Insurance status and mortality in critically ill patients

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ABSTRACT

Objective: The association between insurance status and outcome in critically ill patients is uncertain. We aimed to determine if there was an independent relationship between the presence or absence of compensable insurance status and mortality, after admission to the intensive care unit.

Methods: We performed a retrospective cohort study in five public hospitals in Victoria, comprising adult patients admitted to the ICU between 2007 and 2012. We obtained data on demographics, severity of illness, chronic health status, insurance category, length of stay (LOS) and mortality. We matched socio-economic indices (collected from the Australian Bureau of Statistics) to postcodes. The primary outcome measured was in-hospital mortality. Secondary outcomes were ICU mortality, and ICU and hospital LOS, measured in days.

Results: We studied 33 306 patients. Compensable patients comprised 21.2% of the study population (7046). Personal private insurance accounted for 13.4% (4451) and Transport Accident Commission insurance for 5.1% (1701) of compensable patients. Unadjusted in-hospital mortality was higher in publicly insured patients (13.4% v 10.6%, $P < 0.0001$). After adjusting for age, severity of illness, diagnosis and socio-economic status, being a compensable patient in a public hospital ICU was independently associated with a reduction in mortality (odds ratio, 0.73; 95% CI, 0.65–0.80; $P < 0.001$).

Conclusions: Among ICU patients treated in public hospitals in Victoria, being a compensable patient appears to be independently associated with a reduction in mortality. Further studies are needed to confirm and validate these findings elsewhere in Australia.

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Outcomes of critical illness may be influenced by a patient's insurance status. For example, in the United States, critically ill patients without health insurance receive fewer critical care services, are less likely to receive appropriate care once they have gained access to the health care system and may experience worse clinical outcomes.[1] Once admitted, they receive 8.5% fewer procedures, are more likely to experience hospital discharge delays and are more likely to have life support withdrawn.[1] It is unclear whether these results are generalisable in Australia, where a comprehensive, publicly-funded universal health care system exists.[2]

Within the Australian system, the treatment of patients admitted to hospital is funded via two different streams, according to the availability of monetary compensation from private or other government-subsidised schemes, such as the Transport Accident Commission (TAC) in Victoria. This uncapped revenue is obtained from private patients through accommodation fees, prosthesis payments and medical fees. In the case of salaried medical staff, the medical fees are retained by the public hospital. Private billing also unlocks money directly from the federal government, bypassing the states. Once a patient elects to be admitted as a private patient, 75% of all scheduled medical fees can be billed to the federal government, including fees for surgeons, anaesthetists, diagnostic radiological procedures and pathology tests. Thus, patients who elect to be admitted as private patients are not financially disadvantaged, although hospital revenue is enhanced. Finally, the allocation of financial remuneration to individual doctors generated by billing compensable patients in public hospitals varies between health services.

The aim of our study was to assess whether there is a relationship between the insurance status of a patient and their outcome after admission to an intensive care unit. We hypothesised that there would be an independent relationship between insurance status (compensable v public insurance) and hospital mortality, even after adjustment for confounding factors.

Methods

Study design

Our study was a retrospective cohort study that involved analysis of data from individual hospital ICU databases and hospital administrative databases. Individual patient identifiers were removed at the study hospitals, and a single dataset was created containing de-identified patient and hospital-level data for analysis.

Setting

Hospital A (36 ICU beds), Hospital B (24 ICU beds) and Hospital D (16 ICU beds) were teaching hospitals in metropolitan Melbourne, Victoria, with full cardiothoracic and neurosurgical services. Hospital A was one of two adult major trauma centres in Victoria. It was also the state centre for heart and lung transplantation, mechanical circulatory assistance, cystic fibrosis and HIV, and was one of two centres for bone marrow transplantation. Hospital B provided the state service for liver transplantation, spinal

surgery and spinal rehabilitation. Hospital C (20 ICU beds) was a tertiary referral hospital located about 70 km from Melbourne, providing cardiothoracic and general services to the local and regional population. Hospital E (12 ICU beds) was a metropolitan hospital providing general medical and surgical services to the local population.

Patients

All patients admitted to the ICUs at these five hospitals between 2007 and 2012 (inclusive) were eligible for enrolment. Hospitals A, C and D provided data for all 6 years; Hospital B provided data from 2010 to 2012; and Hospital E provided data for the final 2 years of our study. We excluded readmission episodes to the ICU, patients aged under 18 years, patients whose insurance category was unknown, and patients with no primary outcome listed.

Variables

Final insurance status on discharge from hospital was obtained from administrative databases and was categorised into six mutually exclusive categories:

- public (Medicare and overseas nationals with reciprocal rights to public health care)
- privately insured
- TAC
- Veterans' Affairs (VA)
- WorkCover (WC)
- other (members of the armed forces, overseas nationals and compensable patients not otherwise classified).
- Participant data included:
- demographic data (age, sex, postcode)
- severity of illness scores (Acute Physiology and Chronic Health Evaluation [APACHE II] and Acute Physiology, Age and Chronic Health Evaluation, calibrated for Australian hospitals [APACHE III-j])
- chronic health information (as recorded for the APACHE scoring systems)
- length of stay (LOS) in the ICU and in hospital.

Clinical diagnoses were collapsed into 29 mutually exclusive diagnostic groups (see Appendix online at cicm.org.au/Resources/Publications/Journal, Table 3). Socio-economic information was downloaded from the Australian Bureau of Statistics[3] and the relevant Index of Relative Socio-economic Advantage and Disadvantage (IRSAD) was matched to each patient's postcode. The IRSAD summarises information on economic and social conditions of people and households within a geographic area. A low score indicates relatively greater disadvantage and a lack of advantage in general. Census data are used to generate the IRSAD from domains including household income, education, employment, occupation and housing standards.

Table 1. Distribution of patients by insurance category

Insurance category	*n* (%)
Public	26 260 (78.8%)
Medicare	26 211 (78.7%)
Reciprocal medical rights	49 (0.1%)
Compensable scheme	6802 (20.4%)
Privately insured	4451 (13.4%)
Transport Accident Commission	1701 (5.1%)
Veterans' Affairs	421 (1.3%)
WorkCover	229 (0.7%)
Other	244 (0.7%)
Overseas nationals	184 (0.6%)
Armed forces	6 (0.02%)
Others	54 (0.16%)
Total	*33 306 (100%)*

The primary outcome measured was in-hospital mortality. Secondary outcomes were ICU mortality, and ICU and hospital LOS, measured in days. No data were obtained after hospital discharge.

