



# **TRANSPLANTING HOSPITAL REPORT**

## **2010 - 2015**

PUBLISHED February 2017  
From the ANZDATA Database last surveyed on 31st December 2015



## Contents

<b>1</b>	<b>Introduction</b>	<b>2</b>
<b>2</b>	<b>Methods</b>	<b>3</b>
<b>3</b>	<b>Graft Failure at 1 Year Post-transplant</b>	<b>5</b>
3.1	Risk-adjusted Graft Failure Ratios . . . . .	5
3.2	Funnel Plot . . . . .	6
3.3	Logistic Model Coefficients . . . . .	7
<b>4</b>	<b>Mortality at 1 Year Post-transplant</b>	<b>8</b>
4.1	Risk-adjusted Mortality Ratios . . . . .	8
4.2	Funnel Plot . . . . .	9
4.3	Logistic Model Coefficients . . . . .	10

## 1 Introduction

This report is an abridged version of the transplant hospital report, prepared for general distribution. Individual hospital reports are also created, which contain more detailed information about the characteristics and outcomes within each hospital.

All Australian and New Zealand patients transplanted between 1 January 2010 and 31 December 2015 and who were aged  $\geq 16$  years at the time of operation were included. Both deceased and living donor transplants were included, but patients who received multi-organ grafts were excluded. Patients transplanted at a paediatric hospital were excluded. Recipients aged  $\geq 18$  years at the time of transplant were included for hospitals that provide transplantation services for all ages.

The data are based on reports to the ANZDATA Registry. Interpretation of these results must take into account both the limitations of the methodology and the context. There is considerable literature about interpretation of results from many fields, and further information can be provided for those seeking to better understand the results.

The results presented here are estimates of true values and are subject to random variation. Confidence intervals are a common means of presenting this variability. For example, 95% confidence intervals illustrate a range which is expected to contain the true value 19 times out of 20. By definition, therefore, it is expected that 1 result in 20 will lie outside of 95% confidence intervals due to chance alone, if the assumptions of the model used to obtain the estimate are valid.

Another key limitation is the potential for factors other than those measured, which may be outside the control of treating hospitals, to affect results. This is known as residual confounding. Despite the inclusion of many factors related to patients and their care, most models predict only around 70% of the variation in transplant outcomes. ANZDATA results are consistent with international experience in this regard.

How then should results suggesting a hospital's results are inferior to expectation be interpreted? Perhaps the best approach is to consider them as signals for looking at a deeper level, bearing in mind that it may well be that the effects seen are driven by factors unrelated to the quality of care or beyond the control of individual hospitals (eg, chance, unmeasured confounders, or natural variation).

## 2 Methods

Random effects logistic regression was used to calculate the expected number of events (deaths or graft failures) at 1 year post-transplant for transplanting hospitals based on the patient and donor case-mix. Graft failure included return to dialysis or death. At this point, we have not included 3 year adjusted models due to technical issues with creating a suitably stable model while also including the key predictors.

Factors included in logistic regression models were recipient age, donor age, recipient gender, recipient race and country, presence of chronic lung disease and vascular disease (coronary artery disease, cerebrovascular disease and/or peripheral vascular disease) in the recipient, primary renal disease, number of HLA mismatches, donor type by cause of death (cerebrovascular accident (CVA), or other cause) and cold ischaemic time, time since commencing RRT, peak PRA and transplant year.

In addition, a random effect at the level of the transplanting hospital was included. This is a conservative assumption (i.e., this will reduce the chance of a false positive but will also reduce the chance of detecting a true positive). This term explicitly attempts to account for variation in hospital-specific performance due to chance; in doing so, it may also incorporate some elements of relevant hospital-specific outcomes. Following a similar philosophy we have included total ischaemic time in the model as a factor for adjustment; this assumption implies that this factor is not under the control of the transplanting hospital.

The logistic regression model was fitted to data from all transplant recipients to obtain the probability of an event occurring for each patient based upon their characteristics. The expected number of events for each hospital is the sum of these probabilities for all patients transplanted at that hospital. We have indicated the number of missing patients for each hospital. Where this is large, then the potential exists to bias results if the pattern of missingness is not random.

