPK transplants.
Kidney transplant survival improved overtime, with longer survival for those transplanted in more recent years ($P<0.001$). For those transplanted before 2000, kidney transplant survival was 92.3% at 1 year and 88.6% at 5 years but was 98.2% at 1 year and 96.7% at 5 years for those transplanted in 2010 or later (Figure 11).

The era effect was even stronger when considering kidney failure, including death with kidney function ($P<0.001$). For those transplanted before 2000, survival was 87.8% at 1 year and 81.0% at 5 years but was 95.7% at 1 year and 92.3% at 5 years for those transplanted in 2010 or later (Figure 12).

**Pancreas Transplant Operative Data**
Characteristics of the pancreas transplant operations for 2018, previous years, and overall are shown in Table 13.

**Surgical Technique**
Exocrine drainage of the pancreas transplant has changed overtime. Enteric drainage of the pancreas was first used in ANZ during 2001. Figure 13 illustrates the number of transplants by pancreas duct management. Since 2001, most pancreas transplants have used enteric drainage of the pancreas duct.

The cytomegalovirus and Epstein-Barr virus matching of donor-recipient pairs are shown in Table 14.

**PANCREAS DONORS**
This section gives an overview of donors in 2018 and overtime. Donor eligibility criteria guidelines are available in the Transplantation Society of Australia and New Zealand consensus statement http://www.tsanz.com.au/
organ allocation protocols but briefly require donors to be over 25 kg, and up to the age of 45 years, without known diabetes mellitus or pancreatic trauma, or history of alcoholism or pancreatic trauma. Donation after circulatory death may be considered up to the age of 35 years. As these are guidelines, there may be occasions when there is minor deviation from these advised criteria.

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 postoperative complications and suboptimal insulin secretion. Alcohol consumption is defined by a history of consumption of >40 g/day. Table 15 describes pancreas donor characteristics in ANZ to date.

**TABLE 15.** Pancreas donor characteristics in ANZ to date.

| Donor BMI | 25-34 | 35-44 | 45+ |
|-----------|-------|-------|-----|
| 6-24      | 410   | 192   | 33  |
| 25-34     | 225   | 146   | 50  |
| 35-44     | 229   | 121   | 28  |
| 45+       | 28    | 94    | 23  |

**FIGURE 10.** Pancreas transplant survival, censored for death with function, by donor age (censored at death).

**TABLE 11.** People alive with a functioning pancreas transplant in Australia and New Zealand by y and residence, at y’s end

| Y of transplant | Australia | New Zealand |
|-----------------|-----------|-------------|
|                 | 1-y       | 5-y         | 1-y | 5-y |
| 2010–2015       | 197       | 104         | 14  | 8  |
| 2011–2016       | 216       | 76          | 15  | 7  |
| 2012–2017       | 237       | 55          | 16  | 4  |
| 2013–2018       | 205       | 27          | 14  | 2  |

**TABLE 12.** People alive with a functioning pancreas transplant in Australia and New Zealand by y and residence, at y’s end

| State/country of residence | 2014 | 2015 | 2016 | 2017 | 2018 |
|----------------------------|------|------|------|------|------|
| New South Wales            | 159  | 156  | 153  | 149  | 148  |
| Victoria                   | 179  | 177  | 177  | 174  | 173  |
| Queensland                 | 124  | 119  | 116  | 112  | 112  |
| Western Australia          | 37   | 35   | 33   | 30   | 29   |
| South Australia            | 50   | 49   | 48   | 48   | 47   |
| Tasmania                   | 26   | 25   | 25   | 25   | 25   |
| Australian Capital Territory| 14   | 14   | 13   | 12   | 12   |
| Northern Territory         | 4    | 4    | 4    | 4    | 4    |
| New Zealand                | 50   | 48   | 48   | 48   | 48   |
| Total                      | 643  | 627  | 617  | 602  | 598  |

