
# DIALYSIS HOSPITAL REPORT

## 2018 - 2023

PUBLISHED September 2024
From the ANZDATA Database last surveyed on 31st December 2023

# 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 Changes from Previous Reports

Note the following change has been made for this report:

- ANZDATA has commenced using an annual linkage to the Australian National Death Index to identify deaths that have not been reported. This may have increased mortality rates and deaths without a cause of death reported. See the Technical Updates Report for more details.

# 3 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 3.3.

All patients aged $\geq$18 years who commenced dialysis during 2018-2023 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=629) 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.

## 3.1 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 | 35 (0) | 9 | 10.2 | 0.88 (0.34-2.30) |
| 2 | Alfred Hospital | 334 (20) | 83 | 89.1 | 0.93 (0.68-1.28) |
| 3 | Alice Springs Hospital | 323 (20) | 57 | 63.9 | 0.89 (0.62-1.28) |
| 4 | Austin Hospital | 330 (1) | 69 | 84.3 | 0.82 (0.58-1.16) |
| 5 | Bathurst Base Hospital | 30 (0) | 10 | 7.0 | 1.43 (0.58-3.57) |
| 6 | Bendigo Hospital | 120 (1) | 31 | 38.5 | 0.80 (0.48-1.34) |
| 7 | Bundaberg Hospital | 83 (0) | 23 | 25.0 | 0.92 (0.52-1.62) |
| 8 | Cairns Hospital | 378 (1) | 108 | 100.4 | 1.08 (0.80-1.45) |
| 9 | Cairns Private Hospital | 21 (0) | 8 | 7.6 | 1.06 (0.39-2.86) |
| 10 | Canberra Hospital | 322 (1) | 87 | 84.1 | 1.03 (0.78-1.38) |
| 11 | Central Northern Adelaide Renal Service | 916 (10) | 202 | 208.8 | 0.97 (0.80-1.17) |
| 12 | Chermside Dialysis Centre | 61 (0) | 21 | 17.4 | 1.21 (0.62-2.36) |
| 13 | Coffs Harbour Hospital | 81 (20) | 18 | 19.2 | 0.94 (0.49-1.78) |
| 14 | Concord Repatriation General Hospital | 182 (2) | 44 | 59.3 | 0.74 (0.48-1.14) |
| 15 | Diamond Valley B.Braun Renal Care Centre | 36 (0) | 13 | 14.9 | 0.87 (0.42-1.81) |
| 16 | Dubbo Base Hospital | 68 (1) | 12 | 21.9 | 0.55 (0.23-1.30) |
| 17 | Eastern Health Integrated Renal Services | 303 (2) | 63 | 90.6 | 0.70 (0.49-0.99) |
| 18 | Epworth Eastern Hospital | 44 (0) | 17 | 17.8 | 0.96 (0.45-2.03) |
| 19 | Epworth Geelong Hospital | 23 (0) | 7 | 9.2 | 0.76 (0.27-2.18) |
| 20 | Epworth Richmond Hospital | 33 (2) | 8 | 12.5 | 0.64 (0.22-1.84) |
| 21 | Fiona Stanley Hospital | 758 (85) | 188 | 166.3 | 1.13 (0.93-1.38) |
| 22 | Flinders Medical Centre | 293 (1) | 74 | 70.7 | 1.05 (0.77-1.43) |
| 23 | Forest Hill Dialysis Centre | 52 (1) | 21 | 26.2 | 0.80 (0.45-1.44) |