Statistical analysis

Data were analysed using Stata, version 12.0 (StataCorp). Parametric data are shown as means and SDs, non-parametric data as medians and interquartile ranges (IQRs), and categorical variables as numbers and percentages. To examine the effect on outcome, insurance status was initially analysed as a single binary variable (public v compensable patients, which included privately insured, TAC, VA, WC and other) and then subsequently analysed by considering each of the six mutually exclusive insurance categories. Univariable analyses (using the Student *t* test, Wilcoxon rank-sum test, Kruskal–Wallis test and χ^2 test, as appropriate, depending on the distribution of the data) were performed to compare groups. Two-sided *P* values < 0.05 were considered significant.

To further account for existing imbalances between insured and uninsured patients, we undertook a multivariable logistic regression. This was to model the effect of insurance status on in-hospital mortality after adjusting for socio-economic factors, age, diagnosis, post-operative status, year of admission, hospital and illness severity, with hospital site treated as a random effect. We assessed discrimination using the area under the receiver operating characteristic (ROC) curve, and assessed calibration using the Hosmer–Lemeshow c statistic and associated *P* value.

Table 2. Demographic and clinical characteristics of individual insurance groups*

Characteristic	Public (*n* = 26 260)	Private (*n* = 4451)	TAC (*n* = 1701)	VA (*n* = 421)	WC (*n* = 229)	Other (*n* = 244)
Age (years), median (IQR)	64 (51–74)	66 (55–76)	42 (27–62)	83 (80–87)	42 (30–54)	48 (28–65)
Male, % (*n*)	63.5% (16 672)	60.7% (2714)	69.8% (1234)	62.9% (265)	90.4% (208)	73.8% (186)
Duration of MV (hours), median (IQR)	11.5 (0–40.8)	9.0 (0–51)	34.0 (0–158)	0 (0–49.8)	20.7 (0–132)	22.9 (0–98.2)
IRSAD decile, mean (SD)	5.6 (2.8)	6.8 (2.6)	5.9 (2.8)	6.2 (2.6)	5.7 (2.7)	6.3 (2.6)
Severity of illness, mean (SD)						
APACHE II score	16.1 (7.2)	15.8 (6.8)	13.5 (6.4)	18.1 (6.4)	11.8 (6.1)	15.8 (7.8)
APACHE III-j score	55.9 (26.0)	56.4 (24.4)	45.5 (22.8)	66.7 (23.4)	38.7 (20.1)	54.2 (28.9)
APACHE III-j score (without age component)	45.6 (24.9)	45.1 (23.2)	40.2 (21.8)	47.4 (22.5)	35.6 (19.4)	48.2 (27.9)
Chronic comorbidities, % (*n*/*n*)†						
Chronic cardiovascular disease	5.8% (1425/24 438)	5.6% (241/4329)	1.1% (19/1659)	8.2% (34/416)	0 (0/225)	1.8% (4/217)
Chronic respiratory disease‡	4.8% (1169/24 448)	4.6% (199/4332)	1.8% (30/1659)	3.1% (13/414)	1.8% (4/224)	0.5% (1/217)
Chronic dialysis before ICU admission	2.4% (591/24 470)	3.1% (136/4331)	0.2% (3/1661)	1.7% (7/415)	1.3% (3/225)	0.5% (1/217)
Cirrhosis§	2.7% (657/24 455)	2.9% (124/4332)	0.5% (8/1655)	1.4% (6/415)	0.4% (1/226)	1.8% (4/217)
Insulin-dependent diabetes mellitus	5.2% (951/18 418)	4.3% (165/3848)	1.9% (32/1657)	4.2% (15/354)	2.4% (5/210)	4.8% (7/146)
Immunosuppression	10.8% (881/8131)	17.5% (211/1205)	0.7% (11/1536)	1.0% (1/99)	1.5% (3/196)	6.6% (6/91)
Cancer¶	2.7% (663/24 417)	3.8% (165/4320)	0.2% (3/1653)	3.6% (15/411)	0 (0/224)	2.3% (5/216)
Outcomes						
In-hospital mortality, % (*n*)	13.4% (3522)	10.5% (470)	8% (141)	23% (97)	7% (16)	13.1% (33)
In-ICU mortality, % (*n*/*n*)†	8.4% (2208/26 200)	5.9% (262/4439)	4.7% (80/1688)	12.9% (54/420)	4.4% (10/229)	8.6% (21/243)
Length of ICU stay (days), median (IQR)	1.8 (0.9–3.8)	1.8 (0.9–3.6)	3.8 (1.7–9.1)	1.9 (0.9–3.5)	3.1 (1.5–7.9)	2.2 (1.1–5.6)
Length of hospital stay (days), median (IQR)	10.7 (6.3–20.3)	13.0 (7.2–24.4)	12.9 (7.9–22.9)	12.8 (7.0–20.8)	14.9 (7.3–26.4)	12.4 (5.7–22.6)

TAC = Transport Accident Commission. VA = Veterans' Affairs. WC = WorkCover. IQR = interquartile range. MV = mechanical ventilation. IRSAD = Index of Relative Socio-economic Advantage and Disadvantage. APACHE = Acute Physiology and Chronic Health Evaluation. ICU = intensive care unit. * All *P* values for comparison across group < 0.0001. † Incomplete data; denominators shown. ‡ New York Heart Classification Stage IV or requiring long-term oxygen therapy. § Biopsy-proven cirrhosis or chronic liver disease with portal hypertension. ¶ Metastases, lymphoma or leukaemia.

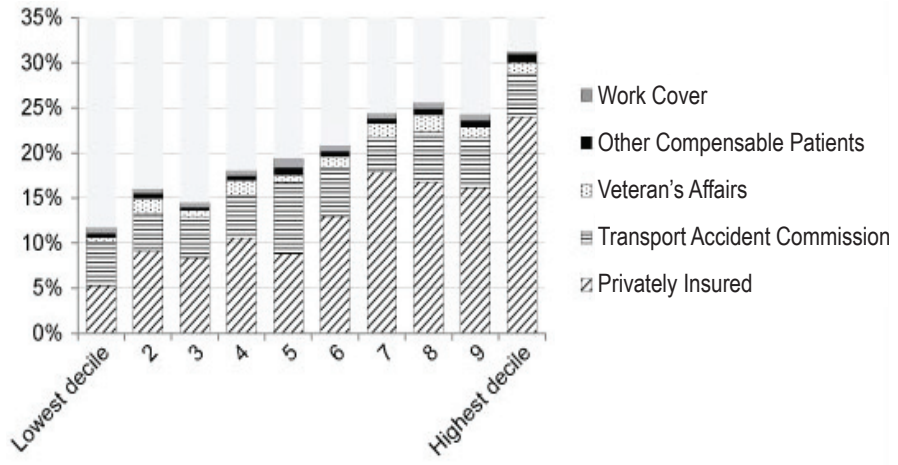
We performed a multivariable linear regression to model the effect of insurance status on LOS in the ICU and in hospital, after log transformation of each, and reported results as geometric means or ratios. To avoid a confounding effect of age in the multivariate analyses, its component was removed from the APACHE III score. This represents a score based on physiological and biochemical disturbances in the first 24 hours of the ICU admission, with markers of pre-existing chronic organ failure.

