



DIALYSIS HOSPITAL REPORT

2010 - 2015

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1 Introduction

This report is an abridged version of the dialysis 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 dialysis 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 Standardised Mortality Ratios

The standardised mortality ratio (SMR) is the ratio of observed deaths to expected deaths within each Hospital. The expected deaths values for each hospital are obtained using multivariate modelling and the characteristics of patients in each hospital. A Poisson regression, including a random effect for each hospital, was used to obtain the regression coefficients predicting death, and the predicted probability of death for each patient was calculated. Those probabilities were then summed over the patients in each hospital, resulting in the expected number of deaths. The impact of each variable in the Poisson model in contributing to the expected mortality across all hospitals (incidence rate ratios) are presented in section 2.3.

All patients aged ≥ 18 years who commenced dialysis during 2010-2015 and remained on dialysis for at least 90 days were included in the model. Follow-up continued until first transplant, recovery of renal function lasting >30 days, death or most recent date of follow-up. A



Australia and New Zealand Dialysis and Transplant Registry

small number of observations had missing values ($n=675$) for one or more predictor variables and these cases were excluded. Dialysis modality is defined at the 90th day of treatment. Hospital is defined as the last recorded hospital for each patient.

2.1 SMRs

The following tables present the standardised mortality ratios (SMRs) for all hospitals in Australia and New Zealand. The expected number of deaths was obtained from a Poisson regression adjusted for various demographic and health indicators.

Table 1: SMRs for Australian hospitals

	Hospital Name	No. Patients*	No. Deaths	No. Expected	SMR (95% CI)
1	Access Nephrology	12 (0)	0	1.7	0.00 (-.-)
2	Alfred Hospital	356 (2)	92	87.7	1.05 (0.85-1.27)
3	Alice Springs Hospital	256 (8)	23	28.6	0.80 (0.51-1.16)
4	Allamanda Dialysis Unit - Closed 03/16	59 (1)	29	26.4	1.10 (0.73-1.53)
5	Austin Hospital	299 (7)	69	70.5	0.98 (0.76-1.22)
6	Bendigo Hospital	67 (0)	12	13.6	0.88 (0.46-1.45)
7	Bundaberg Hospital	76 (1)	21	20.2	1.04 (0.64-1.53)
8	Cairns Hospital	264 (27)	61	58.0	1.05 (0.80-1.33)
9	Canberra Hospital	280 (5)	85	81.3	1.05 (0.84-1.28)
10	Central Northern Adelaide Renal Service	704 (26)	167	164.3	1.02 (0.87-1.18)
11	Chermside Dialysis Unit (Nephrocare)	41 (0)	12	11.2	1.07 (0.56-1.76)
12	Coffs Harbour Hospital	53 (4)	15	16.0	0.94 (0.52-1.46)
13	Diamond Valley Dialysis Clinic	37 (2)	6	8.7	0.69 (0.25-1.34)
14	Dubbo Base Hospital	100 (0)	26	26.9	0.97 (0.63-1.37)
15	Eastern Health Integrated Renal Services	259 (0)	57	58.3	0.98 (0.74-1.25)
16	Epworth Richmond Hospital	23 (1)	11	8.3	1.32 (0.66-2.21)
17	Fiona Stanley Hospital	411 (64)	28	36.0	0.78 (0.52-1.09)
18	Flinders Medical Centre	225 (5)	52	53.6	0.97 (0.72-1.25)
19	Forest Hill Satellite	48 (0)	10	12.3	0.81 (0.39-1.39)
20	Fremantle Hospital	89 (0)	82	66.2	1.24 (0.98-1.52)
21	Geelong Hospital	180 (5)	36	36.7	0.98 (0.69-1.33)
22	Gold Coast Hospital	230 (22)	51	50.8	1.00 (0.75-1.30)
23	Gosford Hospital	180 (9)	60	56.8	1.06 (0.81-1.34)