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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 Private Hospital | 59 (0) | 28 | 22.6 | 1.24 (0.76-2.02) |
| 25 | Gold Coast University Hospital | 298 (5) | 68 | 90.8 | 0.75 (0.52-1.07) |
| 26 | Gosford Hospital | 240 (0) | 88 | 67.3 | 1.31 (0.99-1.72) |
| 27 | Gregory Hills B.Braun Renal Care Centre | 33 (0) | 1 | 7.7 | 0.13 (0.02-0.80) |
| 28 | Henry Dalziel Dialysis Clinic - Greenslopes | 136 (0) | 34 | 32.0 | 1.06 (0.67-1.69) |
| 29 | Hervey Bay Hospital | 93 (0) | 22 | 23.1 | 0.95 (0.50-1.82) |
| 30 | Ipswich Hospital | 110 (2) | 25 | 19.1 | 1.31 (0.76-2.28) |
| 31 | John Flynn Private Hospital | 57 (0) | 22 | 14.6 | 1.51 (0.74-3.05) |
| 32 | John Hunter Hospital | 372 (1) | 108 | 103.9 | 1.04 (0.80-1.36) |
| 33 | Launceston General Hospital | 167 (2) | 35 | 34.5 | 1.01 (0.62-1.65) |
| 34 | Lismore Base Hospital | 113 (0) | 29 | 35.6 | 0.82 (0.48-1.38) |
| 35 | Lismore St Vincent's Private Dialysis Centre | 22 (1) | 6 | 10.1 | 0.60 (0.20-1.80) |
| 36 | Liverpool Private Dialysis Centre | 27 (0) | 4 | 9.9 | 0.40 (0.10-1.64) |
| 37 | Mackay Base Hospital | 134 (1) | 39 | 33.2 | 1.17 (0.80-1.73) |
| 38 | Malvern Dialysis Centre | 81 (0) | 30 | 31.2 | 0.96 (0.55-1.67) |
| 39 | Manning Rural Hospital | 57 (2) | 13 | 14.8 | 0.88 (0.41-1.85) |
| 40 | Mater Hospital, Brisbane | 87 (1) | 15 | 25.1 | 0.60 (0.27-1.33) |
| 41 | Mater Hospital, North Sydney | 34 (1) | 6 | 15.5 | 0.39 (0.09-1.66) |
| 42 | Mater Hospital, Townsville | 39 (1) | 13 | 12.9 | 1.01 (0.47-2.18) |
| 43 | Mayo Private Hospital | 21 (2) | 7 | 8.6 | 0.81 (0.24-2.77) |
| 44 | Monash Medical Centre | 865 (14) | 169 | 204.8 | 0.83 (0.67-1.02) |
| 45 | Morayfield B.Braun Renal Care Centre | 9 (0) | 3 | 4.5 | 0.66 (0.17-2.52) |
| 46 | Mount Isa Base Hospital | 40 (4) | 7 | 13.2 | 0.53 (0.17-1.66) |
| 47 | Nambour Selangor Private Hospital | 12 (1) | 4 | 3.8 | 1.06 (0.39-2.87) |
| 48 | Newcastle Dialysis Centre | 49 (0) | 19 | 17.6 | 1.08 (0.63-1.83) |
| 49 | North Lakes Dialysis Centre | 46 (0) | 20 | 14.2 | 1.41 (0.75-2.63) |
| 50 | North Melbourne B.Braun Renal Care Centre | 20 (1) | 4 | 6.2 | 0.65 (0.09-4.43) |
| 51 | Northern Health Service Melbourne | 232 (34) | 40 | 52.9 | 0.76 (0.50-1.15) |
| 52 | Orange Health Service | 67 (2) | 15 | 13.9 | 1.08 (0.54-2.13) |