Results

Distribution by hospital

From the five hospitals, over the study period, there were 35 185 ICU admissions reported to us. Of these, the following admissions were excluded from the study: 279 patients aged under 18 years, 1846 readmission episodes to the ICU, and 33 admissions for which the insurance category was unknown. The remaining 33 306 patients represented the study population (Hospital A, 11 499; Hospital B, 5628; Hospital C, 7773; Hospital D, 6684; Hospital E, 1722) (see Appendix, Tables 1 and 2).

Figure 1. Proportion of patients in each decile of the Index of Relative Socio-economic Advantage and Disadvantage, by insurance category



Distribution by insurance category

Most patients (78.8%; 26 260/33 306) were classified as public, with 7046 patients (21.2%) compensable at time of discharge (Table 1). The subgroups of compensable patients were: 4451 patients (13.4%) with private insurance; 1701 (5.1%) compensable by the TAC; 421 (1.3%) compensable by VA; 229 (0.7%) compensable by WC; and 244 (0.7%) with other insurance (see Appendix, Table 2, for a breakdown of insurance category by hospital of admission).

Diagnoses leading to ICU admission

Patient diagnoses leading to ICU admission are listed in the Appendix, Table 3.

Demographic data

Overall, public patients were older, had greater illness severity scores, had a higher prevalence of chronic cardiovascular and respiratory disease and diabetes, and came from lower socio-economic areas (Figure 1). The median age of patients was greatest in the VA group (83 years; IQR, 80–87 years), followed by privately insured patients (median, 66 years; IQR, 55–76 years) and then publicly insured patients (median, 64 years; IQR, 51–74 years) (Table 2). Median ages were lowest in the WC group (42 years; IQR, 30–54 years) and the TAC group (42 years; IQR, 27–62 years). APACHE III-j scores were highest in the VA group (mean, 66.7; SD, 23.4) and lowest in the WC group (mean, 38.7; SD, 20.1). Publicly and privately insured patients and VA patients showed a high proportion of chronic cardiovascular disease. VA patients were most commonly admitted after gastrointestinal surgery, and trauma was the most common diagnosis in both the WC and TAC cohorts, consistent with the mechanism of allocation to these compensable groups (see Appendix, Table 3).

Mortality

Unadjusted in-hospital mortality was higher for public patients than compensable patients (13.4% v 10.6%; $P < 0.0001$), as was ICU mortality (8.4% v 6.1%; $P < 0.0001$) (Table 3). After adjusting for age, severity of illness, diagnosis and socio-economic status, compensable patients had reduced odds of death (adjusted odds ratio [OR], 0.73; 95% CI, 0.65–0.80; $P < 0.001$). When examining the specific insurance categories, only the privately insured and TAC groups showed a significant mortality benefit after adjustment for confounding factors (adjusted OR, 0.71; 95% CI, 0.63–0.80; adjusted OR, 0.54; 95% CI, 0.42–0.69; respectively; $P < 0.001$). Adjusted ORs for mortality in the smaller groups (WC, VA and other compensable patients) were not significant (Table 4). Complete regression models are shown in the Appendix, Tables 4 and 5. Logistic regression models for mortality showed good discrimination (area under ROC curve > 0.85) and calibration ($P > 0.05$).

Length of stay

The ICU LOS was longer for compensable patients (median, 2.0 days; IQR, 1.0–4.6 days) than for public patients (median, 1.8 days; IQR, 0.9–3.8 days; $P < 0.0001$) (Table 3). The hospital LOS was also longer for compensable patients (median, 13.0 days; IQR, 7.3–23.8 days) than public patients (median, 10.7 days; IQR, 6.3–20.3 days; $P < 0.001$). These differences persisted after adjusting for confounding factors (ICU LOS, compensable patients: geometric mean, 1.9 days; 95% CI, 1.88–2.00 days v public patients: geometric mean, 1.79 days; 95% CI, 1.77–1.82 days; $P < 0.001$; hospital LOS, compensable patients: geometric mean, 11.9 days; 95% CI, 11.5–12.2 days v public patients: geometric mean, 10.5 days; 95% CI, 10.4–10.7 days; $P < 0.001$). After adjusting for confounding factors, compensable patients stayed a mean of 8% longer in the ICU (95% CI, 5%–12%) and a mean of 13% longer in hospital (95% CI, 9%–16%) ($P < 0.0001$ for both). Risk-adjusted analyses of LOS are shown in the Appendix, Tables 6 and 7.

Table 3. Clinical characteristics of the two patient cohorts (public v compensable insurance)

Characteristic	All patients (*n* = 33 306)	Public (*n* = 26 260)	Compensable (*n* = 7046)	*P*
Age (years), median (IQR)	64 (50–74)	64 (51–74)	63 (46–75)	< 0.0001
Male, % (*n*)	63.7% (21 225)	63.5% (16 762)	64.4% (4540)	< 0.0001
Duration of MV in hours, median (IQR)	12.0 (0–49.2)	11.5 (0–40.8)	15.1 (0–101.3)	< 0.0001
IRSAD decile, mean (SD)	5.8 (2.8)	5.6 (2.8)	6.5 (2.7)	< 0.0001
Severity of illness, mean (SD)				
APACHE II score	15.9 (7.1)	16.1 (7.1)	15.3 (6.8)	< 0.0001
APACHE III-j score	55.4 (25.8)	55.9 (26.0)	53.7 (24.8)	< 0.0001
APACHE III-j score (without age component)	45.2 (24.5)	45.6 (24.9)	43.9 (24.5)	< 0.0001
Chronic comorbidities, % (*n*/*n*)*				
Chronic cardiovascular disease	5.5% (1723/31 284)	5.8% (1425/24 438)	4.4% (298/6846)	< 0.0001
Chronic respiratory disease†	4.5% (1416/31 294)	4.8% (1169/24 448)	3.6% (247/6846)	< 0.0001
Chronic dialysis before ICU admission	2.4% (741/31 139)	2.4% (591/24 470)	2.2% (150/6849)	0.28
Cirrhosis‡	2.6% (800/31 300)	2.7% (657/24 455)	2.1% (143/6845)	0.006
Insulin-dependent diabetes mellitus	4.8% (1175/24 633)	5.2% (951/18 418)	3.6% (224/6215)	< 0.0001
Immunosuppression	9.9% (1113/11 258)	10.8% (881/8131)	7.4% (232/3127)	< 0.0001
Cancer§	2.7% (851/31 241)	2.7% (663/24 417)	2.8% (188/6824)	0.86
Admission source, % (*n*)				
Emergency department	30.6% (10 206)	29.5% (7741)	35% (2465)	< 0.0001
Operating theatres	45.7% (15 224)	46.2% (12 121)	44% (3103)	
Wards	14.2% (4721)	14.2% (3718)	14.2% (1003)	
Other¶	8.7% (2905)	9.5% (2493)	5.8% (412)	
Unknown	0.8% (250)	0.7% (187)	0.9% (63)	
Outcomes				
In-hospital mortality, % (*n*)	12.8% (4263)	13.4% (3515)	10.6% (748)	< 0.0001
In-ICU mortality, % (*n*/*n*)*	7.9% (2635/33 219)	8.4% (2208/26 200)	6.1% (427/7109)	< 0.0001
Length of ICU stay (days), median (IQR)	1.9 (0.9–3.9)	1.8 (0.9–3.8)	2.0 (1.0–4.6)	< 0.0001
Length of hospital stay (days), median (IQR)	11.1 (6.5–21.1)	10.7 (6.3–20.3)	13.0 (7.3–23.8)	< 0.0001