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

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	Hospital Name	No. Patients*	No. Deaths	No. Expected	SMR (95% CI)
24	Henry Dalziel Dialysis Clinic - Greenslopes	106 (0)	26	24.7	1.05 (0.69-1.50)
25	Hervey Bay Hospital	84 (1)	21	20.0	1.05 (0.65-1.55)
26	John Flynn Hospital	71 (0)	33	29.4	1.12 (0.77-1.53)
27	John Hunter Hospital	319 (10)	93	90.3	1.03 (0.83-1.25)
28	Kew Private Dialysis Centre	17 (0)	5	6.5	0.77 (0.25-1.57)
29	Launceston Hospital	138 (2)	34	31.4	1.08 (0.75-1.47)
30	Lismore Hospital	120 (2)	33	36.0	0.92 (0.63-1.26)
31	Lismore Private Dialysis Clinic	20 (0)	9	9.6	0.94 (0.43-1.64)
32	Mackay Hospital	83 (0)	15	17.2	0.87 (0.49-1.37)
33	Macleay Dialysis Centre Kempsey	12 (1)	3	3.9	0.77 (0.16-1.86)
34	Malvern Dialysis Centre	46 (0)	15	12.8	1.17 (0.66-1.84)
35	Manning Rural Referral Hospital	62 (2)	17	14.6	1.16 (0.68-1.77)
36	Mater Hospital	28 (1)	6	6.3	0.96 (0.35-1.87)
37	Mater Townsville	8 (2)	0	2.2	0.00 (-.)
38	Mayo Private Hospital - Taree	25 (0)	6	6.4	0.94 (0.35-1.84)
39	Monash Medical (Adults)	620 (17)	104	105.5	0.99 (0.81-1.18)
40	Nambour Hospital	132 (3)	21	22.5	0.93 (0.58-1.37)
41	Nambour Selangor and Caloundra Private	27 (0)	7	7.7	0.91 (0.37-1.70)
42	Newcastle Nephrocare	39 (1)	10	11.7	0.85 (0.41-1.46)
43	North Melbourne Dialysis Clinic (Diaverum)	31 (1)	12	11.3	1.06 (0.55-1.74)
44	Northern Health Service Melbourne	113 (8)	23	23.4	0.98 (0.62-1.42)
45	Orange Hospital	85 (1)	27	25.3	1.07 (0.70-1.50)
46	Port Macquarie Hospital	57 (0)	12	11.9	1.01 (0.52-1.65)
47	Port Macquarie Private Hospital	22 (0)	9	8.1	1.11 (0.51-1.95)
48	Prince Of Wales Hospital	123 (0)	24	25.5	0.94 (0.60-1.35)
49	Princess Alexandra Hospital	524 (10)	84	83.7	1.00 (0.80-1.23)
50	Rockhampton Hospital	132 (0)	22	22.7	0.97 (0.61-1.41)
51	Royal Brisbane Hospital	279 (12)	50	51.3	0.97 (0.72-1.26)
52	Royal Darwin Hospital	267 (15)	54	51.2	1.06 (0.79-1.36)

