

Report of the



Australian and New Zealand

Paediatric Intensive Care Registry

2004



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Australian and New Zealand Paediatric Intensive Care Registry

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Report of the Australian and New Zealand Paediatric Intensive Care Registry 2004

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The participating hospitals and people listed below have been associated with the Registry for many years and we thank them for their continued active support. There are many other individuals involved in data collection, collation, cleaning and submission. To those people we offer a huge thank you. We are also grateful to Associate Professor Peter Baghurst from the Women's and Children's Hospital for his ongoing advice and contribution to the chapter on cusum charts.

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Foreword

The 4th report of the Australian and New Zealand Paediatric Intensive Care Registry, marks the 9th year of this unique database. With the passing of time an increasing maturity and complexity in the performance of this work has evolved. From its initial function as the simple collection of physiological data and demographic details to allow the comparison of nationally derived mortality risk scores with international standards, this database has significantly developed and expanded. This year the ANZPIC Registry has completed a study of children admitted to adult ICU's, continued to develop the sophisticated CUSUM analysis of mortality, and been positively reviewed by the Victorian Quality Council as one of the second highest tier of databases to support health service quality and safety improvement. The success of this undertaking is a reflection of significant effort on behalf of the entire paediatric intensive care community in Australia and New Zealand. Specifically, however this energy has only achieved so much because of the direction of Lynda Norton and Dr Tony Slater. They are to be commended for their effort and ongoing commitment to the maintenance and development of this significant resource. I look forward to the continuing progression of this project as it enters the 10th year and the significant leadership that it has provided in the Australian and New Zealand intensive care community at large.

Phil Sargent FRACP FJFICM
Chairperson
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Introduction

1.1 Introduction

This is the fourth report describing paediatric intensive care practices and outcomes within Australian and New Zealand paediatric intensive care units (PICUs). This report has been generated from data collected from fifteen intensive care units (ICUs) in Australia and New Zealand during the 2004 calendar year.

Eight of the PICUs are tertiary referral centres for children requiring intensive care. They are based in university affiliated, children's hospitals. Data on all patients admitted to these units have been included, the age ranges from birth to young adulthood.

Eight general ICUs admitting predominantly adults contribute data on their paediatric admissions. These ICUs are based in metropolitan or regional hospitals in Australia and New Zealand. Data on patients less than 16 years of age are submitted by these ICUs.

Table 1.1.1 Hospitals contributing to the ANZPIC Registry in 2004

Hospital	State	ICU Type
The Canberra Hospital	ACT	Metropolitan
Sydney Children's Hospital	NSW	PICU
The Children's Hospital at Westmead	NSW	PICU
Tamworth Base Hospital	NSW	Regional
Mater Children's Hospital	QLD	PICU
Prince Charles Hospital	QLD	PICU- cardiac
Royal Children's Hospital - Brisbane	QLD	PICU
Townsville General Hospital	QLD	Regional
Women's and Children's Hospital	SA	PICU
Launceston Hospital	TAS	Regional
Royal Hobart Hospital	TAS	Metropolitan
Royal Children's Hospital - Melbourne	VIC	PICU
Princess Margaret Hospital	WA	PICU
Starship Children's Hospital	NZ	PICU
Waikato Hospital	NZ	Regional
Wellington Hospital	NZ	Regional

1.2 ICU classification

ICUs are classified as one of the following:

Table 1.2.1 ICU classifications

Classification	Description
PICU	Paediatric, tertiary referral intensive care units based in a capital city
Metropolitan	All other intensive care units in capital cities
Regional	Intensive care units outside a capital city

Data set

2.1 Data set

The minimum data set consists of 38 variables. These variables and their definitions are described in Appendix I. Information collected includes demographic data, diagnosis directly responsible for ICU admission as well as underlying and additional diagnoses. Additionally, physiologic variables measured at the time of first face to face contact between the patient and a doctor from the ICU or a specialist retrieval team, the ICU outcome and the length of stay are recorded.

All participating units collect the minimum data set. All variables are routinely measured or recorded in the patients' medical record.

2.2 Data collection

Data are collected in the hospitals by either filling out the specific ANZPIC Registry forms or by incorporating the ANZPIC Registry data items into the local clinical information system. Participating hospitals maintain unit specific databases and submit electronic copies of de-identified data to the ANZPIC Registry each quarter. Ten of the units use the ANZPIC Registry software while the remaining units have incorporated the ANZPIC Registry data fields into their unit specific databases.

In 2004 a paediatric component was added to the Aortic software developed by the ANZICS Adult Patient Database (APD). This has allowed units already using Aortic to collect data on paediatric admissions.

Training of data managers is undertaken annually during the annual validation exercise and at the ANZICS annual scientific meeting.

2.3 Data verification

Missing, inconsistent or unusual data are identified and flagged at the time of data submission to the Registry. This initial filtering is performed both automatically, via computer based checks for outliers, and manually by the project manager.

2.4 Data validation

Hospitals contributing to the Registry undergo a validation exercise annually. This process involves a number of specific steps:

(1) Following submission of data to the Registry, 50 cases are randomly selected

for re-extraction. The randomisation process is stratified by the risk of death, predicted by PIM2 (1), to ensure that the random sample includes patients with a representative range of mortality risk.

(2) An independent data collector from another PICU physically re-extracts the information from the hospital medical records.

(3) The principal diagnosis, intensive care outcome and the variables required to calculate PIM2 are recorded by the independent data collector. The ICU flow charts, progress notes, emergency department and retrieval records are all reviewed to ensure that the physiological values at first ICU medical contact are recorded.

(4) The re-extracted data is entered into a computer program that simultaneously displays the original data and re-extracted data for each patient, together with the predicted risk of death calculated from both sets of data. This process identifies where errors occur and the impact of the errors.

(5) The Bland Altman technique is used to assess the agreement between the original and re-extracted data (2).

2.5 Registry review

In 2004 the ANZPIC Registry was reviewed by the Victorian Quality Council using the Safety and Quality Data Directory Questionnaire. The review covered timeliness

Table 2.5.1 Results of the evaluation of the ANZPIC Registry database by the Victorian Quality Council in 2004. The ranking is out of 5 for each review category.

Review category	Ranking
Overall sustainability	3
Timeliness	3
Accessibility	4
Completeness	5
Quality processes	3
Outcome measures	4
Suitability	3

of the data collection, completeness, accessibility and quality of the data. Table 2.5.1 indicates the rating out of 5 achieved in each category by the ANZPIC Registry. The full report can be found at <http://qualitycouncil.health.vic.gov.au>.

2.6 Data limitations

Limitations to the data are related to the data collection process, the small population of paediatric patients admitted to ICUs in Australia and New Zealand and the outcome measures used to assess unit performance.

Eight participating units have designated data managers (table 2.6.1). In the remaining ICUs data is collected by a range of staff, from clinical nurses to senior medical staff. Data collection errors are more common in units where large numbers of staff collect the data compared to units where a small number of dedicated staff collect the data.