IQR = interquartile range. MV = mechanical ventilation. IRSAD = Index of Relative Socio-economic Advantage and Disadvantage. ACHE = Acute Physiology and Chronic Health Evaluation. ICU = intensive care unit. * Incomplete data; denominators shown. † New York Heart Classification Stage IV or requiring long-term oxygen therapy. ‡ Biopsy-proven cirrhosis or chronic liver disease with portal hypertension. § Metastases, lymphoma or leukaemia. ¶ Other ICU at same hospital, other hospital, or other hospital ICU.

Table 4. Univariate and multivariate associations between insurance status and in-hospital mortality, public v all compensable patients, and by individual insurance groups

Association	In-hospital mortality, unadjusted OR	95% CI	*P*	In-hospital mortality, adjusted OR*	95% CI	*P*
Public v all compensable patients						
Compensable (compared with public patients)	0.77	0.70–0.83	< 0.001	0.73	0.65–0.80	< 0.001
Public v individual insurance groups						
Public (reference category)	1.00	–	–	1.00	–	–
Privately insured	0.76	0.69–0.84	< 0.001	0.71	0.63–0.80	< 0.001
Transport Accident Commission	0.55	0.46–0.65	< 0.001	0.54	0.42–0.69	< 0.001
Veterans' Affairs	1.93	1.53–2.42	< 0.001	1.13	0.86–1.49	0.38
WorkCover	0.49	0.29–0.81	0.005	0.79	0.45–1.39	0.41
Other compensable patients	1.01	0.70–1.46	0.97	0.89	0.54–1.46	0.65

OR = odds ratio. * Adjusted for age, Acute Physiology and Chronic Health Evaluation III-j score (with age component removed), Index of Relative Socio-economic Advantage and Disadvantage, diagnosis, hospital and year of admission to ICU (see Appendix, Tables 4 and 5, for full logistic regression models).

Discussion

In this large retrospective study of patients admitted to public hospital ICUs, we found that compensable patients were less likely to die than public patients.

Relationship to previous studies

Insurance status is likely a surrogate measure of one of many socio-economic factors (eg, ethnicity, sex, education and income), which have important implications for improved access, and active engagement with health issues.[4,5] The higher mortality risk seen in the public insurance group in our study may be due to poor baseline health, chronic illness, poor health practices, poor access to health services before and after admission, and a lack of social cohesion and education, for which we have been unable to adequately adjust. All of these may hinder recovery from critical illness.

Multiple studies in the US have compared uninsured patients with patients who had insurance; those who were uninsured and critically ill were more likely to have life support withdrawn,[6] less likely to have an invasive procedure[7] or pulmonary artery catheterisation,[8] and more likely to experience discharge delays when they were medically ready to leave the hospital.[9] Patients who were uninsured tended to have mechanical ventilation withdrawn more frequently[10] and also had a trend towards less physical and occupational therapy than insured patients.[11]

Higher survival rates and better outcomes after elective surgery have previously been shown to occur in those with stronger social relationships and higher socio-economic status.[12,13] Under hospital financing agreements, public and private patients in public hospitals should be subject to exactly the same rationing rules,[2] but previous studies found significant differences between private and public patients in time spent waiting for the same procedure in New South Wales.[14] They also found, even within the same urgency category, shorter waiting times for private patients compared with clinically comparable public patients. These findings may be explained by differences in socio-economic status, because socio-economically advantaged patients are more likely to live in closer proximity to health services, which confers a treatment advantage.[2] In our study, despite socio-economic status being related to the likelihood of being a public patient, it was insurance status, not socio-economic status, which was independently related to mortality.

Implications

Our study suggests a link between insurance status and outcome in patients admitted to an ICU in public hospitals in Victoria. This link remained after adjustment for illness severity, age, sex and markers of socio-economic status, suggesting a degree of robustness to the association. The ORs implied an almost 40% increase in the risk of death for public compared with compensable patients. These observations suggest the need to further investigate the factors responsible for such differential outcomes.

Strengths and limitations

Our study has several strengths. Its sample size is large and we included several institutions with a prolonged period of data collection. The data were extracted from well established hospital and ICU databases, serviced by dedicated staff. The primary and secondary outcomes are objective, easy to measure and not specifically collected for the purposes of this study, which limited the influence of ascertainment bias. Validated severity of illness scores allowed for multivariate analysis and calculation of adjusted ORs for each insurance group. The finding of an association between in-hospital mortality, ICU mortality and insurance status remained consistent after adjusting for age, severity of illness, socio-economic factors, baseline imbalances between hospitals and changes over time.

Our study has several limitations. It is a retrospective study, and although demographic data, severity of illness data and outcome data are regularly audited, the accuracy of recording of insurance status is unknown. Despite the large sample size, collected from several broad socio-economically and culturally diverse catchment areas, our findings may not be generalisable to the wider Australian population; thus, selection bias may have been introduced. Indigenous status and being foreign-born have been linked to reduced use of the health care system, based on race, ethnicity and language barriers, and may also be linked to socio-economic status.[15-17] In our analysis, race, language and ethnicity data were not available. We were able to collect chronic health and acute physiological data, but we were unable to obtain data relating to specific health practices (eg, smoking or diet) which might have had independent relationships with outcomes.[18,19] There is also wide variation in socio-economic status in each postal area, and thus IRSADs may not adequately adjust for the influence of these factors on health outcomes. In addition, no information was available on specific therapies given to patients, treatment limitations, end-of-life care practices or patient and clinician preferences for treatment. The standard for outcome measurement in the critical care populations is 90-day mortality, in conjunction with measures of disability and death assessed at 6 months. As no information was available after discharge, in-hospital mortality was the only endpoint available.

