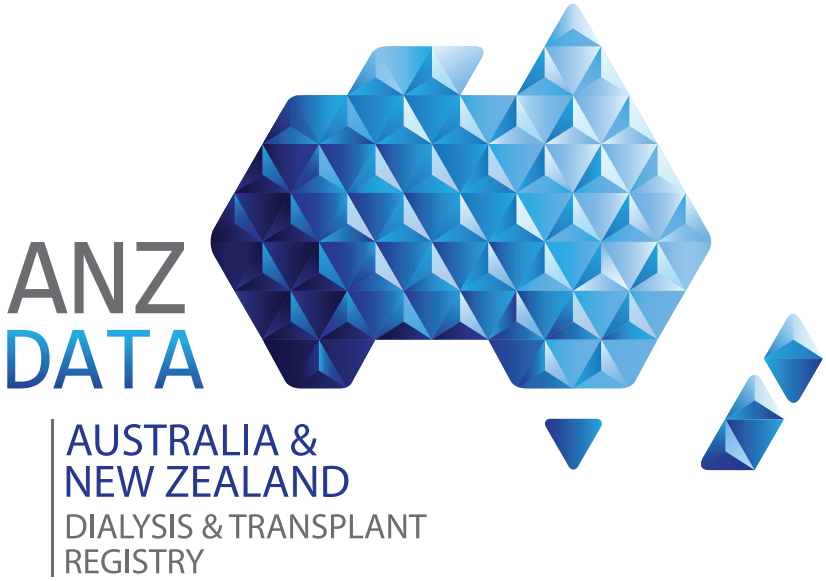

DIALYSIS HOSPITAL REPORT

2015 - 2020

PUBLISHED November 2021
From the ANZDATA Database last surveyed on 31st December 2020

Contents

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 used to present this variability. To account for the multiple comparisons made between centres, 95% false discovery rate (FDR) confidence intervals are used.

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 coefficents predicting death, and the predicted probability of death for each patient was calculated. The expected number of deaths was defined as the number of deaths expected if the patients treated at that hospital had instead been assigned at random to any hospital in Australia and New Zealand, with the random assignment weighted by hospital size. For each patient, predicted mortality probabilities had that patient been treated in each available hospital were calculated, then a weighted average was taken. These weighted average predicted probabilities were then summed over the patients within each hospital, resulting in the expected number of deaths. The standard error of the SMRs were estimated using 500 bootstrapped samples. The SMRs are presented with 95% false discovery rate (FDR) confidence intervals, that account for the multiple comparisons made between centres. The expected proportion of

centres identified falsely by lying outside their confidence interval is 0.05. 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 2015-2020 and remained on dialysis for more than 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. Missing values for comorbidities were recoded to the comorbidity being absent. Following the comorbidities being recoded, some observations still had missing values (n=1061) 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% FDR CI)
1	Access Nephrology	34 (1)	8	6.7	1.19 (0.41-3.39)
2	Alfred Hospital	366 (20)	117	85.5	1.37 (1.05-1.78)
3	Alice Springs Hospital	274 (31)	41	51.9	0.79 (0.51-1.23)
4	Austin Hospital	305 (4)	60	69.3	0.87 (0.63-1.19)
5	Bathurst Base Hospital	18 (0)	6	4.0	1.49 (0.53-4.21)
6	Bendigo Hospital	106 (1)	26	25.5	1.02 (0.56-1.85)
7	Bundaberg Hospital	87 (0)	21	20.9	1.01 (0.50-2.01)
8	Cairns Hospital	362 (13)	78	61.8	1.26 (0.92-1.73)
9	Cairns Private Hospital	22 (2)	6	4.5	1.32 (0.40-4.40)
10	Canberra Hospital	282 (4)	67	64.7	1.04 (0.76-1.42)
11	Central Northern Adelaide Renal Service	804 (37)	167	149.5	1.12 (0.90-1.38)
12	Chermside Dialysis Centre	54 (0)	18	13.4	1.34 (0.76-2.36)
13	Coffs Harbour Hospital	69 (13)	14	16.3	0.86 (0.42-1.76)
14	Diamond Valley B.Braun Renal Care Centre	36 (0)	6	13.8	0.43 (0.11-1.76)
15	Dubbo Base Hospital	87 (1)	24	29.3	0.82 (0.46-1.44)
16	Eastern Health Integrated Renal Services	296 (8)	45	68.4	0.66 (0.44-0.99)
17	Epworth Eastern Hospital	56 (0)	21	15.3	1.37 (0.72-2.61)
18	Epworth Geelong Hospital	14 (0)	1	4.1	0.24 (0.06-0.97)
19	Epworth Richmond Hospital	38 (6)	10	9.7	1.03 (0.37-2.83)
20	Fiona Stanley Hospital	664 (116)	118	104.2	1.13 (0.87-1.47)
21	Flinders Medical Centre	291 (5)	63	64.2	0.98 (0.69-1.39)
22	Forest Hill Dialysis Centre	55 (1)	13	14.9	0.87 (0.43-1.77)
23	Gold Coast Private Hospital	63 (0)	26	19.2	1.35 (0.77-2.37)