For all models, the expected number of events predicted by the model within each category of covariates was consistent with the observed numbers. Additionally, the area under the receiver-operating characteristic (ROC) curves attributable to each model was also examined. For 1 year death and graft failure the area under the ROC curve were 77.0% (95% CI: 71.3-82.7) and 69.2% (95% CI: 65.2-73.1), respectively. These results indicate a model with moderate fit, and the degree of model fit is comparable with US and UK models.

This section contains the random effects logistic regression model results as odds ratios with 95% confidence intervals for the two outcomes. It also contains the number of transplants performed by each hospital and the number of graft failure events (which includes death) and patient deaths within 1 year post-transplant. The expected number of events (graft failures or deaths) based on patient case-mix is presented as well as the ratio of observed to expected. The ratio of observed to expected is presented with a 95% confidence interval, which has the interpretation that there is 95% certainty that the true ratio of observed to expected events lies within the interval boundaries. The rate of observed events per number of transplants is also presented with a 95% confidence interval.

One consequence of the modelling approach is that for small groups, the risk estimates have wide confidence intervals and can be “unstable”. This is manifest in point estimates that can be large – for example the odds ratio for the NZ Maori / Pacific group for patient mortality is almost four-fold. We have examined alternative approaches to this issue, but in practice given the small numbers involved there is little effect on the overall unit SMRs.

### 3 Graft Failure at 1 Year Post-transplant

#### 3.1 Risk-adjusted Graft Failure Ratios

Table 1: Observed vs expected number of graft failures at 1 year post transplant

Code	Hospital	Grafts*	Observed	Expected	Observed Rate (95% CI)	Ratio (95% CI)
ALFD	Alfred Hospital	101 (6)	7	4.8	0.069 (0.028-0.138)	1.44 (0.59-2.87)
AUCK	Auckland Hospital	307 (15)	10	12.8	0.036 (0.018-0.063)	0.78 (0.43-1.51)
AUST	Austin Hospital	194 (8)	5	7.8	0.026 (0.008-0.059)	0.64 (0.21-1.47)
CHCH	Christchurch Hospital	90 (11)	5	3.4	0.056 (0.018-0.125)	1.47 (0.49-3.32)
CNAR	Central Northern Adelaide Renal Service	397 (22)	22	18.5	0.055 (0.035-0.083)	1.19 (0.75-1.78)
HUNT	John Hunter Hospital	170 (13)	4	6.8	0.029 (0.010-0.067)	0.59 (0.24-1.69)
MMCA	Monash Medical (Adults)	345 (11)	18	16.0	0.052 (0.031-0.081)	1.12 (0.67-1.75)
POWH	Prince Of Wales Hospital	198 (11)	10	9.0	0.056 (0.028-0.097)	1.11 (0.62-2.14)
QRTS	Queensland Renal Transplant Service	687 (144)	17	19.8	0.031 (0.019-0.046)	0.86 (0.66-1.61)
RLPT	Royal Perth Hospital	181 (35)	13	7.2	0.088 (0.051-0.140)	1.80 (1.29-3.50)
RMBH	Royal Melbourne Hospital	557 (44)	20	21.0	0.039 (0.025-0.059)	0.95 (0.66-1.57)
RNSH	Royal North Shore Hospital	101 (38)	5	3.2	0.089 (0.042-0.162)	1.57 (1.32-5.16)
SCGH	Sir Charles Gairdner Hospital	224 (53)	7	6.6	0.054 (0.028-0.092)	1.05 (0.94-3.09)
STVI	St Vincent's Hospital (NSW)	13 (3)	0	0.2	0.000 (0.000-0.247)	0.00 (0.00-13.28)
SVIN	St Vincent's Hospital (VIC)	89 (16)	2	3.7	0.045 (0.012-0.111)	0.53 (0.29-2.64)
SWRS	Statewide Renal Services	365 (28)	12	13.7	0.033 (0.017-0.057)	0.87 (0.45-1.51)
WELN	Wellington Hospital	152 (12)	8	6.5	0.053 (0.023-0.101)	1.23 (0.54-2.37)
WEST	Western Renal Service	274 (26)	8	9.8	0.036 (0.018-0.066)	0.82 (0.50-1.86)

