



TRANSPLANTING HOSPITAL REPORT

2009 - 2014

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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.

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.

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	89 (7)	5	3.8	0.067 (0.025-0.141)	1.33 (0.59-3.33)
AUCK	Auckland Hospital	287 (10)	10	12.8	0.038 (0.019-0.068)	0.78 (0.43-1.52)
AUST	Austin Hospital	179 (7)	6	7.8	0.039 (0.016-0.079)	0.77 (0.36-1.81)
CHCH	Christchurch Hospital	103 (9)	5	3.7	0.049 (0.016-0.110)	1.34 (0.44-3.03)
CNAR	Central Northern Adelaide Renal Service	392 (14)	26	20.3	0.066 (0.044-0.096)	1.28 (0.84-1.84)
HUNT	John Hunter Hospital	153 (9)	5	6.8	0.039 (0.015-0.083)	0.73 (0.32-1.86)
MMCA	Monash Medical (Adults)	325 (9)	10	12.8	0.034 (0.017-0.060)	0.78 (0.43-1.51)
POWH	Prince Of Wales Hospital	196 (9)	9	8.9	0.051 (0.025-0.092)	1.01 (0.55-2.02)
QRTS	Queensland Renal Transplant Service	677 (29)	21	23.8	0.031 (0.019-0.047)	0.88 (0.55-1.34)
RLPT	Royal Perth Hospital	188 (16)	15	9.1	0.096 (0.058-0.147)	1.65 (1.19-3.04)
RMBH	Royal Melbourne Hospital	567 (26)	20	21.9	0.039 (0.024-0.058)	0.91 (0.63-1.51)
RNSH	Royal North Shore Hospital	82 (31)	4	2.5	0.085 (0.035-0.168)	1.61 (1.16-5.55)
SCGH	Sir Charles Gairdner Hospital	218 (30)	9	7.5	0.060 (0.032-0.100)	1.19 (0.93-2.88)
STVI	St Vincent's Hospital (NSW)	6 (2)	0	0.1	0.000 (0.000-0.459)	0.00 (0.00-22.75)
SVIN	St Vincent's Hospital (VIC)	68 (14)	1	2.7	0.044 (0.009-0.124)	0.38 (0.24-3.16)
SWRS	Statewide Renal Services	361 (12)	12	14.5	0.033 (0.017-0.057)	0.83 (0.43-1.42)
WELN	Wellington Hospital	143 (6)	7	5.3	0.049 (0.020-0.098)	1.32 (0.54-2.65)
WEST	Western Renal Service	269 (16)	12	11.1	0.048 (0.026-0.081)	1.08 (0.63-1.96)

Transplant procedures performed 2009-2013

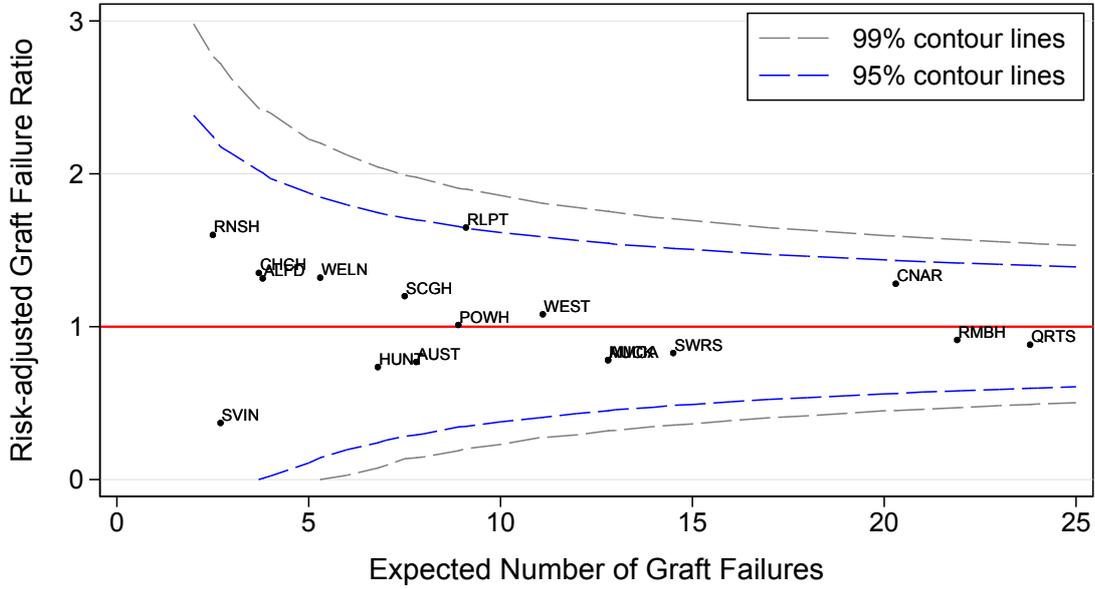
* The number in brackets is the number of grafts excluded from logistic regression due to missing data