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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 | Pindara Renal Unit | 33 (0) | 13 | 10.3 | 1.26 (0.63-2.54) |
| 54 | Port Macquarie Base Hospital | 75 (1) | 17 | 19.0 | 0.89 (0.51-1.57) |
| 55 | Port Macquarie Private Hospital | 21 (0) | 10 | 4.7 | 2.13 (1.10-4.10) |
| 56 | Princess Alexandra Hospital | 597 (2) | 136 | 121.7 | 1.12 (0.89-1.40) |
| 57 | Rockhampton Hospital | 115 (4) | 43 | 41.3 | 1.04 (0.67-1.62) |
| 58 | Royal Brisbane And Women's Hospital | 401 (31) | 101 | 93.0 | 1.09 (0.83-1.42) |
| 59 | Royal Darwin Hospital | 392 (19) | 111 | 79.8 | 1.39 (1.08-1.80) |
| 60 | Royal Hobart Hospital | 132 (1) | 39 | 31.0 | 1.26 (0.82-1.92) |
| 61 | Royal North Shore Hospital | 356 (14) | 60 | 88.0 | 0.68 (0.49-0.95) |
| 62 | Royal Perth Hospital | 609 (9) | 160 | 159.7 | 1.00 (0.81-1.24) |
| 63 | Royal Prince Alfred Hospital | 274 (4) | 43 | 75.8 | 0.57 (0.38-0.85) |
| 64 | Sir Charles Gairdner Hospital | 604 (9) | 155 | 159.9 | 0.97 (0.78-1.21) |
| 65 | South Eastern Private Hospital Dialysis Centre | 21 (1) | 1 | 5.7 | 0.18 (0.03-0.91) |
| 66 | South West Sydney Renal Service | 797 (2) | 192 | 204.4 | 0.94 (0.77-1.14) |
| 67 | St Andrew's Ipswich Private Hospital | 52 (0) | 15 | 16.1 | 0.93 (0.47-1.84) |
| 68 | St Andrew's Toowoomba B.Braun's Dialysis Clinic | 24 (0) | 10 | 5.5 | 1.80 (0.59-5.51) |
| 69 | St George Hospital | 260 (0) | 63 | 71.9 | 0.88 (0.61-1.25) |
| 70 | St Vincent's Hospital (NSW) | 138 (1) | 31 | 45.4 | 0.68 (0.42-1.12) |
| 71 | St Vincent's Hospital (VIC) | 333 (0) | 80 | 102.7 | 0.78 (0.57-1.06) |
| 72 | Sunshine Coast University Hospital | 185 (1) | 32 | 48.5 | 0.66 (0.40-1.09) |
| 73 | Sunshine Coast University Private Hospital (Ramsay) | 28 (1) | 7 | 8.3 | 0.84 (0.28-2.54) |
| 74 | Sunshine Private Dialysis Centre - Fresenius | 30 (5) | 7 | 10.5 | 0.67 (0.21-2.11) |
| 75 | Sydney Adventist Hospital | 52 (0) | 17 | 24.4 | 0.70 (0.31-1.55) |
| 76 | Tamworth Hospital | 113 (3) | 28 | 22.7 | 1.23 (0.73-2.09) |
| 77 | The Prince Of Wales Hospital | 126 (7) | 35 | 33.5 | 1.05 (0.65-1.68) |
| 78 | The Royal Melbourne Hospital | 715 (38) | 139 | 138.2 | 1.01 (0.79-1.28) |
| 79 | The Wesley Hospital Brisbane | 96 (47) | 6 | 6.4 | 0.94 (0.29-3.04) |
| 80 | Toowoomba Hospital | 162 (6) | 42 | 33.5 | 1.25 (0.82-1.91) |
| 81 | Torres & Cape Kidney Health | 38 (0) | 3 | 9.0 | 0.33 (0.05-2.15) |

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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 | Townsville University Hospital | 243 (10) | 51 | 63.5 | 0.80 (0.53-1.21) |
| 83 | Tweed Valley Hospital | 82 (2) | 24 | 23.4 | 1.02 (0.55-1.92) |
| 84 | University Hospital Geelong Barwon Health | 177 (0) | 41 | 43.2 | 0.95 (0.63-1.43) |
| 85 | Wagga Wagga Base Hospital | 150 (10) | 34 | 38.8 | 0.88 (0.54-1.42) |
| 86 | Western Health Service | 414 (0) | 77 | 111.7 | 0.69 (0.51-0.94) |
| 87 | Western Renal Service | 1061 (2) | 270 | 272.8 | 0.99 (0.84-1.17) |
| 88 | Wollongong Hospital | 240 (14) | 61 | 57.7 | 1.06 (0.74-1.51) |