Conclusions

Among ICU patients treated in public hospitals, private and compensable insurance status appears to be independently associated with a reduction in mortality. Our study cannot determine whether the difference in the outcomes described is a result of bias in access to and delivery of medical care, or whether it is the effect of additional unmeasured baseline confounding factors. Future studies should more specifically assess these factors and their association with such differential outcomes.

Competing interests

None declared.

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Appendices. These appendices are part of the submitted manuscript and have been peer reviewed. They are posted as supplied by the authors.

Appendix 1. Hospital patient recruitment per year

	Hospital					
Year	**A**	**B**	**C**	**D**	**E**	**Total**
2007	1,812	0	1,399	904	0	4,115
2008	1,688	0	1,299	980	0	3,967
2009	1,801	4	1,224	1,138	0	4,167
2010	1,871	1,952	1,246	1,184	0	6,253
2011	2,077	1,916	1,261	1,232	834	7,320
2012	2,250	1,756	1,344	1,246	888	7,484
Total	11,499	5,628	7,773	6,684	1,722	33,306

Appendix 2. Distribution of patients by insurance category with respect to individual hospitals

	Hospital					
Insurance Group	**A**	**B**	**C**	**D**	**E**	**Total**
Public	8,296 (72.1%)	4,437 (78.8%)	5,873 (75.6%)	6,052 (90.5%)	1,602 (93.0%)	26,260 (78.8%)
Privately Insured	1,222 (10.6%)	1,093 (19.4%)	1,555 (20.0%)	485 (7.2%)	96 (5.6%)	4,451 (13.4%)
Transport Accident Commission	1,582 (13.7%)	54 (0.9%)	65 (0.8%)	0 (0%)	0 (0%)	1,701 (5.1%)
Veterans Affairs	105 (0.9%)	10 (0.2%)	244 (3.1%)	62 (0.9%)	0 (0%)	421 (1.3%)
Work Cover	198 (1.7%)	8 (0.1%)	6 (0.1%)	14 (0.2%)	3 (0.2%)	229 (0.7%)
Other	96 (0.8%)	26 (0.5%)	30 (0.4%)	71 (1.1%)	21 (1.2%)	244 (0.7%)
Total patients	11,499	5,628	7,773	6,684	1,722	33,306 (100%)

Appendix 3. Distribution of patients with respect to diagnostic categories

Diagnosis	Public Patients	Privately Insured	Trauma Accident Commission	Veteran's Affairs	Work Cover	Other Compensable Groups	Total Compensable	Overall Total
Abdominal & Thoracic Aneurysm	595 (2.3%)	93 (2.1%)	1 (0.1%)	12 (2.8%)	0 (0%)	3 (1.2%)	109 (1.5%)	704 (2.1%)
Asthma	165 (0.6%)	44 (1.0%)	0 (0%)	0 (0%)	1 (0.4%)	1 (0.4%)	46 (0.6%)	211 (0.6%)
Intracranial Haemorrhage	686 (2.6%)	107 (2.4%)	40 (2.3%)	14 (3.3%)	3 (1.2%)	16 (6.6.%)	180 (2.5%)	866 (2.6%)
Burns	257 (1.0%)	8 (0.2%)	6 0.3%)	2 (0.5%)	31 (13.5%)	6 (2.5%)	53 (0.7%)	310 (0.9%)
CAGS	4,256 (16.2%)	688 (15.5%)	3 0.2%)	42 (9.9%)	1 (0.4%)	25 (10.2%)	759 (10.8%)	5,015 (15.1%)
CAGS and Valve	1,065 (4.1%)	180 (4.0%)	2 (0.1%)	25 (5.9%)	0 (0%)	4 (1.6%)	211 (3.0%)	1,276 (3.8%)
Cardiac Arrest	882 (3.4%)	115 (2.6%)	13 (0.8%)	14 (3.3%)	5 (2.2%)	14 (5.7%)	161 (2.3%)	1,043 (3.1%)
Gastro-intestinal Disorders	789 (3.0%)	148 (3.3%)	13 (0.8%)	10 (2.4%)	0 (0%)	7 (2.9%)	178 (2.5%)	967 (2.9%)
Haematology Disorders	142 (0.5%)	50 (1.1%)	1 (0.1%)	0 (0%)	0 (0%)	1 (0.4%)	52 (0.7%)	194 (0.6%)
Head Injury	505 (1.9%)	53 (1.2%)	629 (37.0%)	8 (1.9%)	56 (24.4%)	10 (4.1%)	756 (10.7%)	1,261 (3.8%)
Cardiac Failure	976 (3.7%)	144 (3.2%)	3 (0.2%)	25 (5.9%)	4 (1.7%)	12 (4.9%)	188 (2.7%)	1,164 (3.5%)
Metabolic Disorders	448 (1.7%)	61 (1.4%)	2 (0.1%)	1 (0.2%)	0 (0%)	4 (1.6%)	68 (1.0%)	516 (1.5%)
Orthopaedic Disorders	361 (1.4%)	61 (1.4%)	12 (0.7%)	14 (3.3%)	3 (1.3%)	0 (0%)	90 (1.3%)	451 (1.3%)
Other Diagnoses	504 (1.9%)	89 (2.0%)	1 (0.1%)	3 (0.7%)	10 (4.4%)	9 (3.7%)	112 (1.6%)	616 (1.8)
Other Cardiothoracic Operations	1,996	405	7	31	1	12	456	2,452