In this report, data from one unit was excluded from the PIM2 analysis. Changes to the system of data collection occurred during the year. The unit does not have a trained data collector and was not able to undertake the data validation exercise.

Table 2.6.1 Number of hospitals employing designated data collectors by ICU type

Classification	Data collectors	No data collectors
PICU	5	4
Metropolitan	1	1
Regional	2	3

Demographics

3.1 Population

During 2004 the ANZPIC Registry received data on 7,329 admissions to ICUs in Australia and New Zealand. The number of admissions to individual ICUs remains relatively stable from year to year. Table 3.1.1 shows the breakdown of admissions by region. The postcodes of patients admitted to ICUs were used to assign a home state irrespective of their admission hospital. The child population (< 16 yrs) for each state or territory was obtained from the Australian Bureau of Statistics (ABS) census data (3) and Statistics New Zealand (4). Admissions per 1,000 children varied from 1.06 to 1.82. Overseas admissions were excluded (n = 97).

The prevalence rate for the ANZPIC Registry was 1.4 per 1,000 children. This is similar to the rate (1.3) recorded by the Paediatric Intensive Care Audit Network (PICANet) in the UK (5).

There are approximately 700 paediatric admissions annually to Australian and New Zealand ICUs that do not currently contribute to the ANZPIC Registry (ANZ-ICS Adult Patient Database personal communication).

Table 3.1.1 Regional admission prevalence and sex-specific admissions to ANZPIC Registry hospitals in 2004. Also shown are the populations of children < 16 yr. (Population data from the ABS and Statistics NZ 2001 census).

Region	prevalence (per 1,000)	males	females	population
ACT	1.06	33	41	69,798
NSW	1.25	991	757	1,395,422
NT	1.22	34	29	51,709
QLD	1.82	882	595	810,630
SA	1.62	290	206	306,188
TAS	1.16	72	49	103,964
VIC	1.15	680	471	1,003,177
WA	1.77	437	306	418,699
NZ	1.41	618	482	903,980
Total	1.38	4037	2936	5,063,567

3.2 Age

The majority of admissions to ICU in 2004 were for children less than 5 yrs (64.5%) with infants <12 months of age making up more than half this group (37.4% of all ICU admissions). Thirty three percent of infants admitted under 1 year of age were neonates < 28 days old.

A greater number of males were admitted than females across all ages as illustrated in figure 3.2.1

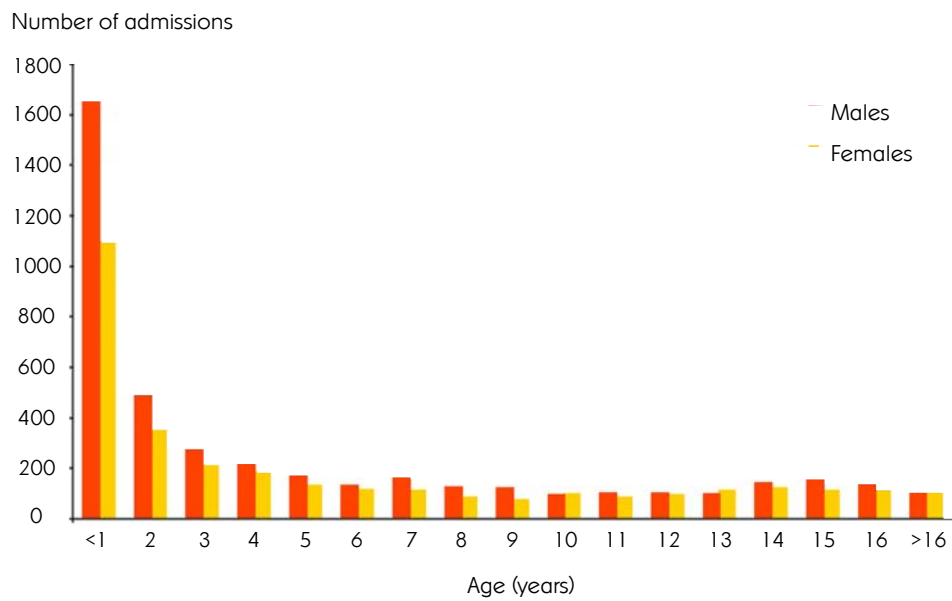


Figure 3.2.1 ICU admission numbers by age and sex, 2004

3.3 Ethnicity

The ANZPIC Registry uses the Australian Standard Classification of Cultural and Ethnic Groups and the New Zealand Standard Classification of Ethnicity. Both are based on the principle of self assessed identification with an ethnic group (6). In PICU's ethnicity is most often determined by the parents or next of kin. Figure 3.3.1, below, illustrates the proportions of the various ethnic groups in the population of children admitted to ICUs participating in the ANZPIC Registry .

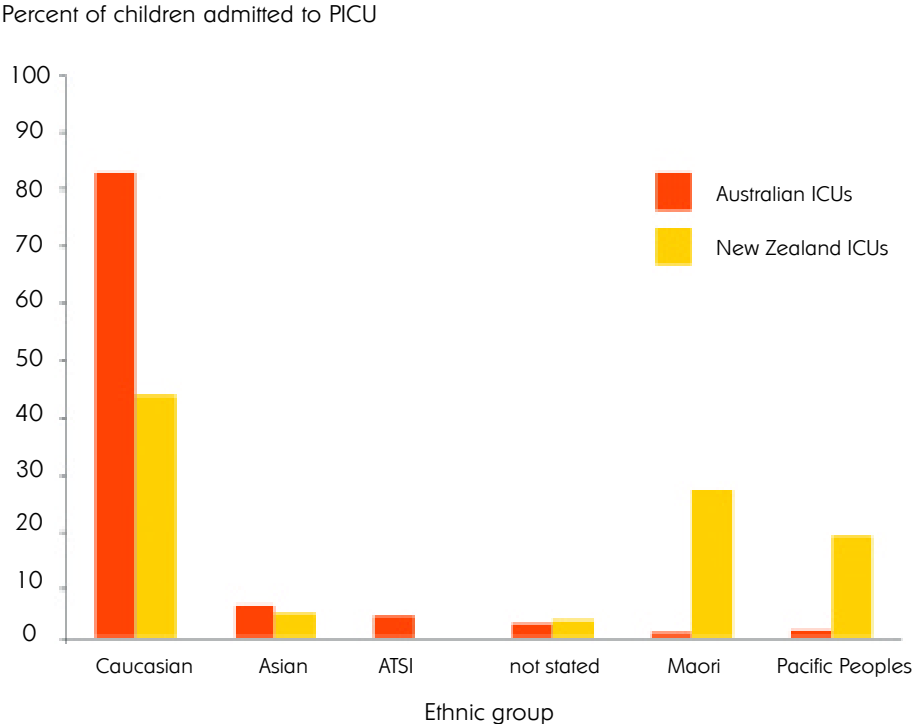


Figure 3.3.1 Proportion of the total patient population by ethnicity and country, 2004 (ATSI - Aboriginal & Torres Strait Islander)

Admission characteristics

4.1 Admission source

Admissions from the operating theatre accounted for 42% of all ICU admissions. Seventeen percent of admissions are from the emergency department, 18% are from wards. Twenty two percent of children were admitted directly to ICU from outside the hospital.