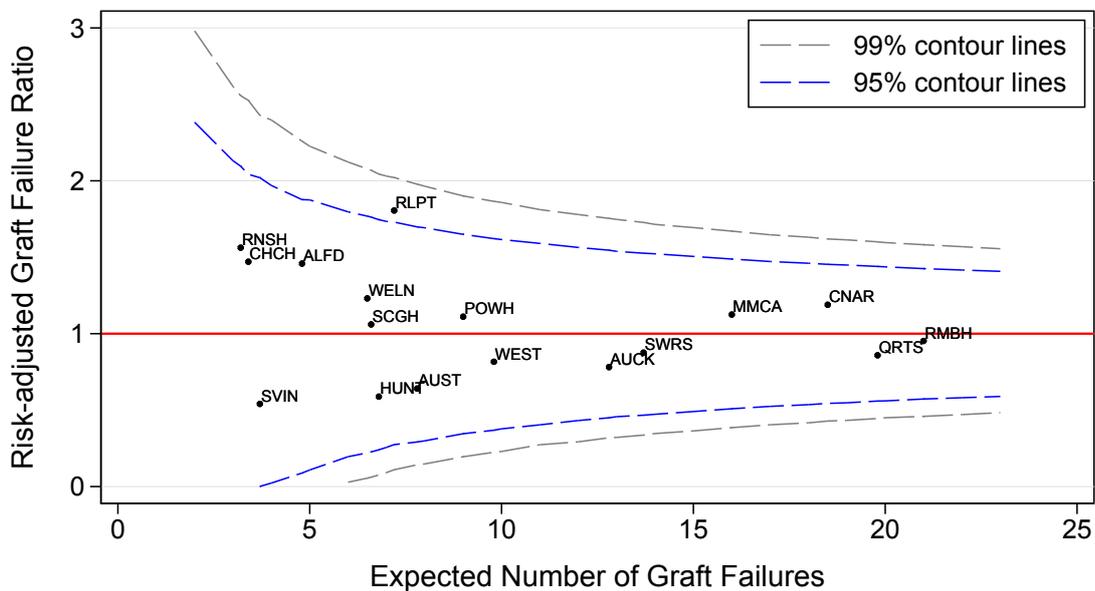
Transplant procedures performed 2010-2014

\* The number in brackets is the number of grafts excluded from logistic regression due to missing data



### 3.2 Funnel Plot

Risk-adjusted Graft Failure Ratio at 1 Year



Observations with missing values are dropped from the model

### 3.3 Logistic Model Coefficients

Table 2: Logistic regression model odds ratios for graft failure at 1 year post transplant

	Odds Ratio	95% CI
<b>Subsequent Graft</b>	1.31	[0.77,2.23]
<b>Age (years)</b>	1.00	[0.99,1.01]
<b>Male</b>	1.21	[0.87,1.70]
<b>Duration of ESKD</b>		
Preemptive	0.94	[0.44,2.02]
<6 months	0.11	[0.02,0.83]
6-12 months	0.77	[0.39,1.54]
12-23 months	0.90	[0.56,1.44]
24+ months	ref.	
<b>Peak PRA</b>	1.00	[0.99,1.01]
<b>Donor Age (years)</b>	1.02	[1.01,1.03]
<b>Country and Race</b>		
Australian non-indigenous	ref.	
Australian Aboriginal/Torres Strait Islander	0.82	[0.36,1.90]
New Zealand non-indigenous	1.33	[0.71,2.48]
New Zealand Māori / Pacific	1.57	[0.64,3.85]
<b>Lung Disease</b>	1.01	[0.52,1.98]
<b>Cardiac Disease</b>	1.53	[1.03,2.27]
<b>PRD</b>		
GN	ref.	
Polycystic	0.51	[0.27,0.98]
Diabetes	1.20	[0.80,1.81]
Miscellaneous	1.47	[1.00,2.15]
<b>Number of Mismatches</b>	1.10	[0.99,1.21]
<b>Year of Transplant</b>	0.95	[0.85,1.07]
<b>Donor Type / Cause of Death / Ischaemic Time</b>		
LD	ref.	
DD CVA 0-11 hours	1.31	[0.73,2.37]
DD non-CVA 0-11 hours	1.59	[0.86,2.94]
DD CVA $\geq$ 12 hours	2.08	[1.21,3.59]
DD non-CVA $\geq$ 12 hours	2.18	[1.23,3.84]