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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% FDR CI)
24	Gold Coast University Hospital	261 (21)	48	56.2	0.85 (0.60-1.21)
25	Gosford Hospital	217 (1)	58	57.8	1.00 (0.71-1.42)
26	Henry Dalziel Dialysis Clinic - Greenslopes	134 (5)	35	25.7	1.36 (0.80-2.33)
27	Hervey Bay Hospital	93 (0)	31	22.8	1.36 (0.85-2.17)
28	Ipswich Hospital	36 (0)	2	11.6	0.17 (0.03-1.16)
29	John Flynn Private Hospital	47 (1)	21	9.8	2.15 (1.11-4.16)
30	John Hunter Hospital	365 (5)	98	79.3	1.24 (0.94-1.62)
31	Launceston General Hospital	162 (4)	40	31.7	1.26 (0.78-2.03)
32	Lismore Base Hospital	104 (1)	27	35.3	0.77 (0.44-1.33)
33	Lismore St Vincent's Private Dialysis Centre	18 (2)	1	7.7	0.13 (0.02-0.94)
34	Liverpool Private Dialysis Centre	36 (4)	3	6.5	0.46 (0.07-3.11)
35	Mackay Base Hospital	115 (7)	27	23.7	1.14 (0.66-1.95)
36	Malvern Dialysis Centre	82 (2)	20	18.8	1.07 (0.53-2.14)
37	Manning Rural Referral Hospital	55 (3)	14	13.9	1.00 (0.44-2.32)
38	Mater Hospital, Brisbane	72 (3)	11	14.9	0.74 (0.32-1.70)
39	Mater Hospital, North Sydney	29 (0)	6	11.0	0.55 (0.14-2.14)
40	Mater Hospital, Townsville	33 (2)	9	7.9	1.14 (0.42-3.12)
41	Mayo Private Hospital	22 (1)	5	5.6	0.89 (0.17-4.57)
42	Monash Medical Centre	771 (34)	113	139.6	0.81 (0.63-1.04)
43	Mount Isa Base Hospital	20 (2)	0	4.1	0.00 (.-.)
44	Nambour Selangor Private Hospital	18 (3)	4	6.8	0.59 (0.12-2.89)
45	Newcastle Dialysis Centre	39 (1)	6	13.9	0.43 (0.11-1.68)
46	North Lakes Dialysis Centre	41 (0)	15	11.8	1.28 (0.61-2.68)
47	North Melbourne B.Braun Renal Care Centre	14 (1)	2	2.3	0.85 (0.15-4.99)
48	Northern Beaches Hospital	2 (0)	2	0.4	4.60 (0.13-167.32)
49	Northern Health Service Melbourne	188 (32)	36	41.3	0.87 (0.53-1.45)
50	Orange Health Service	63 (1)	15	9.6	1.57 (0.79-3.11)
51	Pindara Renal Unit	23 (1)	4	4.5	0.90 (0.20-4.04)
52	Port Macquarie Base Hospital	62 (4)	12	14.0	0.86 (0.39-1.90)