Table 4.1.1 Intensive care admission source by type, 2004

Admission source	% Elective	% Non-elective
Operating theatre	35.3	6.9
Direct admission	2.1	19.8
Emergency department	0.7	16.7
Ward	3.4	14.7
Other ICU or NICU	0.2	0.2
Total	41.6	58.4

4.2 Admission type

Admissions are classified as elective or non-elective. An admission is defined as elective if the admission is after elective surgery or is for an elective procedure or elective monitoring or review of home ventilation. An ICU admission or operation is considered elective if it could be postponed for more than 6 hours without adverse effect. An unplanned admission is one the ICU was not expecting and is regarded as non-elective.

As is shown in table 4.1.1, nearly 60% of ICU admissions are non-elective. This varies between units with the PICUs having more elective admissions than the regional ICUs

4.3 Admission diagnosis

Diagnosis codes developed by the ANZICS Paediatric Study Group (PSG) (7) are used to code the principal reason for ICU admission. Additionally, an underlying

diagnosis and additional diagnoses can be assigned for an admission. The ANZPIC Registry diagnosis codes are listed in Appendix II.

This year the codes have been aggregated into 13 broad diagnostic categories (table 4.3.1). In previous reports the miscellaneous category included the diagnostic groups; infection, endocrine, metabolic, and ICU procedures and monitoring. These groups have been shown separately in 2004.

The most common diagnostic group in the <10 yr age group was the respiratory category. Post-operative cardiovascular surgery was the next most common category in admissions <10 years of age. In admissions > 10 years of age post operative cardiac surgery (17.9%) was the most common reason for ICU admission followed by injury (15.2%).

The top ten reasons for non-elective and elective admission to ICU are listed in tables 4.3.2 and 4.3.3

Table 4.3.1 Number of admissions and mortality rate by diagnostic group, 2004

Diagnostic group	number	%	mortality rate (95%CI)
Respiratory	1683	23.0	3.2 (2.5 - 4.2)
Neurological	655	8.9	6.9 (5.2 - 9.1)
Injury	632	8.6	3.8 (2.6 - 5.6)
Cardiovascular	434	5.9	13.4 (10.5 - 16.9)
Infection	235	3.2	9.4 (6.3 - 13.8)
Endocrine / metabolic	209	2.9	1.0 (0.3 - 3.4)
Miscellaneous	199	2.7	2.0 (0.1 - 6.0)
Gastrointestinal / renal	136	1.9	4.4 (2.0 - 9.3)
Post operative - cardiac	1380	18.1	0.9 (0.6 - 1.6)
Post operative - other	727	9.9	0.1 (0.0 - 0.8)
Post operative - ent / thoracic	452	6.2	0.0
Post operative - neurosurgical	314	4.3	1.0 (0.3 - 2.8)
ICU procedure / monitoring	273	3.7	0.0

Table 4.3.2 Top 10 reasons for non-elective admission to ICU and median length of stay (LOS) in 2004

Principal admission diagnosis	number	%	Median LOS
Seizures	362	(8.5)	0.89
Bronchiolitis	318	(7.4)	2.74
Head trauma	296	(6.9)	1.14
Asthma	229	(5.4)	0.90
Respiratory failure	223	(5.2)	2.86
Pneumonia or pneumonitis	189	(4.4)	3.46
Diabetes mellitus with ketoacidosis	144	(3.4)	1.05
Septic shock	110	(2.6)	2.15
Central apnoea	102	(2.4)	1.36
Croup	91	(2.1)	1.18

Table 4.3.3 Top 10 reasons for elective admission to ICU and median length of stay (LOS) in 2004

Principal admission diagnosis	number	%	Median LOS
VSD repair	203	(6.7)	1.19
ICU procedure	162	(5.3)	0.13
Spinal instrumentation	154	(5.0)	0.97
Valve repair or replacement	129	(4.2)	0.90
Adenoidectomy &/or tonsillectomy	114	(3.7)	0.80
Tetralogy of Fallot repair	104	(3.4)	1.13
ASD repair	99	(3.2)	0.96
Post procedure - other	78	(2.6)	0.74
ENT - other	78	(2.6)	0.92
Arterial switch procedure	76	(2.5)	3.73

4.4 Admissions by month

Annual admission numbers have increased slightly each year as more units contribute to the ANZPIC Registry. Figure 4.4.1 shows the number of admissions per hospital each year since 2000. The increase in admissions at Starship Children’s Hospital in 2004 can be attributed to the transfer of the paediatric cardiac surgery service from Greenlane Hospital to Starship.

The number of admissions in each ICU and the proportion of ventilated admissions are shown in table 4.4.1

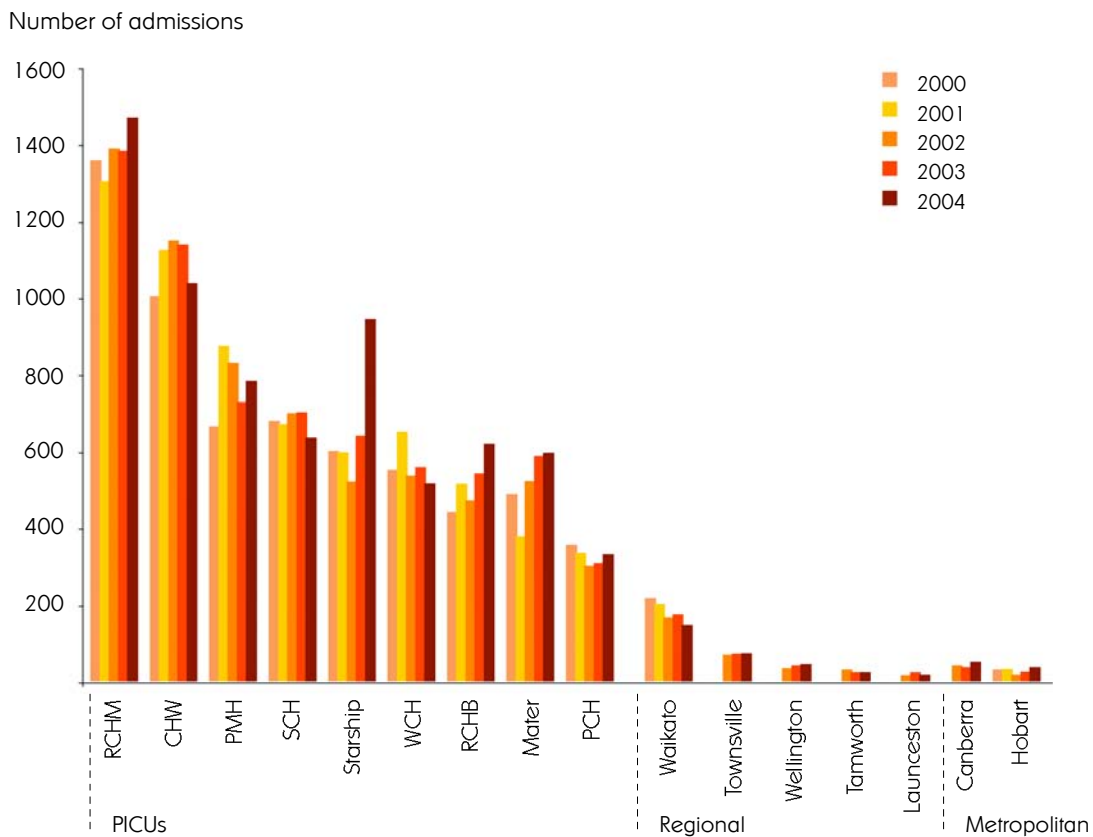


Figure 4.4.1 Number of patients admitted to ICUs participating in the ANZPIC Registry by ICU classification, 2000 - 2004