## 4 Mortality at 1 Year Post-transplant

### 4.1 Risk-adjusted Mortality Ratios

Table 3: Observed vs expected number of deaths at 1 year post transplant

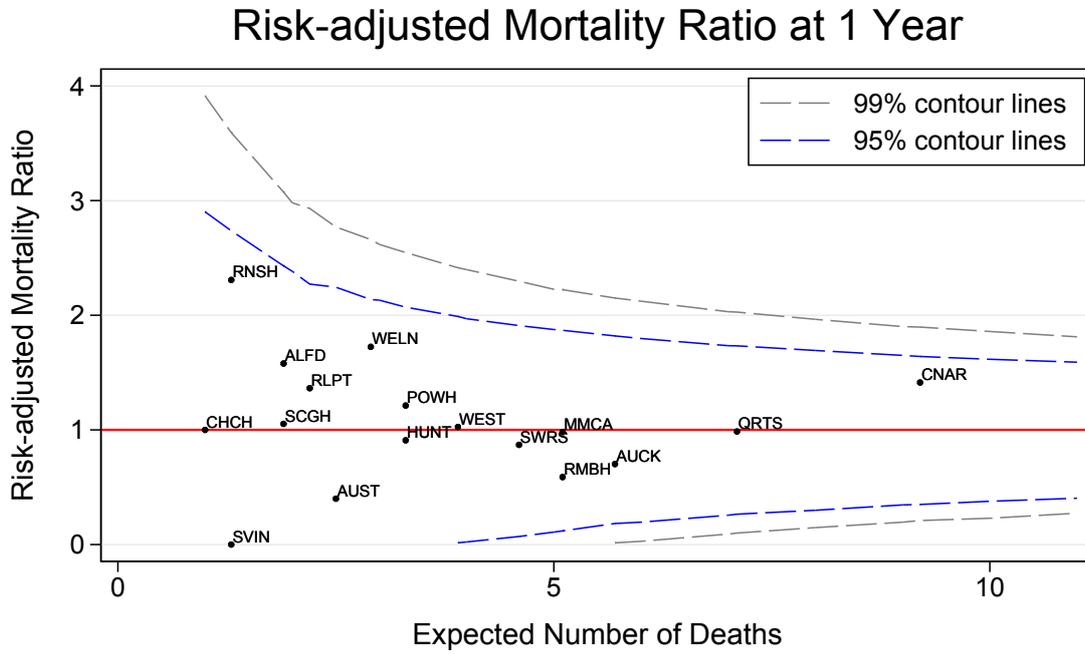
Code	Hospital	Patients*	Observed	Expected	Observed Rate (95% CI)	Ratio (95% CI)
ALFD	Alfred Hospital	91 (6)	3	1.9	0.033 (0.007-0.093)	1.58 (0.33-4.49)
AUCK	Auckland Hospital	290 (14)	4	5.7	0.014 (0.004-0.035)	0.70 (0.19-1.76)
AUST	Austin Hospital	181 (7)	1	2.5	0.006 (0.000-0.030)	0.40 (0.01-2.23)
CHCH	Christchurch Hospital	79 (10)	1	1.0	0.013 (0.000-0.069)	1.05 (0.03-5.68)
CNAR	Central Northern Adelaide Renal Service	341 (16)	13	9.2	0.038 (0.020-0.064)	1.41 (0.76-2.39)
HUNT	John Hunter Hospital	156 (12)	3	3.3	0.026 (0.007-0.064)	0.90 (0.33-3.02)
MMCA	Monash Medical (Adults)	298 (7)	5	5.1	0.017 (0.005-0.039)	0.98 (0.32-2.25)
POWH	Prince Of Wales Hospital	173 (9)	4	3.3	0.029 (0.009-0.066)	1.20 (0.49-3.44)
QRTS	Queensland Renal Transplant Service	622 (133)	7	7.1	0.011 (0.005-0.023)	0.98 (0.40-2.01)
RLPT	Royal Perth Hospital	165 (34)	3	2.2	0.018 (0.004-0.052)	1.37 (0.28-3.95)
RMBH	Royal Melbourne Hospital	466 (36)	3	5.1	0.009 (0.002-0.022)	0.58 (0.21-1.98)
RNSH	Royal North Shore Hospital	88 (33)	3	1.3	0.068 (0.025-0.143)	2.39 (1.78-9.98)
SCGH	Sir Charles Gairdner Hospital	188 (47)	2	1.9	0.021 (0.006-0.054)	1.07 (0.59-5.38)
STVI	St Vincent's Hospital (NSW)	12 (3)	0	0.1	0.000 (0.000-0.265)	0.00 (0.00-37.34)
SVIN	St Vincent's Hospital (VIC)	80 (14)	0	1.3	0.013 (0.000-0.068)	0.00 (0.02-4.20)
SWRS	Statewide Renal Services	326 (26)	4	4.6	0.012 (0.003-0.031)	0.87 (0.24-2.22)
WELN	Wellington Hospital	140 (11)	5	2.9	0.036 (0.012-0.081)	1.72 (0.56-3.92)
WEST	Western Renal Service	247 (23)	4	3.9	0.020 (0.007-0.047)	1.02 (0.42-2.93)

