



# **DIALYSIS HOSPITAL REPORT**

**2008 - 2013**

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## 1 Introduction

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

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 centres, 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  $\geq 18$  years who commenced dialysis during 2008-2013 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

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small number of observations had missing values ( $n=301$ ) 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 centres

	Centre Name	No. Patients*	No. Deaths	No. Expected	SMR (95% CI)
1	Alfred Hospital	295 (0)	73	72.3	1.01 (0.79-1.25)
2	Alice Springs Hospital	226 (8)	42	37.1	1.13 (0.82-1.50)
3	Allamanda Dialysis Unit	84 (1)	34	30.2	1.13 (0.78-1.54)
4	Austin Hospital	313 (7)	83	82.4	1.01 (0.80-1.24)
5	Bendigo Hospital	62 (0)	11	20.7	0.53 (0.27-0.89)
6	Bundaberg Hospital	89 (1)	17	20.1	0.85 (0.49-1.29)
7	Cairns Hospital	243 (3)	58	52.2	1.11 (0.84-1.41)
8	Canberra Hospital	281 (1)	64	64.8	0.99 (0.76-1.24)
9	Central Northern Adelaide Renal Service	752 (12)	186	182.2	1.02 (0.88-1.17)
10	Chermside Dialysis Unit (Nephrocare)	41 (0)	13	14.4	0.91 (0.48-1.46)
11	Coffs Harbour Hospital	59 (4)	14	8.9	1.57 (0.86-2.50)
12	Diamond Valley Dialysis Clinic	29 (0)	4	6.1	0.65 (0.18-1.43)
13	Dubbo Base Hospital	92 (1)	24	25.9	0.93 (0.59-1.33)
14	Eastern Health Integrated Renal Service	216 (2)	40	45.0	0.89 (0.63-1.18)
15	Epworth Richmond Hospital	25 (4)	3	3.8	0.80 (0.16-1.92)
16	Flinders Medical Centre	215 (6)	58	58.5	0.99 (0.75-1.26)
17	Forest Hill Satellite	47 (1)	8	8.2	0.97 (0.42-1.76)
18	Fremantle Hospital	353 (2)	99	93.1	1.06 (0.86-1.28)
19	Geelong Hospital	165 (3)	33	32.9	1.00 (0.69-1.38)
20	Goldcoast Hospital	217 (11)	56	59.6	0.94 (0.71-1.20)
21	Gosford Hospital	199 (5)	71	64.3	1.10 (0.86-1.38)
22	Henry Dalziel Dialysis Clinic - Greenslopes	115 (0)	42	34.0	1.24 (0.89-1.64)
23	Hervey Bay Hospital	88 (2)	22	21.6	1.02 (0.64-1.48)
24	John Flynn Hospital	88 (0)	39	30.4	1.28 (0.91-1.71)

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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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	Centre Name	No. Patients*	No. Deaths	No. Expected	SMR (95% CI)
25	John Hunter Hospital	336 (3)	118	120.8	0.98 (0.81-1.16)
26	Kew Private Dialysis Centre	19 (0)	3	4.0	0.75 (0.15-1.80)
27	Launceston Hospital	133 (1)	41	39.4	1.04 (0.75-1.38)
28	Lismore Hospital	113 (4)	27	31.9	0.85 (0.56-1.20)
29	Lismore Private Dialysis Clinic	22 (0)	8	9.4	0.85 (0.37-1.54)
30	Mackay Hospital	69 (3)	16	18.5	0.87 (0.50-1.34)
31	Macleay Dialysis Centre Kempsey	13 (0)	3	6.9	0.43 (0.09-1.05)
32	Malvern Dialysis Centre	48 (1)	16	9.5	1.68 (0.96-2.60)
33	Manning Rural Referral Hospital	59 (1)	18	19.9	0.90 (0.54-1.37)
34	Mater Hospital	28 (1)	6	4.8	1.26 (0.46-2.45)
35	Mayo Private Hospital - Taree	15 (0)	8	9.9	0.81 (0.35-1.46)
36	Monash Medical (Adults)	597 (8)	104	108.3	0.96 (0.78-1.15)
37	Nambour Hospital	117 (2)	21	22.6	0.93 (0.58-1.37)
38	Nambour Selangor and Caloundra Private	31 (0)	10	8.4	1.19 (0.57-2.04)
39	Newcastle Nephrocare	30 (0)	4	6.1	0.66 (0.18-1.44)
40	North Melbourne Dialysis Clinic (Diaverum)	37 (1)	8	8.6	0.93 (0.40-1.67)
41	Northern Health Service Melbourne	67 (0)	1	5.8	0.17 (0.00-0.64)
42	Orange Hospital	92 (1)	25	23.3	1.07 (0.69-1.53)
43	Port Macquarie Hospital	65 (0)	13	16.8	0.78 (0.41-1.25)
44	Port Macquarie Private Hospital	27 (0)	11	6.2	1.76 (0.88-2.95)
45	Prince Of Wales Hospital	118 (0)	25	30.1	0.83 (0.54-1.19)
46	Princess Alexandra Hospital	473 (4)	101	102.8	0.98 (0.80-1.18)
47	Rockhampton Hospital	109 (0)	21	25.4	0.83 (0.51-1.22)
48	Royal Brisbane Hospital	282 (10)	57	61.3	0.93 (0.70-1.19)
49	Royal Darwin Hospital	209 (4)	35	35.7	0.98 (0.68-1.33)
50	Royal Hobart Hospital	124 (0)	39	37.6	1.04 (0.74-1.39)
51	Royal Melbourne Hospital	600 (7)	146	138.5	1.05 (0.89-1.23)
52	Royal North Shore Hospital	209 (16)	37	44.4	0.83 (0.59-1.12)
53	Royal Perth Hospital	555 (36)	147	139.7	1.05 (0.89-1.23)