Table 4.4.1 Number of admissions and ventilated patients by unit in 2004.

Hospital	Admissions	Number ventilated	%
Launceston Hospital	17	3	17.6
Mater Children's Hospital	596	212	35.6
Prince Charles Hospital	332	279	84.0
Princess Margaret Hospital	782	249	31.8
Royal Children's Hospital - Brisbane	620	189	30.5
Royal Children's Hospital - Melbourne	1469	939	63.9
Royal Hobart Hospital	37	*	-
Sydney Children's Hospital	636	342	53.8
Starship Children's Hospital	944	643	68.1
Tamworth Base Hospital	24	2	8.3
The Canberra Hospital	51	31	60.8
The Children's Hospital at Westmead	1037	558	53.8
Townsville General Hospital	74	29	39.2
Waikato Hospital	147	37	25.2
Wellington Hospital	46	36	78.3
Women's and Children's Hospital	517	199	38.5

* data on ventilated admissions was unavailable at the time of report

Monthly admission numbers show an increase during winter. These variations can be attributed to seasonal changes in specific illnesses. There is an increase in respiratory admissions during winter while post-operative admissions appear to fall, see figure 4.4.2. A decrease in post-operative admissions may occur as a result of elective surgery cancellations in response to bed shortages.

Most of the increase in admissions over the winter months is seen in the <1 yr age group, figure 4.4.3.

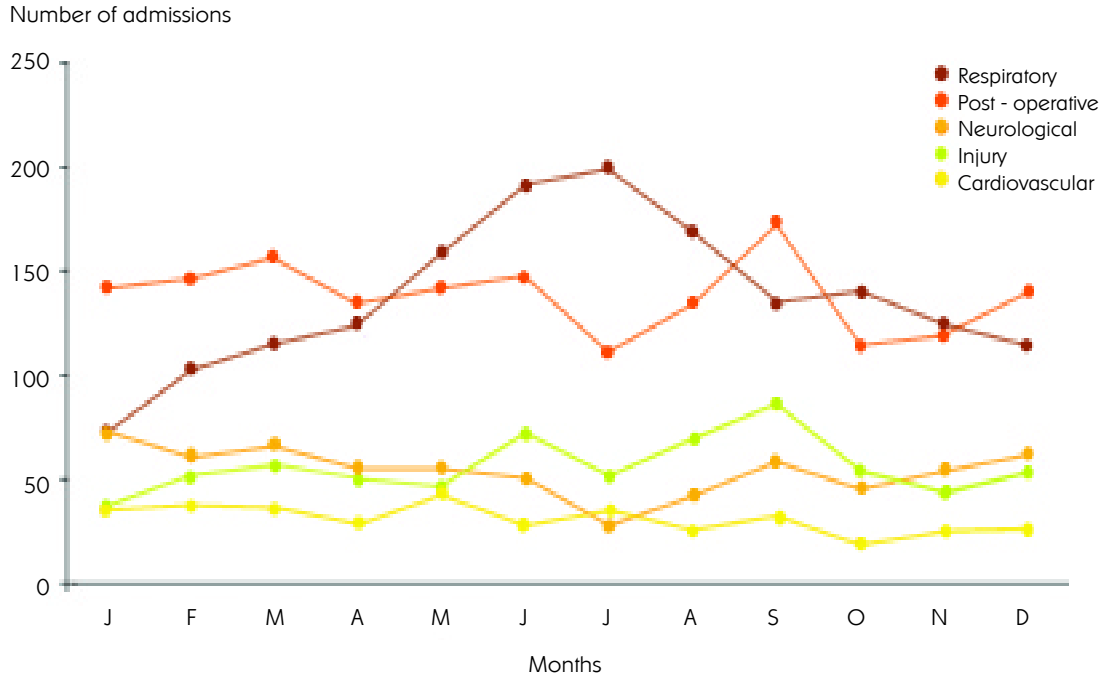


Figure 4.4.2 Monthly admission numbers by diagnostic group in 2004

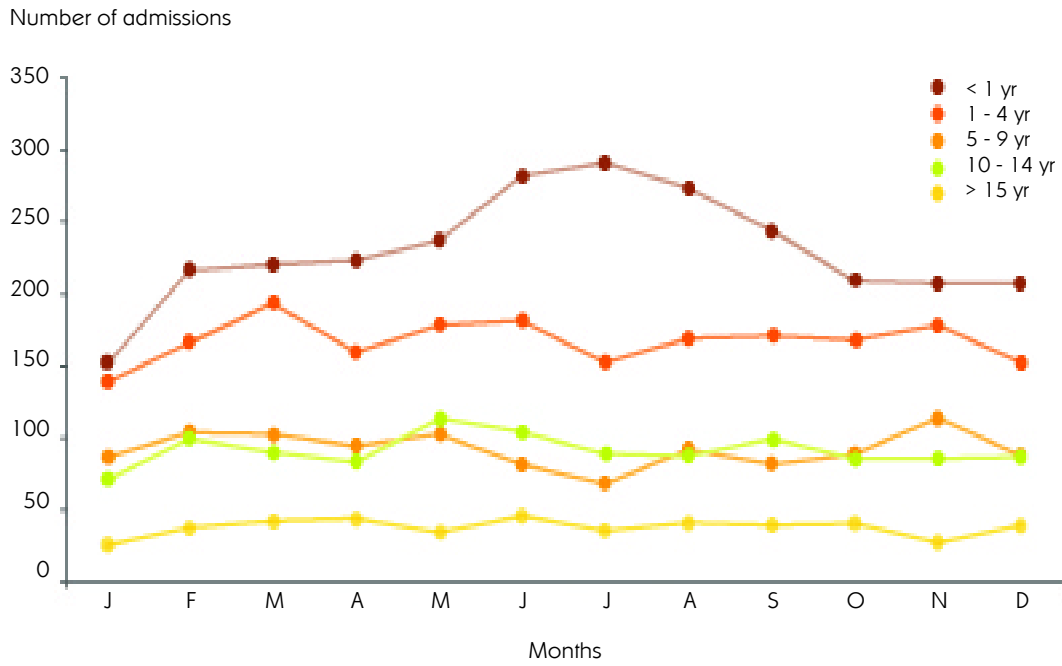


Figure 4.4.3 Monthly admission numbers by age in 2004

Length of stay

5.1 Median length of stay

Length of stay (LOS) in ICU is skewed with the majority of patients staying between 1 and 1.5 days. Because of this skewness the median LOS is the most appropriate measure of central tendency as the mean LOS is disproportionately influenced by prolonged admissions. One percent of patients stayed longer than 28 days and these patients occupied 25% of bed days. In 2004, five patients stayed more than six months. All were aged < 18 months of age and were intubated for an average of 74 % of their ICU admission.