Patients transplanted 2010-2014 (primary grafts only)

\* The number in brackets is the number of patients excluded from logistic regression due to missing data



## 4.2 Funnel Plot



Observations with missing values are dropped from the model

### 4.3 Logistic Model Coefficients

Table 4: Logistic regression model odds ratios for mortality at 1 year post transplant

	Odds Ratio	95% CI
<b>Age (years)</b>	1.03	[1.01,1.06]
<b>Male</b>	0.67	[0.39,1.13]
<b>Duration of ESKD</b>		
Preemptive	0.22	[0.03,1.79]
<12 months	0.82	[0.34,2.00]
12-23 months	0.90	[0.44,1.84]
24+ months	ref.	
<b>Peak PRA</b>	1.00	[0.99,1.02]
<b>Donor Age (years)</b>	1.02	[1.00,1.04]
<b>Country and Race</b>		
Australian non-indigenous	ref.	
Australian Aboriginal/Torres Strait Islander	0.92	[0.25,3.35]
New Zealand non-indigenous	1.35	[0.44,4.13]
New Zealand Māori / Pacific	3.71	[1.10,12.50]
<b>Lung Disease</b>	1.38	[0.57,3.34]
<b>Cardiac Disease</b>	2.16	[1.23,3.80]
<b>PRD</b>		
GN	ref.	
Polycystic	0.20	[0.05,0.88]
Diabetes	1.05	[0.53,2.10]
Miscellaneous	1.67	[0.91,3.06]
<b>Number of Mismatches</b>	1.02	[0.87,1.19]
<b>Year of Transplant</b>	0.94	[0.78,1.13]
<b>Donor Type / Cause of Death / Ischaemic Time</b>		
LD	ref.	
DD CVA 0-11 hours	1.64	[0.64,4.18]
DD non-CVA 0-11 hours	1.43	[0.51,4.01]
DD CVA $\geq$ 12 hours	1.68	[0.68,4.18]
DD non-CVA $\geq$ 12 hours	2.19	[0.87,5.53]

Categories have been collapsed as there were 0 deaths in the following group: Duration of ESKD <6 months