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

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	Hospital Name	No. Patients*	No. Deaths	No. Expected	SMR (95% CI)
53	Royal Hobart Hospital	109 (0)	34	32.8	1.04 (0.72-1.41)
54	Royal Melbourne Hospital	603 (49)	125	122.8	1.02 (0.85-1.20)
55	Royal North Shore Hospital	231 (57)	36	37.4	0.96 (0.67-1.30)
56	Royal Perth Hospital	447 (33)	119	115.9	1.03 (0.85-1.22)
57	Sir Charles Gairdner Hospital	480 (64)	97	96.1	1.01 (0.82-1.22)
58	South West Sydney Renal Service	578 (66)	136	137.0	0.99 (0.83-1.17)
59	St Andrews Dialysis Clinic	6 (0)	1	2.1	0.48 (0.01-1.77)
60	St George Hospital	269 (0)	52	53.2	0.98 (0.73-1.26)
61	St Vincent's Hospital (NSW)	112 (1)	24	23.0	1.04 (0.67-1.50)
62	St Vincent's Hospital (VIC)	316 (6)	71	70.6	1.01 (0.79-1.25)
63	Statewide Renal Services	518 (20)	126	124.6	1.01 (0.84-1.20)
64	Sydney Adventist Hospital	51 (0)	12	12.8	0.94 (0.48-1.53)
65	Tamworth Hospital	121 (2)	40	35.6	1.12 (0.80-1.50)
66	The Tweed Hospital	55 (3)	21	19.0	1.10 (0.68-1.62)
67	Toowoomba Hospital	149 (4)	30	31.0	0.97 (0.65-1.34)
68	Townsville Hospital	181 (4)	41	41.5	0.99 (0.71-1.31)
69	Varsity Lakes Hospital - Queensland	5 (0)	0	0.7	0.00 (-.-)
70	Wesley Hospital	62 (8)	11	10.1	1.09 (0.54-1.82)
71	Western Health	269 (4)	58	59.1	0.98 (0.75-1.25)
72	Western Renal Service	755 (13)	159	158.6	1.00 (0.85-1.16)
73	Wollongong Hospital	209 (8)	46	47.0	0.98 (0.72-1.28)

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Table 2: SMRs for New Zealand hospitals

	Hospital Name	No. Patients [*]	No. Deaths	No. Expected	SMR (95% CI)
74	Auckland Hospital	289 (2)	71	72.1	0.98 (0.77-1.23)
75	Christchurch Hospital	187 (7)	54	50.5	1.07 (0.80-1.37)
76	Dunedin Hospital	100 (2)	31	28.6	1.08 (0.74-1.50)
77	Hawkes Bay Hospital	109 (16)	34	31.9	1.07 (0.74-1.45)
78	Middlemore Hospital	591 (9)	143	142.3	1.00 (0.85-1.18)
79	Palmerston Hospital	153 (0)	33	34.7	0.95 (0.66-1.30)
80	Taranaki Hospital	69 (1)	23	19.8	1.16 (0.74-1.68)
81	Waikato Hospital	544 (15)	187	183.9	1.02 (0.88-1.17)
82	Waitemata Renal Service	254 (2)	49	52.4	0.94 (0.69-1.21)
83	Wellington Hospital	321 (0)	91	89.5	1.02 (0.82-1.24)
84	Whangarei Hospital	158 (1)	36	38.3	0.94 (0.66-1.27)

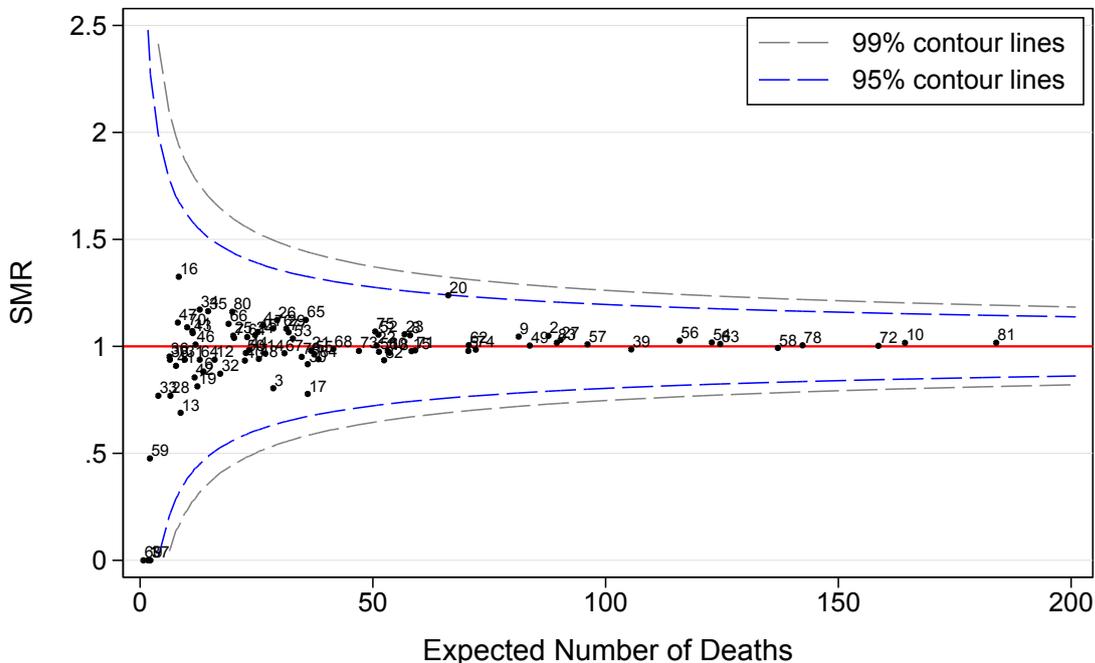
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2.2 Funnel Plot