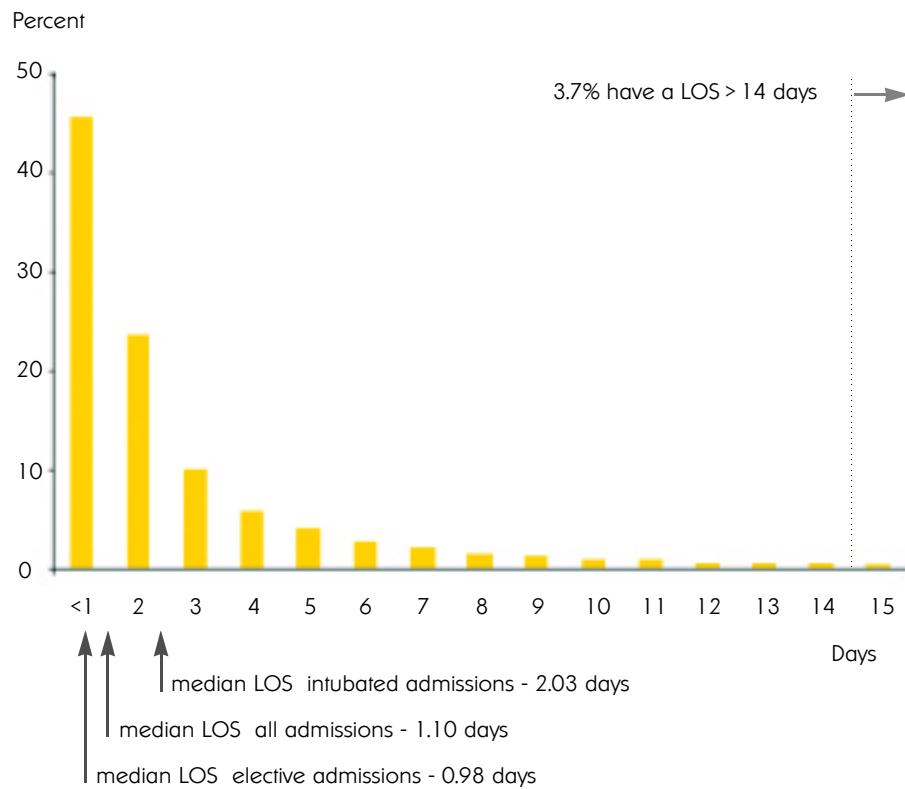


Figure 5.1.1 Length of stay distribution in 2004

The average LOS varied depending on the ICU classification (figure 5.1.2), whether patients were intubated or not (figure 5.1.4), the type of ICU admission (table 5.1.1) and the diagnostic category (table 5.1.2).

5.2 Occupied bed days

Intubated admissions utilised 80% of bed days. Similarly, non-elective admissions utilised 68% of bed days.

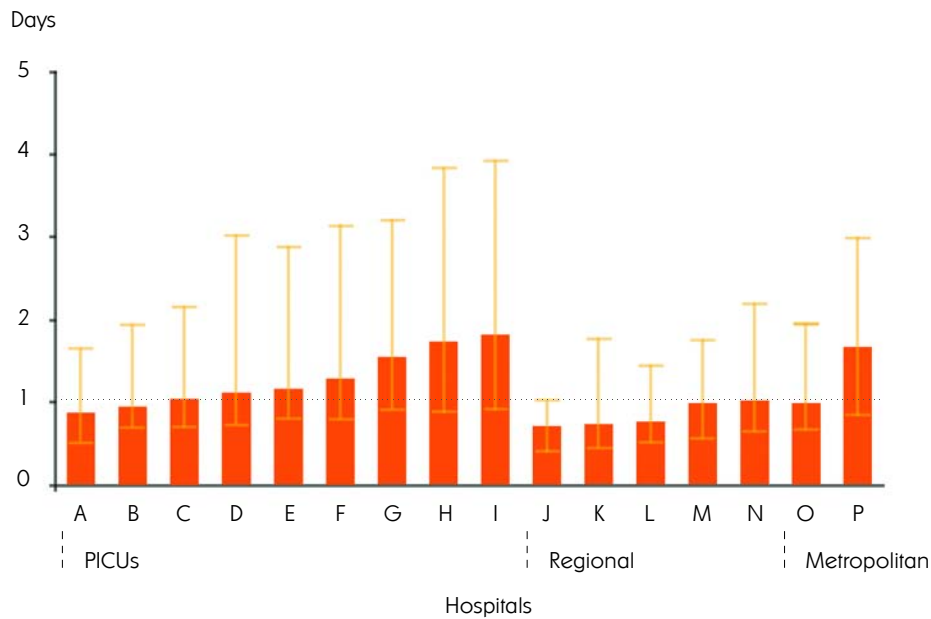


Figure 5.1.2 Median length of stay and interquartile range for all hospitals by ICU classification in 2004. The median length of stay for the Registry is shown by the horizontal line