* 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) |
|---|---|---|---|---|---|
| 89 | Auckland City Hospital | 371 (3) | 76 | 99.2 | 0.77 (0.55-1.06) |
| 90 | Bay Of Plenty Renal Unit | 143 (3) | 25 | 28.6 | 0.87 (0.51-1.50) |
| 91 | Christchurch Hospital | 215 (2) | 44 | 30.3 | 1.45 (1.00-2.12) |
| 92 | Dunedin Hospital | 135 (0) | 53 | 22.3 | 2.37 (1.59-3.55) |
| 93 | Hawkes Bay Hospital | 122 (10) | 41 | 19.9 | 2.06 (1.38-3.07) |
| 94 | Middlemore Hospital | 804 (43) | 171 | 146.7 | 1.17 (0.95-1.43) |
| 95 | Palmerston North Hospital | 187 (45) | 31 | 33.2 | 0.93 (0.58-1.51) |
| 96 | Taranaki Hospital | 75 (0) | 27 | 17.8 | 1.51 (0.88-2.62) |
| 97 | Waikato Hospital | 617 (20) | 209 | 138.6 | 1.51 (1.27-1.78) |
| 98 | Waitemata Renal Service | 359 (12) | 76 | 84.5 | 0.90 (0.64-1.26) |
| 99 | Wellington Regional Hospital | 409 (3) | 128 | 68.5 | 1.87 (1.47-2.38) |
| 100 | Whangarei Hospital | 178 (0) | 55 | 49.8 | 1.10 (0.75-1.62) |

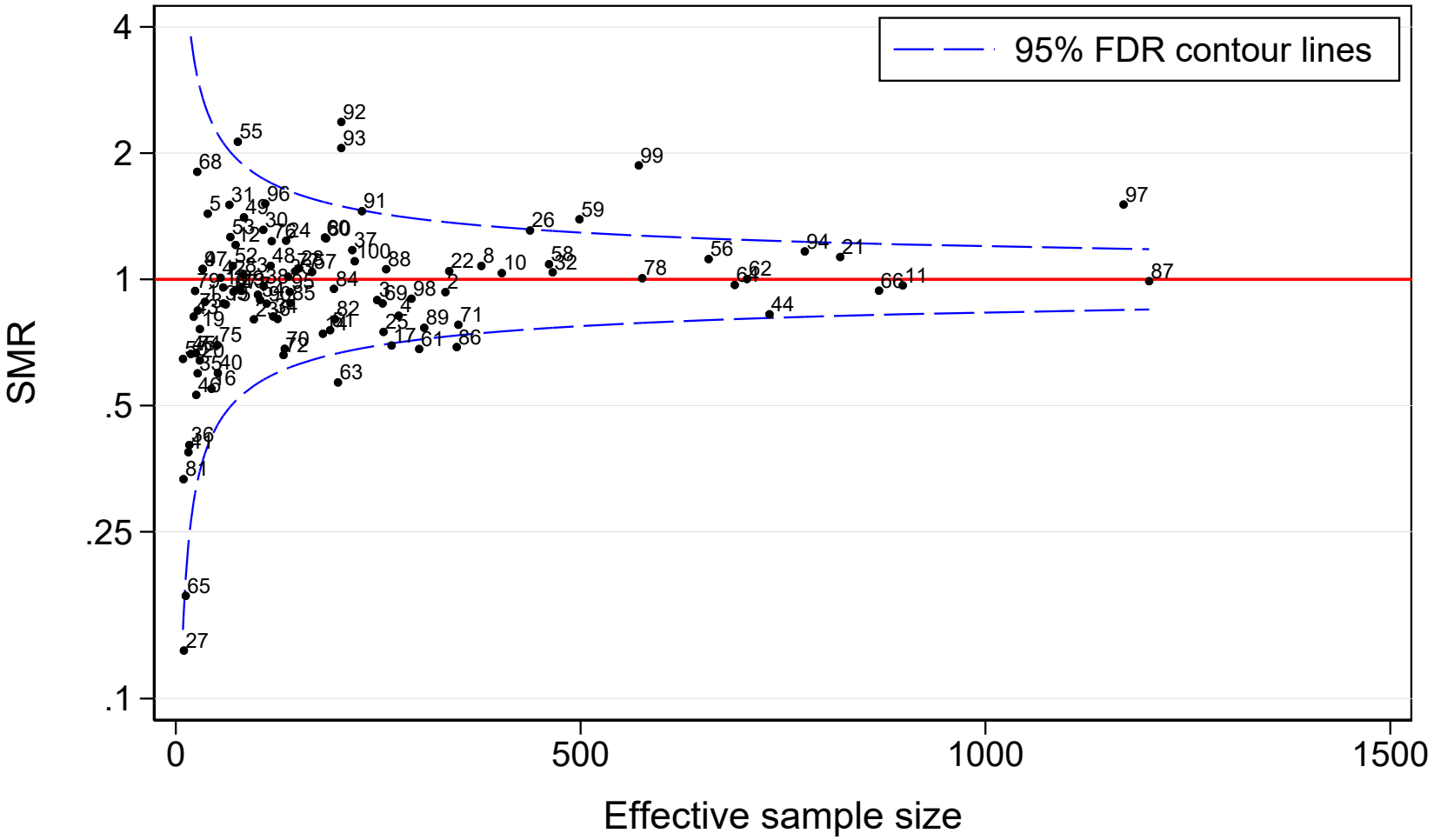
* The number in brackets is the number of patients excluded from Poisson regression due to missing data