	(7.6%)	(9.1%)	(0.4%)	(7.4%)	(0.4%)	(4.9%)	(6.5%)	(7.4%)
	518	92	5	11	0	8	116	634
Other Cardiovascular Disorders	(2.0%)	(2.1%)	(0.3%)	(2.6%)	(0%)	(3.2%)	(1.6%)	(1.9%)
	890	180	12	7	1	16	216	1,106
Other Neurological Disorders	(3.4%)	(4.0%)	(0.7%)	(1.7%)	(0.4%)	(6.6%)	(3.1%)	(3.3%)
	1,611	238	30	33	4	14	319	1,930
Other Respiratory Disorders	(6.1%)	(5.3%)	(1.8%)	(7.8%)	(1.7%)	(5.7%)	(4.5%)	(5.8%)
	839	66	3	1	2	3	75	914
Drug Overdose	(3.2%)	(1.5%)	(0.2%)	(0.2%)	(0.9%)	(1.2%)	(1.1%)	(2.7%)
	940	158	10	15	0	18	201	1,141
Pneumonia	(3.6%)	(3.5%)	(0.6%)	(3.6%)	(0%)	(7.4%)	2.8%)	(3.4%)
Post-operative Gastro-intestinal	2,433	556	15	67	3	7	648	3,081
Conditions	(9.3%)	(12.5%)	(0.9%)	(16.0%)	(1.3%)	(2.9%)	(9.2%)	(9.2%)
	386	61	2	8	1	3	75	461
Renal Disorders	(1.5%)	(1.4%)	(0.1%)	(1.9%)	(0.4%)	(1.2%)	(1.1%)	(1.4%)
	355	58	0	3	0	1	62	417
Genito-urinary Disorders	(1.3%)	(1.3%)	(0%)	(0.7%)	(0%)	(0.4%)	(0.9%)	(1.2%)
	382	84	3	8	0	5	100	482
Sub-arachnoid Haemorrahge	(1.4%)	(1.9%)	(0.2%)	(1.9%)	(0%)	(2.0%)	(1.4%)	(1.4%)
	349	62	3	3	2	6	76	425
Seizures	(1.3%)	(1.4%)	(0.2%)	(0.7%)	(0.9%)	(2.5%)	(1.1%)	(1.3%)
	1,483	304	5	29	7	16	361	1,844
Sepsis and Septic Shock	(5.6%)	(6.8%)	(0.3%)	(6.9%)	(3.1%)	(6.6%)	(5.1%)	(5.5%)
	595	97	863	12	92	20	1084	1,679
Trauma (excluding head injuries)	(2.3%)	(2.2%)	(50.8%)	(2.8%)	(40.2%)	(8.2%)	(15.4%)	(5.0%)
	1,590	205	0	14	2	1	222	1,812
Cardiac Valve Operations	(6.0%)	(4.6%)	(0%)	(3.3%)	(0.9%)	(0.4%)	(3.1%)	5.4%)
Total	26,260	4,451	1,701	421	229	244	7046	33,306

Appendix 4: Multivariable logistic regression model for variables independently associated with in-hospital mortality (for individual insurance category groups)

		Adjusted Odds Ratio	95% Confidence Interval	P Value
Age & Severity of Illness				
	Age (years)	1.030	(1.027 - 1.033)	<0.001
	APACHE III Score (without age component)	1.038	(1.037 - 1.040)	<0.001
Index of Relative Socio-economic Advantage and Disadvantage				
	Lowest Decile	1.00	(Reference category)	
	2	0.94	(0.78 - 1.13)	0.500
	3	0.90	(0.74 - 1.10)	0.300
	4	0.87	(0.73 - 1.04)	0.130
	5	1.00	(0.83 - 1.21)	1.000
	6	0.83	(0.69 - 0.99)	0.039
	7	0.99	(0.84 - 1.17)	0.930
	8	1.01	(0.84 - 1.20)	0.940
	9	0.89	(0.75 - 1.04)	0.150
	Highest Decile	0.84	(0.69 - 1.01)	0.070
Post-operative Status				
	Operative	1.00	(Reference category)	
	Non-operative	1.96	(1.59 - 2.42)	<0.001
	Operative status unknown	11.4	(6.87 - 19.0)	<0.001
Diagnosis				
	CAGS	1.00	(Reference category)	
	Abdominal & Thoracic Aneurysm	4.49	(3.13 - 6.46)	<0.001
	Asthma	1.55	(0.59 - 4.06)	0.37
	Burns	5.23	(3.04 – 9.00)	<0.001
	CAGS and Valve	1.65	(1.13 - 2.41)	0.009
	Cardiac Arrest	7.77	(5.48 - 11.0)	<0.001
	Cardiac Failure	6.19	(4.39 - 8.74)	<0.001
	Cardiac Valve Operations	1.46	(0.99 - 2.15)	0.06
	Drug Overdose	0.86	(0.50 - 1.50)	0.60
	Gastro-intestinal Disorders	5.34	(3.75 - 7.60)	<0.001
	Genito-urinary Disorders	1.55	(0.80 - 2.98)	0.19
	Haematology Disorders	8.90	(5.63 - 14.1)	<0.001
	Head Injury	8.77	(6.03 - 12.7)	<0.001
	Intracranial Haemorrhage	18.6	(13.6 - 25.5)	<0.001
	Metabolic Disorders	1.57	(0.97 - 2.56)	0.07
	Orthopaedic Disorders	4.06	(2.60 - 6.34)	<0.001
	Other Cardiothoracic Operations	4.40	(3.30 - 5.88)	<0.001
	Other Cardiovascular Disorders	3.98	(2.69 - 5.89)	<0.001
	Other Diagnoses	3.32	(2.13 - 5.16)	<0.001
	Other Neurological Disorders	7.78	(5.57 - 10.9)	<0.001
	Other Respiratory Disorders	6.82	(4.89 - 9.51)	<0.001
	Pneumonia	5.47	(3.86 - 7.75)	<0.001
	Post-operative Gastro-intestinal Conditions	5.50	(4.23 - 7.15)	<0.001
	Renal Disorders	2.60	(1.73 - 3.90)	<0.001
	Seizures	1.38	(0.78 - 2.45)	0.27

	Sepsis and Septic Shock	4.03	(2.88 - 5.64)	<0.001
	Sub-arachnoid Haemorrhage	20.1	(14.0 - 28.8)	<0.001
	Trauma (excluding head injuries)	5.22	(3.67 - 7.40)	<0.001
Hospital				
	Hospital A	1.00	(Reference category)	
	Hospital B	0.79	(0.69 - 0.91)	0.001
	Hospital C	0.90	(0.79 - 1.01)	0.080
	Hospital D	1.13	(1.00 - 1.26)	0.048
	Hospital E	1.02	(0.85 - 1.21)	0.870
Year of ICU Admission				
	2007	1.00	(Reference category)	
	2008	1.02	(0.87 - 1.19)	0.83
	2009	0.90	(0.77 - 1.05)	0.17
	2010	0.76	(0.66 - 0.88)	<0.001
	2011	0.77	(0.67 - 0.88)	<0.001
	2012	0.76	(0.66 - 0.88)	<0.001
Insurance Group				
	Public Patient	1.00	(Reference category)	
	Privately Insured	0.71	(0.63 - 0.80)	<0.001
	Trauma Accident Commission	0.54	(0.42 - 0.69)	<0.001
	Veteran's Affairs	1.13	(0.86 - 1.49)	0.38
	Work Cover	0.79	(0.45 - 1.39)	0.42
	Other Compensable Groups	0.89	(0.55 - 1.46)	0.66

Pseudo R^2 = 0.293

Area under Receiver Operator Characteristic curve = 0.862

Hosmer-Lemeshow C statistic = 11.0, P Value = 0.21

APACHE = Acute Physiological and Chronic Health Evaluation

CAGS = Coronary Artery Bypass Graft Surgery

Appendix 5: Multivariable logistic regression model for variables independently associated with in-hospital mortality (for overall public / compensable patients)