This funnel plot shows the SMRs for all hospitals (y-axis) plotted against the expected number of patient deaths (x-axis). The red line indicates an SMR of 1.0, and the contours indicate 95% and 99% confidence intervals. (Note that the contours approximately correspond to ± 2 and ± 3 standard deviations from 1.0, respectively). If a hospital lies within the confidence intervals then that hospital has an observed to expected ratio that is statistically consistent (at the 5% level) with 1.0 (i.e. there is no statistical difference in the number of observed and expected events). If a hospital lies above the upper control lines, this indicates that the number of observed deaths is statistically greater than the number expected under the model. Conversely, if a hospital lies below the lines, this indicates statistically fewer observed deaths than expected under the model.

In interpreting the SMR and funnel plots it should be borne in mind that the precision of these estimates is strongly influenced by the number of patients in a hospital. As such, smaller hospitals will have less precise estimates and greater uncertainty about where the true effect lies. This is shown in wider confidence intervals for the SMR estimates and likely greater change in these estimates as they are updated over time.

Note that the numbers identifying hospitals in the funnel plot below correspond to the first column in SMR tables



2.3 Poisson Model Coefficients

Table 3: Poisson regression model incidence rate ratios (IRR)

	IRR	95% CI
Era of Treatment Start		
2010-2011	ref.	
2012-2013	1.029	(0.957-1.107)
2014-2015	0.995	(0.890-1.112)
Time Since Beginning Dialysis		
0-0.99 years	ref.	
1-1.99 years	1.192	(1.096-1.296)
2-2.99 years	1.433	(1.303-1.575)
3+ years	1.704	(1.541-1.883)
Age	1.032	(1.029-1.035)
Male	1.085	(1.011-1.164)
Country and Race		
Australian non-indigenous	ref.	
Australian Aboriginal/Torres Strait Islander	1.052	(0.906-1.221)
New Zealand non-indigenous	1.464	(1.177-1.821)
New Zealand Māori/Pacific	1.347	(1.075-1.687)
Diabetes (as comorbidity)	1.215	(1.093-1.351)
Chronic Lung Disease	1.291	(1.195-1.396)
Peripheral Vascular Disease	1.276	(1.183-1.378)
Cerebrovascular Disease	1.239	(1.140-1.346)
Coronary Artery Disease	1.335	(1.242-1.436)
Current or Former Smoker	1.177	(1.098-1.262)
Late Referral	1.350	(1.249-1.460)
BMI		
Underweight	1.885	(1.568-2.267)
Normal	ref.	
Overweight	0.859	(0.790-0.932)
Obese	0.763	(0.701-0.830)
Primary Renal Disease		
GN	ref.	
Analgesic	1.399	(1.079-1.814)
Polycystic	0.708	(0.554-0.903)
Reflux	0.935	(0.649-1.348)
Hypertension	1.271	(1.123-1.439)
Diabetes	1.700	(1.521-1.900)
Other	1.751	(1.541-1.990)
Uncertain diagnosis	1.388	(1.169-1.648)