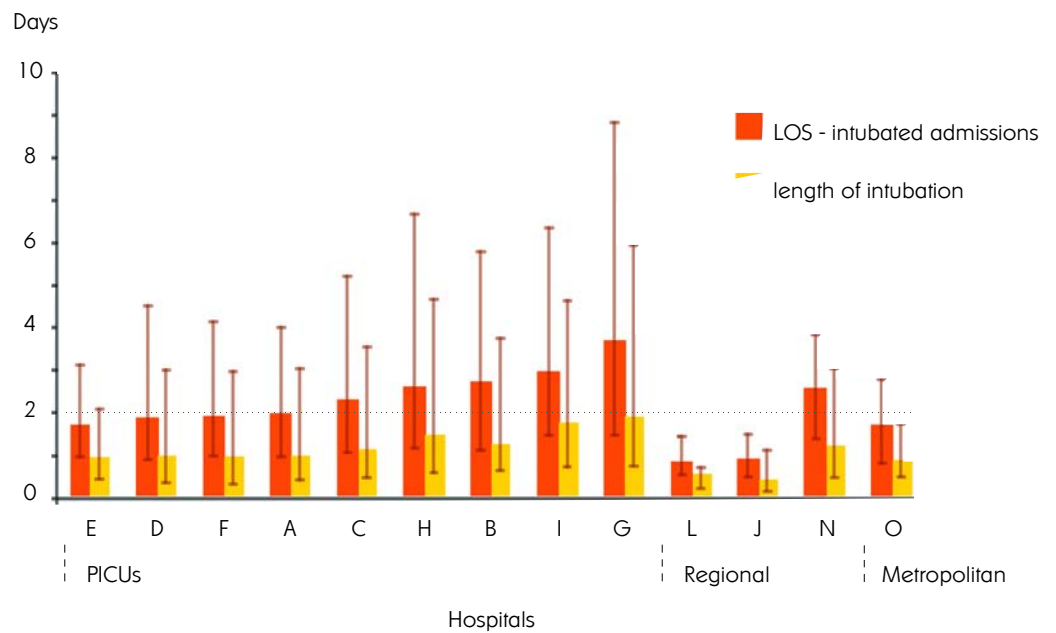


Figure 5.1.3 Median length of stay and interquartile range for intubated admissions in each hospital, by ICU classification, in 2004. The median length of intubation is shown for each hospital. Hospitals with < 10 intubated admissions have been excluded (n = 3). The median length of stay for the Registry is indicated by the horizontal line.

Table 5.1.1 Median length of stay (LOS), interquartile range (IQR) and percent of occupied bed days (OBD) by admission type, 2004

	Median LOS	IQR	OBD%
All admissions	1.10	0.8 - 2.9	100
Elective admissions	0.98	0.8 - 2.0	32.0
Non-elective admissions	1.48	0.7 - 3.6	68.0
Intubated admissions	2.03	1.0 - 5.0	80.3
Non-intubated admissions	0.85	0.6 - 1.4	19.7

Table 5.1.2 Median length of stay (LOS), interquartile range (IQR) and percent of occupied bed days (OBD) by principal diagnostic group, 2004

Diagnostic group	Median LOS	IQR	OBD %
Respiratory	1.87	0.8 - 4.7	34
Neurological	1.16	0.7 - 2.5	11
Injury	0.96	0.6 - 2.6	7
Cardiovascular	2.79	1.0 - 6.4	8
Miscellaneous	0.87	0.3 - 2.0	11
Gastrointestinal / renal	1.68	0.7 - 3.9	2
Post operative - cardiac	1.24	0.9 - 2.9	14
Post operative - other	0.92	0.8 - 1.7	5
Post operative - ent / thoracic	0.91	0.7 - 1.6	4
Post operative - neurosurgical	0.91	0.7 - 1.8	3

Mortality

6.1 Mortality rates

The ANZPIC Registry collects data on ICU outcome from all participating units. Some units also provide data on hospital outcome.

In 2004 232 patients died while in ICU. The crude mortality rate was 3.2%. Crude mortality rates for each unit are shown in figure 6.1.1. The hospital codes in this section are not the same as codes in earlier sections

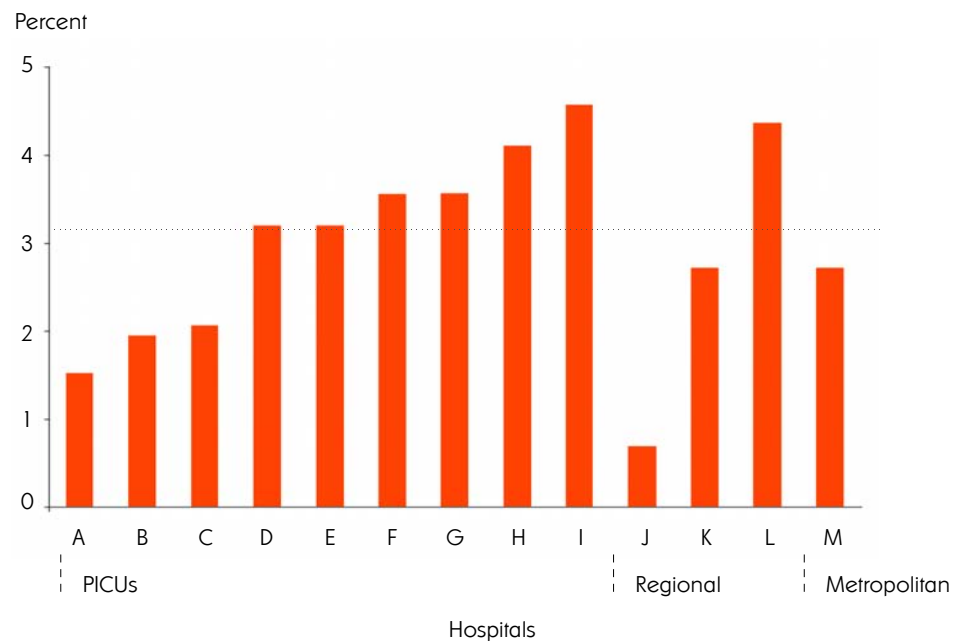


Figure 6.1.1 Mortality rate for 13 hospitals by ICU classification in 2004. The mortality rate for the ANZPIC Registry is shown by the horizontal line. No deaths were recorded in three units

6.2 Diagnosis specific mortality

In 2004 twenty nine percent of all deaths had a principal diagnosis in the miscellaneous diagnostic category (figure 6.2.1). Of these, the principal reasons for admission to ICU were cardiac arrest - out of hospital (31%), septic shock (27%) and cardiac arrest - in hospital (13%). Mortality rates for males is higher than for females.