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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% FDR CI)
53	Port Macquarie Private Hospital	8 (0)	3	2.3	1.31 (0.43-3.98)
54	Princess Alexandra Hospital	579 (4)	123	104.9	1.17 (0.94-1.46)
55	Rockhampton Hospital	119 (4)	31	34.9	0.89 (0.53-1.49)
56	Royal Brisbane And Women's Hospital	370 (9)	67	73.6	0.91 (0.65-1.27)
57	Royal Darwin Hospital	361 (21)	66	71.1	0.93 (0.65-1.33)
58	Royal Hobart Hospital	134 (0)	37	25.6	1.45 (0.92-2.28)
59	Royal North Shore Hospital	323 (24)	52	69.7	0.75 (0.51-1.10)
60	Royal Perth Hospital	564 (49)	130	106.9	1.22 (0.94-1.58)
61	Sir Charles Gairdner Hospital	557 (38)	133	115.0	1.16 (0.91-1.47)
62	South West Sydney Renal Service	733 (49)	146	146.1	1.00 (0.80-1.25)
63	St Andrew's Ipswich Private Hospital	22 (2)	3	4.3	0.69 (0.13-3.81)
64	St Andrews Toowoomba B.Braun'S Dialysis Clinic	11 (0)	3	1.4	2.21 (0.36-13.48)
65	St George Hospital	255 (0)	59	64.6	0.91 (0.64-1.30)
66	St Vincent's Hospital (NSW)	135 (2)	32	36.6	0.87 (0.49-1.54)
67	St Vincent's Hospital (VIC)	327 (11)	59	77.8	0.76 (0.53-1.08)
68	Statewide Renal Services	577 (28)	130	134.1	0.97 (0.76-1.23)
69	Sunshine Coast University Hospital	178 (4)	32	34.9	0.92 (0.55-1.52)
70	Sunshine Coast University Private Hospital (Ramsay)	13 (3)	1	1.4	0.69 (0.09-5.43)
71	Sunshine Private Dialysis Centre - Fresenius	21 (2)	3	5.0	0.60 (0.10-3.64)
72	Sydney Adventist Hospital	46 (0)	16	16.0	1.00 (0.50-1.98)
73	Tamworth Hospital	106 (2)	33	20.5	1.61 (0.96-2.71)
74	The Prince Of Wales Hospital	130 (10)	24	33.5	0.72 (0.39-1.31)
75	The Royal Melbourne Hospital	667 (88)	118	105.2	1.12 (0.86-1.46)
76	The Tweed Hospital	86 (5)	21	16.9	1.25 (0.68-2.29)
77	The Wesley Hospital Brisbane	82 (48)	9	9.0	1.00 (0.34-2.89)
78	Thursday Island Hospital	15 (0)	3	3.7	0.82 (0.12-5.41)
79	Toowoomba Hospital	145 (7)	24	24.1	1.00 (0.57-1.74)
80	Townsville University Hospital	221 (23)	53	45.7	1.16 (0.81-1.67)
81	University Hospital Geelong Barwon Health	178 (1)	40	43.7	0.92 (0.59-1.43)

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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% FDR CI)
82	Western Health Service	383 (8)	62	89.2	0.70 (0.50-0.96)
83	Western Renal Service	933 (5)	168	219.6	0.77 (0.62-0.94)
84	Wollongong Hospital	222 (15)	51	45.5	1.12 (0.77-1.62)

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

Table 2: SMRs for New Zealand hospitals

	Hospital Name	No. Patients*	No. Deaths	No. Expected	SMR (95% FDR CI)
85	Auckland City Hospital	335 (1)	65	98.3	0.66 (0.47-0.93)
86	Christchurch Hospital	197 (0)	52	39.5	1.32 (0.94-1.84)
87	Dunedin Hospital	110 (1)	37	23.0	1.61 (1.01-2.55)
88	Hawkes Bay Hospital	136 (38)	28	23.8	1.17 (0.73-1.88)
89	Middlemore Hospital	638 (76)	137	149.3	0.92 (0.72-1.16)
90	Palmerston North Hospital	154 (31)	18	35.1	0.51 (0.26-1.02)
91	Taranaki Hospital	80 (1)	29	18.7	1.55 (0.95-2.52)
92	Waikato Hospital	698 (25)	206	162.9	1.26 (1.03-1.55)
93	Waitemata Renal Service	310 (17)	68	91.5	0.74 (0.53-1.05)
94	Wellington Regional Hospital	374 (1)	108	77.6	1.39 (1.09-1.77)
95	Whangarei Hospital	196 (0)	46	62.0	0.74 (0.49-1.13)