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TABLE 13. Descriptive characteristics of pancreas transplant operations

|                          | 2018 | 1984–2017 | Total |
|--------------------------|------|-----------|-------|
| Pancreas transplant      |      |           |       |
| Total pancreas transplants | 56  | 810       | 866   |
| Cold ischemic time (h)   |      |           |       |
| Patients (%)             | 26 (46) | 673 (83) | 699 (81) |
| Mean (SD)                | 7.1 (2.3) | 10.7 (3.5) | 10.5 (3.5) |
| Median (IQR)             | 6 (6, 8) | 11 (8, 13) | 11 (8, 13) |
| Anastomosis time (min)   |      |           |       |
| Patients (%)             | 5 (9) | 684 (84) | 689 (80) |
| Mean (SD)                | 27.0 (3.9) | 29.7 (8.0) | 29.7 (8.0) |
| Median (IQR)             | 29 (25, 30) | 30 (25, 34) | 30 (25, 34) |
| Exocrine drainage        |      |           |       |
| Enteric, n (%)           | 54 (96) | 575 (71) | 629 (73) |
| Bladder, n (%)           | 0 (0) | 164 (20) | 164 (19) |
| Not reported, n (%)      | 2 (4) | 71 (9) | 73 (8) |
| Kidney transplant        |      |           |       |
| Total SPK transplants    | 53   | 782       | 835   |
| Cold ischemic time (h)   |      |           |       |
| Patients (%)             | 24 (43) | 650 (80) | 674 (78) |
| Mean (SD)                | 6.8 (2.0) | 10.7 (3.4) | 10.5 (3.5) |
| Median (IQR)             | 6 (6, 7) | 11 (8, 13) | 11 (8, 13) |
| Anastomosis time (min)   |      |           |       |
| Patients (%)             | 4 (7) | 659 (81) | 663 (77) |
| Mean (SD)                | 26.5 (4.4) | 29.8 (8.0) | 29.7 (8.0) |
| Median (IQR)             | 27 (23, 30) | 30 (25, 34) | 30 (25, 34) |
| Kidney donor arteries    |      |           |       |
| None, n (%)              | 0 (0) | 2 (<1) | 2 (<1) |
| 1, n (%)                 | 23 (41) | 586 (72) | 609 (70) |
| 2, n (%)                 | 1 (2) | 67 (8) | 68 (8) |
| 3, n (%)                 | 0 (0) | 4 (<1) | 4 (<1) |
| Not reported, n (%)      | 29 (52) | 123 (15) | 152 (18) |

IQR, interquartile range; SPK, simultaneous pancreas-kidney.

FIGURE 13. Change in management of exocrine drainage of the pancreas overtime.

TABLE 14. Infectious disease serology cross tabulation of donor-recipient pairs

|                      | Donor serology, n (column %) |
|----------------------|-------------------------------|
|                      | Positive | Negative | Not reported |
| Recipient serology   |           |          |             |
| CMV                  |           |          |             |
| Positive             | 88 (17)  | 43 (13)  | 3 (9)       |
| Negative             | 10 (2)   | 6 (2)    | 0 (0)       |
| Not reported         | 413 (81) | 271 (85) | 32 (91)     |
| EBV                  |           |          |             |
| Positive             | 109 (22) | 17 (21)  | 21 (8)      |
| Negative             | 2 (<1)   | 0 (0)    | 1 (<1)      |
| Not reported         | 395 (78) | 64 (79)  | 257 (92)    |

CMV, cytomegalovirus; EBV, Epstein-Barr virus.
### TABLE 15. Demographics and characteristics of pancreas transplant donors