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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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	Centre Name	No. Patients*	No. Deaths	No. Expected	SMR (95% CI)
54	Sir Charles Gairdner Hospital	449 (35)	128	123.1	1.04 (0.87-1.23)
55	South West Sydney Renal Service	581 (8)	143	144.9	0.99 (0.83-1.16)
56	St Andrews Dialysis Clinic - Toowoomba	14 (0)	3	3.3	0.92 (0.19-2.22)
57	St George Hospital	288 (1)	67	64.3	1.04 (0.81-1.31)
58	St Vincent's Hospital (NSW)	106 (0)	24	23.7	1.01 (0.65-1.45)
59	St Vincent's Hospital (VIC)	294 (0)	68	63.4	1.07 (0.83-1.34)
60	Statewide Renal Services	482 (11)	140	138.1	1.01 (0.85-1.19)
61	Sydney Adventist Hospital	48 (2)	14	7.9	1.78 (0.97-2.83)
62	Tamworth Hospital	112 (2)	34	32.2	1.06 (0.73-1.44)
63	The Tweed Hospital	53 (6)	18	17.7	1.02 (0.60-1.54)
64	Toowoomba Hospital	135 (10)	21	21.2	0.99 (0.61-1.45)
65	Townsville Hospital	227 (4)	57	63.2	0.90 (0.68-1.15)
66	Wesley Hospital	61 (3)	18	15.7	1.15 (0.68-1.74)
67	Western Health	247 (1)	59	59.1	1.00 (0.76-1.27)
68	Western Renal Service	702 (3)	158	159.0	0.99 (0.84-1.15)
69	Wollongong Hospital	216 (1)	55	53.2	1.03 (0.78-1.33)

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



Table 2: SMRs for New Zealand centres

	Centre Name	No. Patients*	No. Deaths	No. Expected	SMR (95% CI)
70	Auckland Hospital	295 (2)	82	84.0	0.98 (0.78-1.20)
71	Christchurch Hospital	186 (7)	53	50.0	1.06 (0.79-1.36)
72	Dunedin Hospital	102 (1)	30	28.0	1.07 (0.72-1.49)
73	Hawkes Bay Hospital	123 (10)	37	29.6	1.25 (0.88-1.69)
74	Middlemore Hospital	550 (0)	144	143.2	1.01 (0.85-1.18)
75	Palmerston Hospital	150 (0)	32	32.5	0.98 (0.67-1.35)
76	Taranaki Hospital	72 (0)	26	24.2	1.07 (0.70-1.52)
77	Waikato Hospital Hamilton	569 (10)	191	187.1	1.02 (0.88-1.17)
78	Waitemata Renal Service	235 (6)	31	44.5	0.70 (0.47-0.96)
79	Wellington Hospital	309 (1)	82	78.3	1.05 (0.83-1.29)
80	Whangarei Hospital	149 (0)	35	37.6	0.93 (0.65-1.26)