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
Subsequent Graft	1.28	[0.77,2.15]
Age (years)	1.01	[0.99,1.02]
Male	1.25	[0.89,1.74]
Duration of ESKD		
Preemptive	1.04	[0.52,2.07]
<6 months	0.21	[0.05,0.90]
6-11 months	0.67	[0.33,1.38]
12-23 months	0.86	[0.54,1.39]
24+ months	ref.	
Peak PRA	1.00	[1.00,1.01]
Donor Age (years)	1.02	[1.01,1.03]
Country and Race		
Australian non-indigenous	ref.	
Australian Aboriginal/Torres Strait Islander	1.46	[0.69,3.08]
New Zealand non-indigenous	0.91	[0.48,1.73]
New Zealand Māori / Pacific	2.13	[0.96,4.71]
Lung Disease	1.34	[0.75,2.40]
Cardiac Disease	1.58	[1.08,2.32]
PRD		
GN	ref.	
Polycystic	0.64	[0.36,1.14]
Diabetes	1.08	[0.71,1.64]
Miscellaneous	1.54	[1.05,2.25]
Number of Mismatches	1.08	[0.98,1.19]
Year of Transplant	0.90	[0.80,1.00]
Donor Type / Cause of Death / Ischaemic Time		
LD	ref.	
DD CVA 0-11 hours	1.42	[0.81,2.50]
DD non-CVA 0-11 hours	1.30	[0.71,2.38]
DD CVA \geq 12 hours	2.01	[1.20,3.35]
DD non-CVA \geq 12 hours	1.53	[0.88,2.69]

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	80 (7)	3	1.7	0.038 (0.008-0.106)	1.75 (0.36-4.94)
AUCK	Auckland Hospital	273 (10)	5	6.4	0.018 (0.006-0.042)	0.78 (0.25-1.79)
AUST	Austin Hospital	165 (7)	1	2.3	0.006 (0.000-0.033)	0.43 (0.01-2.38)
CHCH	Christchurch Hospital	90 (8)	2	1.7	0.022 (0.003-0.078)	1.19 (0.14-4.17)
CNAR	Central Northern Adelaide Renal Service	334 (10)	14	11.1	0.042 (0.023-0.069)	1.26 (0.69-2.08)
HUNT	John Hunter Hospital	139 (8)	4	3.7	0.036 (0.012-0.082)	1.09 (0.45-3.10)
MMCA	Monash Medical (Adults)	282 (7)	3	3.8	0.011 (0.002-0.031)	0.78 (0.16-2.26)
POWH	Prince Of Wales Hospital	172 (7)	3	2.9	0.023 (0.006-0.058)	1.02 (0.37-3.43)
QRTS	Queensland Renal Transplant Service	619 (29)	9	8.8	0.015 (0.007-0.027)	1.03 (0.47-1.93)
RLPT	Royal Perth Hospital	174 (16)	5	3.7	0.029 (0.009-0.066)	1.35 (0.44-3.09)
RMBH	Royal Melbourne Hospital	478 (22)	1	3.9	0.004 (0.001-0.015)	0.26 (0.06-1.85)
RNSH	Royal North Shore Hospital	71 (26)	3	1.1	0.070 (0.023-0.157)	2.62 (1.45-9.74)
SCGH	Sir Charles Gairdner Hospital	183 (25)	4	3.0	0.033 (0.012-0.070)	1.31 (0.73-4.20)
STVI	St Vincent's Hospital (NSW)	5 (2)	0	0.0	0.000 (0.000-0.522)	0.00 (0.00-69.90)
SVIN	St Vincent's Hospital (VIC)	60 (12)	0	0.8	0.017 (0.000-0.089)	0.00 (0.03-6.45)
SWRS	Statewide Renal Services	317 (10)	4	4.8	0.013 (0.003-0.032)	0.84 (0.23-2.12)
WELN	Wellington Hospital	130 (6)	5	3.4	0.038 (0.013-0.087)	1.48 (0.48-3.36)
WEST	Western Renal Service	243 (13)	5	4.6	0.025 (0.009-0.053)	1.10 (0.49-2.83)

Patients transplanted 2009-2013 (primary grafts only)

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





4.2 Funnel Plot

Risk-adjusted Mortality Ratio at 1 Year



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
Age (years)	1.05	[1.02,1.07]
Male	0.85	[0.51,1.41]
Duration of ESKD		
Preemptive	0.68	[0.20,2.30]
<12 months	0.57	[0.23,1.45]
12-23 months	0.78	[0.39,1.58]
24+ months	ref.	
Peak PRA	1.01	[1.00,1.02]
Donor Age (years)	1.01	[1.00,1.03]
Country and Race		
Australian non-indigenous	ref.	
Australian Aboriginal/Torres Strait Islander	2.40	[0.88,6.54]
New Zealand non-indigenous	0.87	[0.27,2.75]
New Zealand Māori / Pacific	4.69	[1.50,14.65]
Lung Disease	1.52	[0.70,3.33]
Cardiac Disease	1.93	[1.13,3.29]
PRD		
GN	ref.	
Polycystic	0.72	[0.30,1.74]
Diabetes	1.18	[0.60,2.32]
Miscellaneous	1.80	[0.97,3.33]
Number of Mismatches	0.97	[0.83,1.13]
Year of Transplant	0.91	[0.76,1.09]
Donor Type / Cause of Death / Ischaemic Time		
LD	ref.	
DD CVA 0-11 hours	1.16	[0.46,2.90]
DD non-CVA 0-11 hours	1.01	[0.37,2.73]
DD CVA \geq 12 hours	2.00	[0.90,4.41]
DD non-CVA \geq 12 hours	1.20	[0.48,2.96]

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