| Donors, n (column %) | 2018 | 1984–2017 | Total  |
|----------------------|------|-----------|--------|
| Total (row %)        | 56 (100) | 810 (100) | 866 (100) |
| Age category         |       |           |        |
| 0–24                 | 27 (48) | 385 (48)  | 412 (48) |
| 25–34                | 13 (23) | 213 (26)  | 226 (26) |
| 35–44                | 15 (27) | 177 (22)  | 192 (22) |
| 45+                  | 1 (2)  | 32 (4)    | 33 (4)  |
| Not reported         | 0 (0)  | 3 (<1)    | 3 (<1)  |
| Sex                  |       |           |        |
| Female               | 19 (34) | 487 (60)  | 506 (58) |
| Male                 | 37 (66) | 322 (40)  | 359 (41) |
| Not reported         | 0 (0)  | 1 (<1)    | 1 (<1)  |
| BMI (kg/m²)          |       |           |        |
| Underweight/normal (<24.9) | 27 (48) | 521 (64)  | 548 (63) |
| Overweight (25–29.9) | 16 (29) | 251 (31)  | 267 (31) |
| Obese (30+)          | 1 (2)  | 35 (4)    | 36 (4)  |
| Not reported         | 12 (21)| 3 (<1)    | 15 (2)  |
| Donor type           |       |           |        |
| Brain death (DBD)    | 54 (96)| 800 (99)  | 854 (99) |
| Circulatory death (DCD) | 2 (4)  | 10 (1)    | 12 (1)  |
| Donor mode of death  |       |           |        |
| Cerebral hypoxia/ischemia | 18 (32) | 83 (10)   | 101 (12) |
| Cerebral infarct     | 2 (4)  | 15 (2)    | 17 (2)  |
| Intracranial hemorrhage | 15 (27)| 216 (27)  | 231 (27) |
| Non-neurological condition | 5 (9)  | 189 (23)  | 194 (22) |
| Other neurological condition | 1 (2)  | 17 (2)    | 18 (2)  |
| Traumatic brain injury | 14 (25)| 288 (36)  | 302 (33) |
| Not reported         | 1 (2)  | 2 (<1)    | 3 (<1)  |
| Alcohol consumption  |       |           |        |
| Never                | 11 (20)| 642 (79)  | 653 (75) |
| Former               | 0 (0)  | 4 (<1)    | 4 (<1)  |
| Current              | 13 (23)| 36 (4)    | 49 (6)  |
| Not reported         | 32 (57)| 128 (16)  | 160 (18) |
| Smoking history      |       |           |        |
| Never                | 10 (18)| 509 (63)  | 519 (60) |
| Former               | 1 (2)  | 33 (4)    | 34 (4)  |
| Current              | 17 (30)| 191 (24)  | 208 (24) |
| Not reported         | 28 (50)| 77 (10)   | 105 (12) |
| Donor’s blood group  |       |           |        |
| O                    | 28 (50)| 412 (51)  | 440 (51) |
| A                    | 22 (39)| 299 (37)  | 321 (37) |
| B                    | 4 (7)  | 79 (10)   | 83 (10) |
| AB                   | 2 (4)  | 19 (2)    | 21 (2)  |
| Not reported         | 0 (0)  | 1 (<1)    | 1 (<1)  |
| Kidney biopsy        |       |           |        |
| Performed            | 11 (20)| 176 (22)  | 187 (22) |
| Not performed        | 26 (46)| 626 (77)  | 652 (75) |
| Not reported         | 19 (34)| 8 (<1)    | 27 (3)  |
| CMV                  |       |           |        |
| Positive             | 16 (29)| 495 (61)  | 511 (59) |
| Negative             | 13 (23)| 307 (38)  | 320 (37) |
| Not reported         | 27 (48)| 8 (<1)    | 35 (4)  |
| EBV                  |       |           |        |
| Positive             | 17 (30)| 489 (60)  | 506 (58) |
| Negative             | 4 (7)  | 77 (10)   | 81 (9)  |
| Not reported         | 35 (63)| 244 (30)  | 279 (32) |

BMI, body mass index; CMV, cytomegalovirus; DBD, donor after brain death; DCD, donor after circulatory death; EBV, Epstein-Barr virus.

### TABLE 16. Distribution of state of residence of pancreas donors in Australia overtime, by national pancreas transplant unit