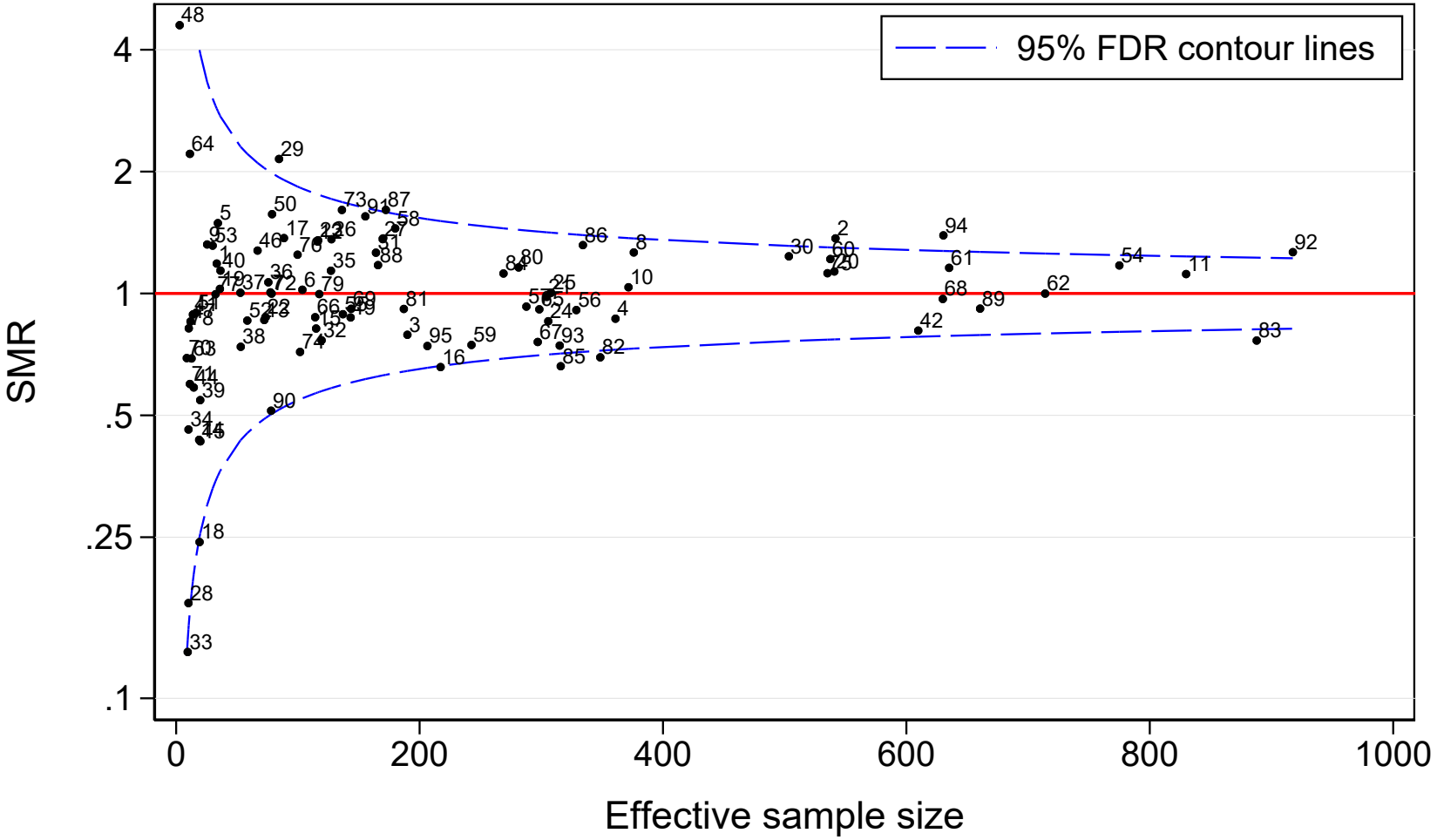
* The number in brackets is the number of patients excluded from Poisson regression due to missing data

2.2 Funnel Plot

This funnel plot shows the SMRs for all hospitals on a logarithmic scale (y-axis) plotted against the effective sample size (x-axis). Hospitals with an SMR of 0 are not shown. The red line indicates an SMR of 1, and the contours indicate 95% FDR confidence intervals. If a hospital lies within the confidence intervals then that hospital has an observed to expected ratio that is statistically consistent (at a 5% FDR level) with 1 (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. The SMR is presented on a logarithmic scale as confidence intervals for the logarithm of the SMR (log-SMR) have better coverage properties. The effective sample size measures the variability of each log-SMR relative to the overall variability of all log-SMRs.

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.



Missing comorbidities are recoded to being absent
Observations with other missing values are dropped from the model

2.3 Poisson Model Coefficients

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

	IRR	95% CI
Era of Treatment Start		
2015-2016	ref.	
2017-2018	0.983	(0.916-1.054)
2019-2020	0.955	(0.860-1.059)
Time Since Beginning Dialysis		
0-0.99 years	ref.	
1-1.99 years	1.192	(1.101-1.292)
2-2.99 years	1.443	(1.318-1.581)
3+ years	1.757	(1.597-1.934)
Age	1.027	(1.024-1.030)
Male	1.045	(0.977-1.117)
New Zealand	1.276	(1.091-1.492)
Diabetes (as comorbidity)	1.180	(1.069-1.302)
Chronic Lung Disease	1.314	(1.216-1.420)
Peripheral Vascular Disease	1.301	(1.208-1.402)
Cerebrovascular Disease	1.180	(1.082-1.286)
Coronary Artery Disease	1.327	(1.240-1.420)
Current or Former Smoker	1.117	(1.047-1.192)
Late Referral	1.328	(1.227-1.438)
BMI		
Underweight	1.278	(1.039-1.571)
Normal	ref.	
Overweight	0.868	(0.801-0.940)
Obese	0.757	(0.699-0.820)
Primary Kidney Disease		
Glomerulonephritis	ref.	
Diabetic Kidney Disease	1.661	(1.485-1.858)
Hypertension	1.285	(1.132-1.458)
Polycystic Disease	0.761	(0.604-0.959)
Reflux Nephropathy	1.069	(0.737-1.551)
Other	1.646	(1.453-1.865)
Uncertain diagnosis	1.469	(1.246-1.732)