## 3.2 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

## 3.3 Poisson Model Coefficients

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

| | IRR | 95% CI |
|---|---|---|
| **Era of Treatment Start** | | |
| 2018-2019 | ref. | |
| 2020-2021 | 1.077 | (1.012-1.146) |
| 2022-2023 | 1.030 | (0.936-1.132) |
| **Time Since Beginning Dialysis** | | |
| 0-0.99 years | ref. | |
| 1-1.99 years | 1.257 | (1.169-1.352) |
| 2-2.99 years | 1.583 | (1.459-1.717) |
| 3+ years | 2.050 | (1.881-2.233) |
| **Age** | 1.031 | (1.028-1.033) |
| **Male** | 1.019 | (0.960-1.082) |
| **Diabetes (as comorbidity)** | 1.208 | (1.106-1.319) |
| **Chronic Lung Disease** | 1.282 | (1.195-1.376) |
| **Peripheral Vascular Disease** | 1.300 | (1.215-1.391) |
| **Cerebrovascular Disease** | 1.153 | (1.065-1.249) |
| **Coronary Artery Disease** | 1.383 | (1.301-1.470) |
| **Current or Former Smoker** | 1.129 | (1.065-1.196) |
| **Late Referral** | 1.349 | (1.252-1.453) |
| **BMI** | | |
| Underweight | 1.196 | (1.003-1.426) |
| Normal | ref. | |
| Overweight | 0.820 | (0.763-0.882) |
| Obese | 0.767 | (0.714-0.823) |
| **Primary Kidney Disease** | | |
| Glomerular Disease | ref. | |
| Diabetic kidney disease | 1.771 | (1.602-1.957) |
| Hypertension / Renal vascular disease | 1.277 | (1.139-1.431) |
| Familial / hereditary kidney diseases | 0.680 | (0.556-0.832) |
| Tubulointerstitial disease | 1.428 | (1.244-1.639) |
| Other systemic diseases affecting the kidney | 2.447 | (2.068-2.895) |
| Miscellaneous kidney disorders | 1.510 | (1.338-1.704) |