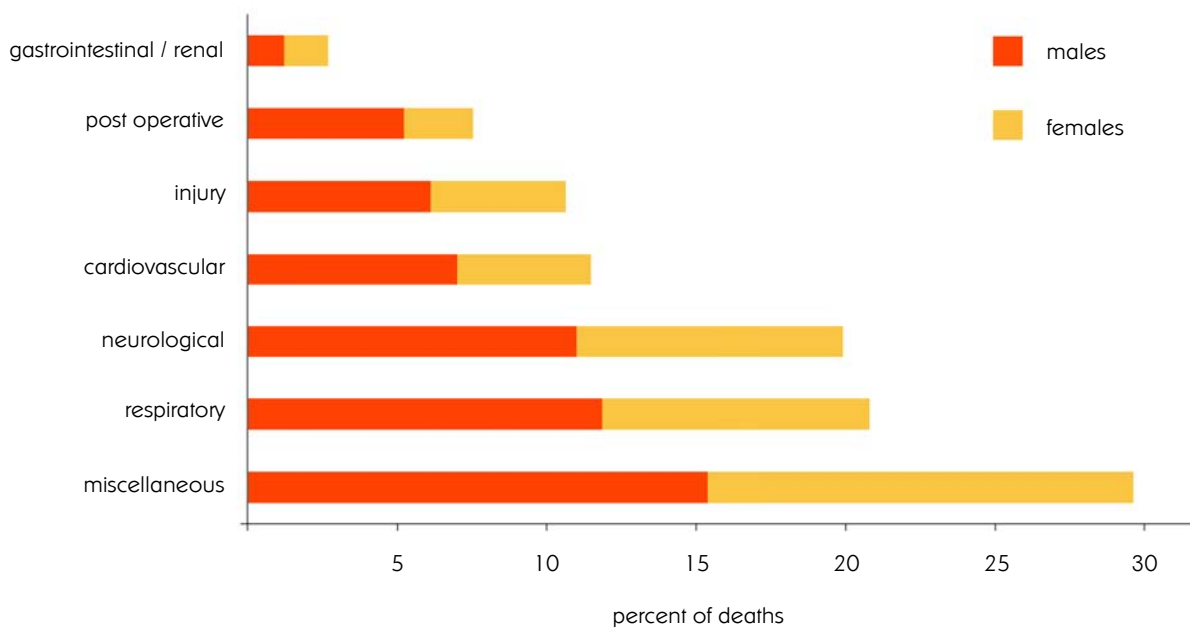


Figure 6.2.1 Diagnostic categories of patients not surviving ICU, by sex, 2004

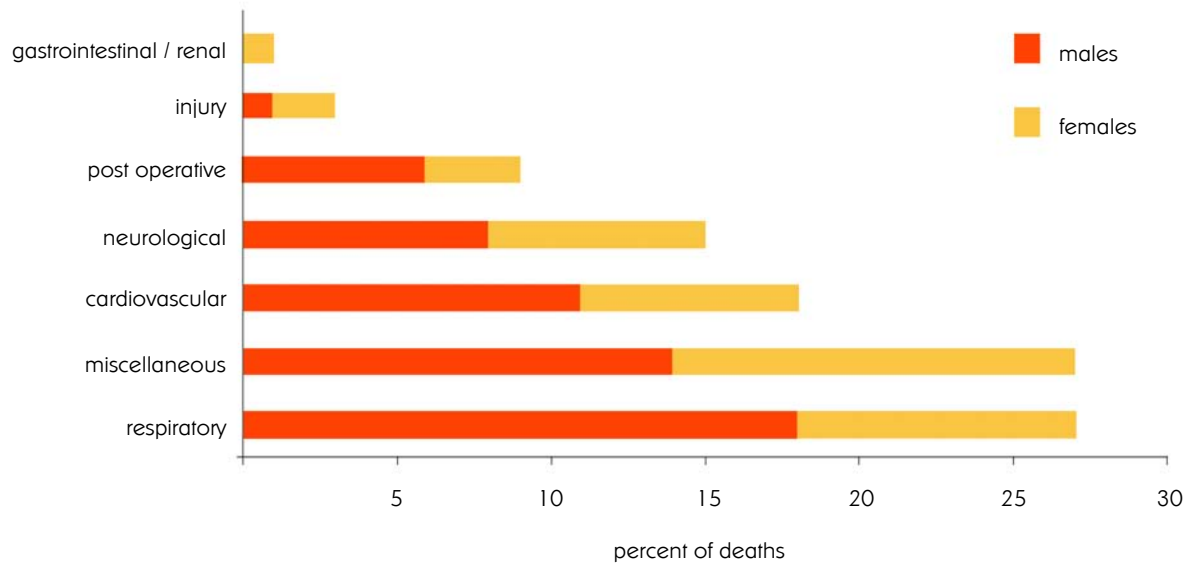


Figure 6.2.2 Diagnostic categories of patients aged <1 year not surviving ICU, by sex, 2004

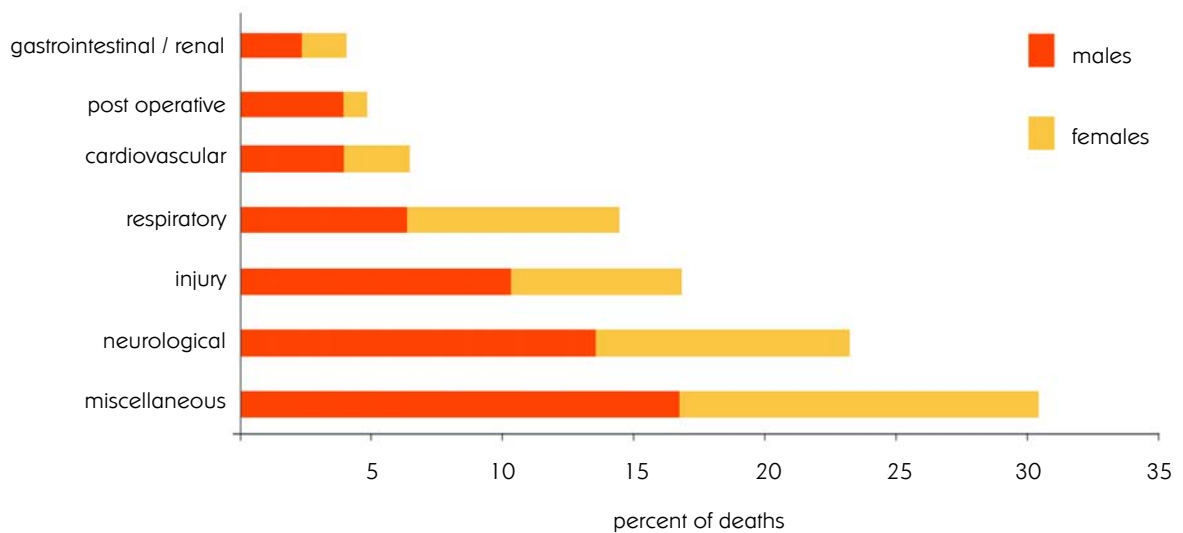


Figure 6.2.3 Diagnostic categories of patients aged 1-15 years not surviving ICU, by sex, 2004

6.3 Risk adjusted mortality

Risk adjusted standardised mortality ratios (SMR) were calculated for each unit contributing to the ANZPIC Registry. The SMR is the ratio of the number of deaths observed in a given population of patients to the number of deaths predicted for that population by PIM2 (1). PIM2 is the mortality prediction model used by the ANZPIC Registry

Figure 6.3.1 illustrates the SMR with 95% confidence intervals for PICUs in 2004. One unit was excluded from this analysis due to concerns about the quality of data collected in that unit.

The metropolitan and regional ICUs have been excluded from figure 6.3.1 as they had fewer than 20 deaths. No deaths were recorded in three ICUs in 2004.