	Adjusted Odds Ratio	95% Confidence Interval	P Value
Age & Severity of Illness			
Age (years)	1.030	(1.028 - 1.033)	<0.001
APACHE III Score (without age component)	1.038	(1.037 - 1.040)	<0.001
Index of Relative Socio-economic Advantage and Disadvantage			
Lowest Decile	1.00	(Reference category)	
2	0.94	(0.79 - 1.13)	0.53
3	0.90	(0.74 - 1.09)	0.30
4	0.88	(0.73 - 1.04)	0.14
5	1.00	(0.83 - 1.21)	0.97
6	0.83	(0.69 - 0.99)	0.04
7	1.00	(0.84 - 1.17)	0.95
8	1.02	(0.85 - 1.21)	0.87
9	0.89	(0.76 - 1.05)	0.17
Highest Decile	0.84	(0.70 - 1.02)	0.07
Post-operative Status			
Operative	1.00	(Reference category)	
Non-operative	1.96	(1.59 - 2.41)	<0.001
Operative status unknown	11.4	(6.88 - 19.0)	<0.001
Diagnosis			
CAGS	1.00	(Reference category)	
Abdominal & Thoracic Aneurysm	4.51	(3.14 - 6.48)	<0.001
Asthma	1.57	(0.60 - 4.11)	0.36
Burns	5.41	(3.15 - 9.3)	<0.001
CAGS and Valve	1.65	(1.13 - 2.40)	0.009
Cardiac Arrest	7.85	(5.54 - 11.1)	<0.001
Cardiac Failure	6.26	(4.44 - 8.83)	<0.001
Cardiac Valve Operations	1.46	(0.99 - 2.15)	0.06
Drug Overdose	0.88	(0.51 - 1.53)	0.65
Gastro-intestinal Disorders	5.39	(3.78 - 7.67)	<0.001
Genito-urinary Disorders	1.55	(0.80 - 2.98)	0.19
Haematology Disorders	9.04	(5.72 - 14.3)	<0.001
Head Injury	7.93	(5.53 - 11.4)	<0.001
Intracranial Haemorrhage	18.8	(13.7 - 25.7)	<0.001
Metabolic Disorders	1.58	(0.97 - 2.58)	0.07
Orthopaedic Disorders	4.12	(2.64 - 6.42)	<0.001
Other Cardiothoracic Operations	4.43	(3.32 - 5.92)	<0.001
Other Cardiovascular Disorders	4.01	(2.71 - 5.94)	<0.001
Other Diagnoses	3.36	(2.16 - 5.22)	<0.001
Other Neurological Disorders	7.84	(5.61 - 10.9)	<0.001
Other Respiratory Disorders	6.89	(4.94 - 9.60)	<0.001
Pneumonia	5.52	(3.90 - 7.83)	<0.001
Post-operative Gastro-intestinal Conditions	5.54	(4.26 - 7.21)	<0.001
Renal Disorders	2.62	(1.74 - 3.93)	<0.001
Seizures	1.41	(0.79 - 2.49)	0.24
Sepsis and Septic Shock	4.08	(2.92 - 5.70)	<0.001
Sub-arachnoid Haemorrhage	20.4	(14.2 - 29.3)	<0.001

	Trauma (excluding head injuries)	4.72	(3.36 - 6.63)	<0.001
Hospital				
	Hospital A	1.00	(Reference category)	
	Hospital B	0.79	(0.69 - 0.91)	0.001
	Hospital C	0.92	(0.81 - 1.04)	0.160
	Hospital D	1.14	(1.01 - 1.28)	0.028
	Hospital E	1.02	(0.86 - 1.22)	0.81
Year of ICU Admission				
	2007	1.00	(Reference category)	
	2008	1.02	(0.87 - 1.19)	0.84
	2009	0.90	(0.77 - 1.04)	0.16
	2010	0.76	(0.66 - 0.88)	<0.001
	2011	0.77	(0.66 - 0.88)	<0.001
	2012	0.76	(0.66 - 0.87)	<0.001
Insurance Status				
	Public Patient	1.00	(Reference category)	
	Compensable Patient	0.73	(0.80 - 0.65)	<0.001

Pseudo R^2 = 0.293

Area under Receiver Operator Characteristic curve = 0.861

Hosmer-Lemeshow C statistic = 13.2, P Value = 0.11

APACHE = Acute Physiological and Chronic Health Evaluation

CAGS = Coronary Artery Bypass Graft Surgery

Appendix 6: Multivariable linear regression model for variables independently associated with log length of stay in ICU (for overall public / compensable patients)

	Ratio of Length of Stay compared to Reference Categories*	95% Confidence Interval	P Value
Insurance Status			
Public Patients	1.00	(Reference category)	
Compensable Patient	1.08	(1.05 - 1.12)	<0.001
Index of Relative Socio-economic Advantage and Disadvantage			
Lowest Decile	1.00	(Reference category)	
2	1.00	(0.94 - 1.05)	0.9
3	1.01	(0.95 - 1.07)	0.74
4	1.06	(1.00 - 1.11)	0.039
5	0.95	(0.89 – 1.00)	0.07
6	0.98	(0.93 - 1.03)	0.46
7	0.96	(0.91 - 1.01)	0.1
8	0.97	(0.91 - 1.02)	0.19
9	0.96	(0.92 - 1.01)	0.15
Highest Decile	0.93	(0.88 - 0.99)	0.014
Post-operative Status			
Non-operative	1.00	(Reference category)	
Operative	1.11	(1.03 - 1.19)	0.004
Operative status unknown	0.76	(0.66 - 0.88)	<0.001
Diagnosis			
CAGS	1.00	(Reference category)	
Abdominal & Thoracic Aneurysm	1.28	(1.17 - 1.39)	<0.001
Asthma	0.86	(0.73 - 1.02)	0.08
Burns	1.57	(1.35 - 1.83)	<0.001
CAGS and Valve	1.27	(1.18 - 1.35)	<0.001
Cardiac Arrest	0.73	(0.65 - 0.81)	<0.001
Cardiac Failure	1.01	(0.92 - 1.11)	0.85
Cardiac Valve Operations	0.95	(0.90 - 1.01)	0.11
Drug Overdose	0.71	(0.64 - 0.79)	<0.001
Gastro-intestinal Disorders	1.19	(1.07 - 1.32)	0.001
Genito-urinary Disorders	0.78	(0.70 - 0.87)	<0.001
Haematology Disorders	1.05	(0.89 - 1.25)	0.56
Head Injury	1.53	(1.38 - 1.69)	<0.001
Intracranial Haemorrhage	1.27	(1.16 - 1.40)	<0.001
Metabolic Disorders	0.88	(0.78 - 0.99)	0.036
Orthopaedic Disorders	0.69	(0.62 - 0.76)	<0.001
Other Cardiothoracic Operations	1.02	(0.97 - 1.07)	0.52
Other Cardiovascular Disorders	1.06	(0.95 - 1.19)	0.29
Other Diagnoses	0.88	(0.80 - 0.97)	0.013
Other Neurological Disorders	1.09	(1.00 - 1.19)	0.042
Other Respiratory Disorders	1.20	(1.10 - 1.31)	<0.001
Pneumonia	1.78	(1.61 - 1.96)	<0.001
Post-operative Gastro-intestinal Conditions	0.98	(0.93 - 1.02)	0.32
Renal Disorders	1.05	(0.92 - 1.19)	0.48
Seizures	0.95	(0.83 - 1.08)	0.43
Sepsis and Septic Shock	1.09	(1.00 - 1.20)	0.06
Sub-arachnoid Haemorrhage	1.91	(1.69 - 2.14)	<0.001
Trauma (excluding head injuries)	1.49	(1.39 - 1.59)	<0.001