| State                | 2018 | 2017 | 2016 | 2015 | 2014 | 2013 |
|----------------------|------|------|------|------|------|------|
| Westmead (NSW)       |      |      |      |      |      |      |
| NSW                  | 13 (50)| 14 (47)| 10 (34)| 15 (54)| 10 (36)| 7 (35)|
| VIC                  | 1 (4) | 0 (0)| 1 (3)| 1 (4)| 2 (7)| 0 (0)|
| QLD                  | 7 (27)| 4 (13)| 10 (34)| 4 (14)| 3 (11)| 2 (10)|
| WA                   | 2 (8) | 7 (23)| 5 (17)| 4 (14)| 3 (11)| 4 (20)|
| SA                   | 0 (0) | 1 (3)| 0 (0)| 3 (11)| 5 (18)| 5 (25)|
| TAS                  | 0 (0) | 0 (0)| 0 (0)| 0 (0)| 0 (0)| 0 (0)|
| ACT                  | 3 (12)| 3 (10)| 3 (10)| 1 (4)| 5 (18)| 2 (10)|
| NT                   | 0 (0) | 1 (3)| 0 (0)| 0 (0)| 0 (0)| 0 (0)|
| Monash (VIC)         |      |      |      |      |      |      |
| NSW                  | 1 (5) | 0 (0)| 0 (0)| 0 (0)| 1 (7)| 7 (50)|
| VIC                  | 17 (85)| 15 (88)| 16 (70)| 16 (84)| 11 (73)| 6 (43)|
| QLD                  | 0 (0) | 1 (6)| 0 (0)| 0 (0)| 0 (0)| 0 (0)|
| WA                   | 1 (5) | 1 (6)| 3 (13)| 0 (0)| 1 (7)| 0 (0)|
| SA                   | 1 (5) | 0 (0)| 2 (9)| 3 (16)| 0 (0)| 0 (0)|
| TAS                  | 0 (0) | 0 (0)| 1 (4)| 0 (0)| 2 (13)| 1 (7)|
| ACT                  | 0 (0) | 0 (0)| 1 (4)| 0 (0)| 0 (0)| 0 (0)|
| NT                   | 0 (0) | 0 (0)| 0 (0)| 0 (0)| 0 (0)| 0 (0)|
| Royal Adelaide (SA)  |      |      |      |      |      |      |
| NSW                  | 0 (0) | 0 | 0 | 0 | 0 | 0 |
| VIC                  | 0 (0) | 0 | 0 | 0 | 0 | 0 |
| QLD                  | 0 (0) | 0 | 0 | 0 | 0 | 0 |
| WA                   | 0 (0) | 0 | 0 | 0 | 0 | 0 |
| SA                   | 3 (75)| 0 | 0 | 0 | 0 | 0 |
| TAS                  | 0 (0) | 0 | 0 | 0 | 0 | 0 |
| ACT                  | 0 (0) | 0 | 0 | 0 | 0 | 0 |
| NT                   | 1 (25)| 0 | 0 | 0 | 0 | 0 |
| Recipient state  | NSW | VIC | QLD | WA | SA | TAS | ACT | NT | Not reported | Total |
|------------------|-----|-----|-----|----|----|-----|-----|----|--------------|-------|
| 2018 only        | 14  | 18  | 7   | 3  | 4  | 0   | 3   | 1  | 0            | 50    |
| NSW              | 10  | 0   | 3   | 0  | 0  | 0   | 2   | 0  | 0            | 15    |
| VIC              | 1   | 14  | 0   | 1  | 1  | 0   | 0   | 0  | 0            | 17    |
| QLD              | 1   | 0   | 4   | 1  | 0  | 0   | 0   | 0  | 0            | 6     |
| WA               | 1   | 1   | 0   | 1  | 0  | 0   | 0   | 0  | 0            | 3     |
| SA               | 1   | 2   | 0   | 0  | 3  | 0   | 1   | 1  | 0            | 8     |
| TAS              | 0   | 1   | 0   | 0  | 0  | 0   | 0   | 0  | 0            | 1     |
| ACT              | 0   | 0   | 0   | 0  | 0  | 0   | 0   | 0  | 0            | 0     |
| NT               | 0   | 0   | 0   | 0  | 0  | 0   | 0   | 0  | 0            | 0     |
| All y (1984–2018) | 304 | 236 | 73  | 54 | 70 | 23  | 37  | 2  | 3            | 802   |
| NSW              | 144 | 9   | 26  | 16 | 21 | 4   | 18  | 0  | 0            | 238   |
| VIC              | 22  | 183 | 1   | 5  | 7  | 16  | 2   | 0  | 3            | 239   |
| QLD              | 68  | 9   | 27  | 15 | 22 | 0   | 10  | 1  | 0            | 152   |
| WA               | 20  | 4   | 12  | 10 | 5  | 1   | 2   | 0  | 0            | 54    |
| SA               | 17  | 19  | 3   | 5  | 11 | 1   | 5   | 1  | 0            | 62    |
| TAS              | 16  | 10  | 1   | 0  | 1  | 1   | 0   | 0  | 0            | 29    |
| ACT              | 16  | 1   | 3   | 1  | 2  | 0   | 0   | 0  | 0            | 23    |
| NT               | 1   | 0   | 0   | 2  | 1  | 0   | 0   | 0  | 0            | 4     |
| Not reported     | 0   | 1   | 0   | 0  | 0  | 0   | 0   | 0  | 0            | 1     |