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



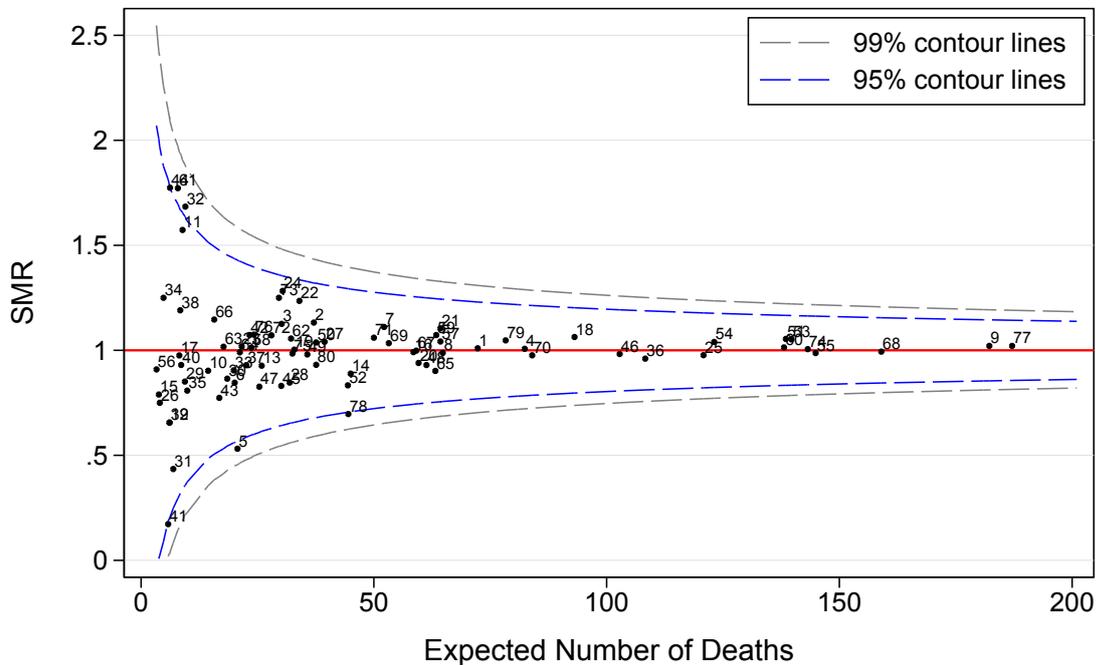


## 2.2 Funnel Plot

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  $\pm 2$  and  $\pm 3$  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



Observations with missing values are dropped from the model

## 2.3 Poisson Model Coefficients

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

	IRR	95% CI
<b>Era of Treatment Start</b>		
2007-2008	ref.	
2009-2010	1.798	(1.672-1.934)
2011-2012	4.077	(3.649-4.556)
<b>Time Since Beginning Dialysis</b>		
0-0.99 years	ref.	
1-1.99 years	1.625	(1.495-1.766)
2-2.99 years	2.654	(2.412-2.919)
3+ years	5.951	(5.386-6.576)
<b>Age</b>		
18-34 years	ref.	
35-44 years	1.315	(0.816-2.119)
45-54 years	1.830	(1.184-2.828)
55-64 years	2.338	(1.532-3.568)
65-74 years	3.446	(2.267-5.239)
75-84 years	4.918	(3.236-7.472)
85+ years	6.625	(4.351-10.086)
<b>Male</b>	1.111	(1.036-1.191)
<b>Country and Race</b>		
Australian non-indigenous	ref.	
Australian Aboriginal/Torres Strait Islander	1.205	(1.044-1.392)
New Zealand non-indigenous	1.280	(1.094-1.496)
New Zealand Maori/Pacific	1.213	(1.024-1.436)
<b>Diabetes (as comorbidity)</b>	1.139	(1.026-1.264)
<b>Chronic Lung Disease</b>	1.276	(1.183-1.377)
<b>Peripheral Vascular Disease</b>	1.324	(1.229-1.427)
<b>Cerebrovascular Disease</b>	1.194	(1.103-1.293)
<b>Coronary Artery Disease</b>	1.267	(1.178-1.363)
<b>Current or Former Smoker</b>	1.079	(1.007-1.155)
<b>Late Referral</b>	1.199	(1.113-1.293)
<b>BMI</b>		
Normal	ref.	
Underweight	1.329	(1.104-1.600)
Overweight	0.851	(0.786-0.921)
Obese	0.773	(0.712-0.840)
<b>Primary Renal Disease</b>		
GN	ref.	
Analgesic	1.330	(1.049-1.687)
Polycystic	0.648	(0.509-0.825)
Reflux	0.719	(0.496-1.043)
Hypertension	1.222	(1.085-1.378)
Diabetes	1.502	(1.349-1.674)
Other	1.745	(1.538-1.979)
Uncertain diagnosis	1.405	(1.204-1.641)