Hospital				
	Hospital A	1.00	(Reference category)	
	Hospital B	0.57	(0.55 - 0.59)	<0.001
	Hospital C	0.68	(0.66 - 0.71)	<0.001
	Hospital D	0.60	(0.57 - 0.62)	<0.001
	Hospital E	0.64	(0.60 - 0.68)	<0.001
Year of ICU Admission				
	2007	1.00	(Reference category)	
	2008	0.78	(0.74 - 0.82)	<0.001
	2009	0.75	(0.71 - 0.79)	<0.001
	2010	0.93	(0.89 - 0.97)	0.001
	2011	0.99	(0.95 - 1.03)	0.6
	2012	1.03	(0.99 - 1.08)	0.15
Age & Severity of Illness*				
	Age (years)	-0.1%	(-0.2% to 0.1%)	0.06
	APACHE III Score (without age component)	1.6%	(1.5% to 1.7%)	<0.001

Adjusted R^2 = 0.1887

Number of observations = 30,935

*Continuous variables reported as % change in length of stay associated with a one unit increase

APACHE = Acute Physiological and Chronic Health Evaluation

CAGS = Coronary Artery Bypass Graft Surgery

LOS = Length of Stay

Appendix 7: Multivariable linear regression model for variables independently associated with log length of stay in hospital (for overall public / compensable patients)

	Ratio of Length of Stay Compared to Reference Categories*	95% Confidence Interval	P Value
Insurance Status			
Public Patients	1.00	(Reference category)	<0.001
Compensable Patient	1.13	(1.09 - 1.16)	<0.001
Index of Relative Socio-economic Advantage and Disadvantage			
Lowest Decile	1.00	(Reference category)	
2	1.01	(0.95 - 1.07)	0.77
3	0.93	(0.88 - 0.99)	0.018
4	0.98	(0.92 - 1.03)	0.41
5	0.96	(0.91 - 1.01)	0.11
6	0.95	(0.90 – 1.00)	0.046
7	0.95	(0.90 – 1.00)	0.042
8	0.94	(0.89 – 1.00)	0.036
9	0.92	(0.88 - 0.97)	0.001
Highest Decile	0.88	(0.83 - 0.93)	<0.001
Post-operative Status			
Non-operative	1.00	(Reference category)	
Operative	0.88	(0.82 - 0.93)	<0.001
Operative status unknown	0.80	(0.68 - 0.93)	0.004
Diagnosis			
CAGS	1.00	(Reference category)	
Abdominal & Thoracic Aneurysm	1.12	(1.03 - 1.22)	0.009
Asthma	0.67	(0.56 - 0.81)	<0.001
Burns	1.82	(1.60 - 2.07)	<0.001
CAGS and Valve	1.24	(1.16 - 1.33)	<0.001
Cardiac Arrest	0.81	(0.74 - 0.90)	<0.001
Cardiac Failure	1.30	(1.18 - 1.43)	<0.001
Cardiac Valve Operations	1.18	(1.11 - 1.24)	<0.001
Drug Overdose	0.46	(0.41 - 0.51)	<0.001
Gastro-intestinal Disorders	1.55	(1.40 - 1.70)	<0.001
Genito-urinary Disorders	1.18	(1.06 - 1.32)	0.004
Haematology Disorders	2.37	(2.02 - 2.76)	<0.001
Head Injury	1.25	(1.14 - 1.36)	<0.001
Intracranial Haemorrhage	1.23	(1.13 - 1.33)	<0.001
Metabolic Disorders	1.10	(0.97 - 1.25)	0.13
Orthopaedic Disorders	1.50	(1.35 - 1.66)	<0.001
Other Cardiothoracic Operations	1.52	(1.44 - 1.60)	<0.001
Other Cardiovascular Disorders	1.26	(1.12 - 1.41)	<0.001
Other Diagnoses	1.02	(0.93 - 1.13)	0.65
Other Neurological Disorders	1.56	(1.44 - 1.69)	<0.001
Other Respiratory Disorders	1.52	(1.39 - 1.66)	<0.001
Pneumonia	1.80	(1.64 - 1.98)	<0.001
Post-operative Gastro-intestinal Conditions	1.53	(1.46 - 1.62)	<0.001
Renal Disorders	1.57	(1.38 - 1.79)	<0.001
Seizures	1.02	(0.91 - 1.15)	0.72
Sepsis and Septic Shock	1.57	(1.44 - 1.70)	<0.001
Sub-arachnoid Haemorrhage	1.78	(1.60 - 1.97)	<0.001
Trauma (excluding head injuries)	1.21	(1.13 - 1.28)	<0.001

Hospital				
	Hospital A	1.00	(Reference category)	
	Hospital B	0.76	(0.74 - 0.79)	<0.001
	Hospital D	0.86	(0.84 - 0.89)	<0.001
	Hospital E	0.66	(0.63 - 0.70)	<0.001
Year of ICU Admission				
	2007	1.00	(Reference category)	
	2008	1.06	(1.00 - 1.11)	0.038
	2009	0.98	(0.93 - 1.03)	0.46
	2010	0.94	(0.90 - 0.99)	0.016
	2011	0.94	(0.90 - 0.98)	0.006
	2012	0.93	(0.89 - 0.98)	0.003
Age & Severity of Illness*				
	Age (years)	0.5%	(0.5% to 0.6%)	<0.001
	APACHE III Score (without age component)	0.8%	(0.7% to 0.9%)	<0.001

Adjusted R^2 = 0.1838
Number of observations = 24,779
*Continuous variables reported as % change in length of stay associated with a one unit increase
APACHE = Acute Physiological and Chronic Health Evaluation
CAGS = Coronary Artery Bypass Graft Surgery
LOS = Length of Stay (N.B. hospital LOS not provided by Hospital C)