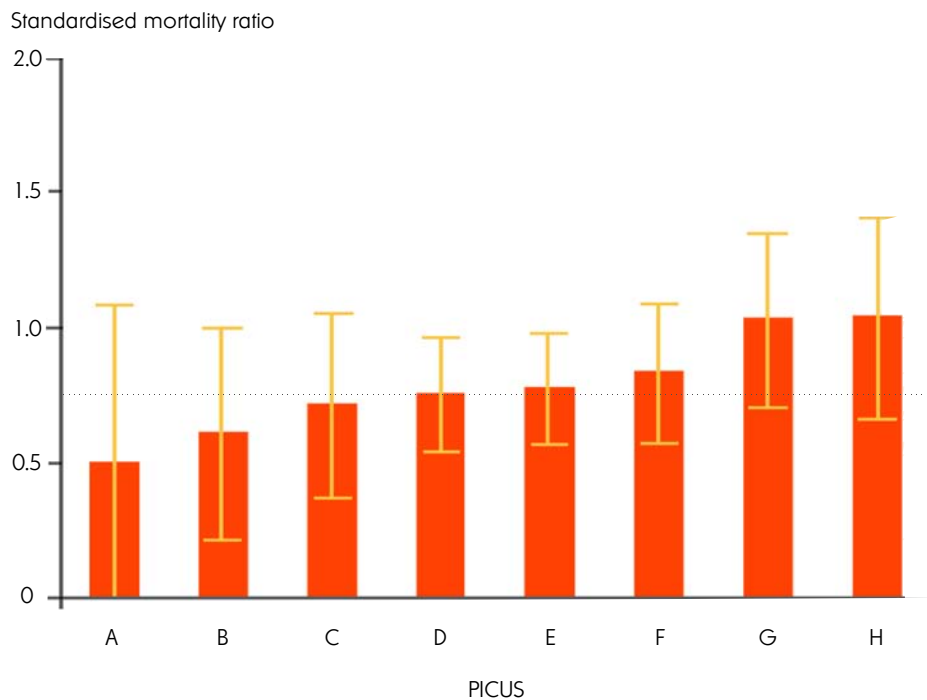


Figure 6.3.1 Standardised mortality rate with 95% confidence intervals for eight participating PICUs in 2004. The ANZPIC Registry SMR is shown by the horizontal line [0.77 (0.67 - 0.87)].

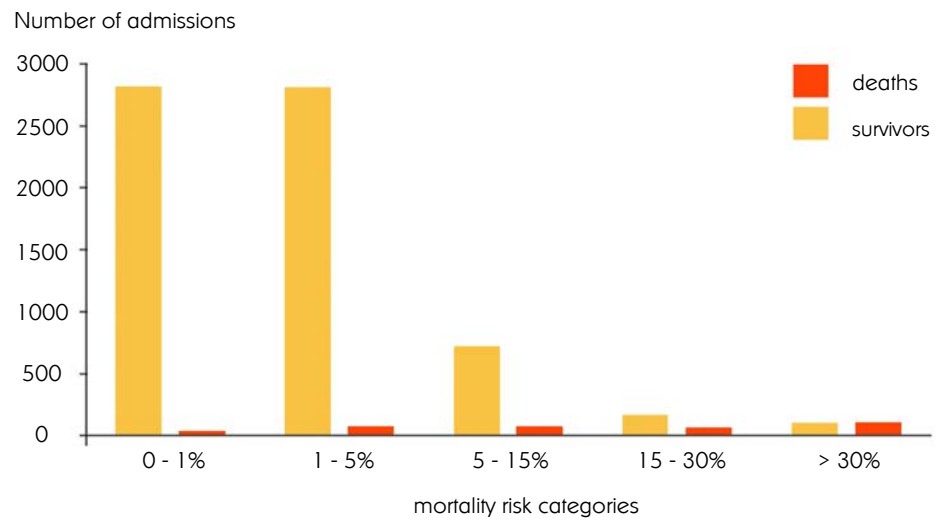


Figure 6.3.2 Number of admissions and vital status at discharge by PIM2 mortality risk category, in 2004

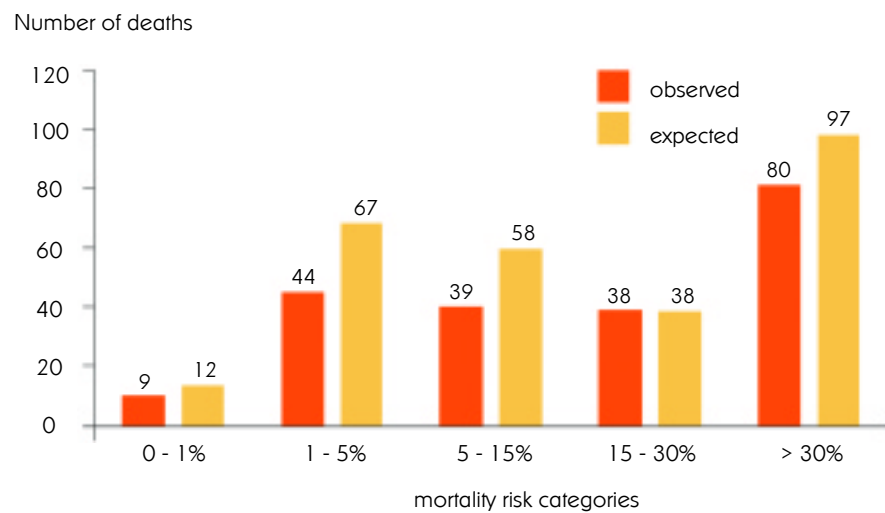


Figure 6.3.3 Observed vs expected number of deaths by mortality risk category, as predicted by PIM2, in 2004

Figure 6.3.2 illustrates the distribution of mortality risk for patients submitted to the Registry. The majority of children admitted to ICU have a low risk of mortality. Figure 6.3.3 illustrates the observed and expected numbers of deaths in the five mortality risk categories in 2004.

6.4 Sequential control charts

Cumulative sum charts have been constructed for eight units with greater than 200 admissions per year (Figures 6.4.1 - 6.4.8). One unit has been excluded due to concerns about the quality of data collected in that unit.

The upper chart in each figure represents the cumulative excess deaths. The amber line represents the cumulative number of excess deaths - relative to the number of deaths predicted by PIM2. The black line represents the cumulative number of excess deaths without adjustment for mortality risk and illustrates the effect of risk adjustment. The lower chart represents the sequential probability ratio tests for an increase or decrease in the odds of death.

For both charts the x axis represents each admission to ICU in sequence for the two year period 2003 - 2004.

The y axis in the upper chart represents the cumulative excess deaths that have occurred, relative to the number of deaths predicted. The y axis in the lower chart represents 'process control' where the process is the cumulative observed outcome relative to that predicted by PIM2. The chart is designed to test two hypotheses; hypothesis A (HA) that the odds of deaths in the unit have doubled relative to the population used to derive PIM2 and, hypothesis B(HB) that the odds of death in the unit have halved relative to the PIM2 population.

If the upper line crosses the control limits, HA is accepted, whereas if the lower line crosses the control limits, HB is accepted. The control limits of ± 2.9 and ± 4.6 are set arbitrarily. Conceptually the control limits correspond to the hypotheses being accepted at $\alpha = \beta = 0.05$ (± 2.9) or at $\alpha = \beta = 0.01$ (± 4.6). It should be noted, however, that the resetting of the chart and repeated testing mean that the thresholds no longer represent true probabilities, but become more pragmatic thresholds for deciding if the process is in or out of control.

Figures 6.4.1 - 6.4.7 indicate that for the two-year period, there were no alarm signals for an increase in odds of death in any unit. Four units signalled a reduced odds of death, Figures 6.4.1, 6.4.3, 6.4.7 and 6.4.8.

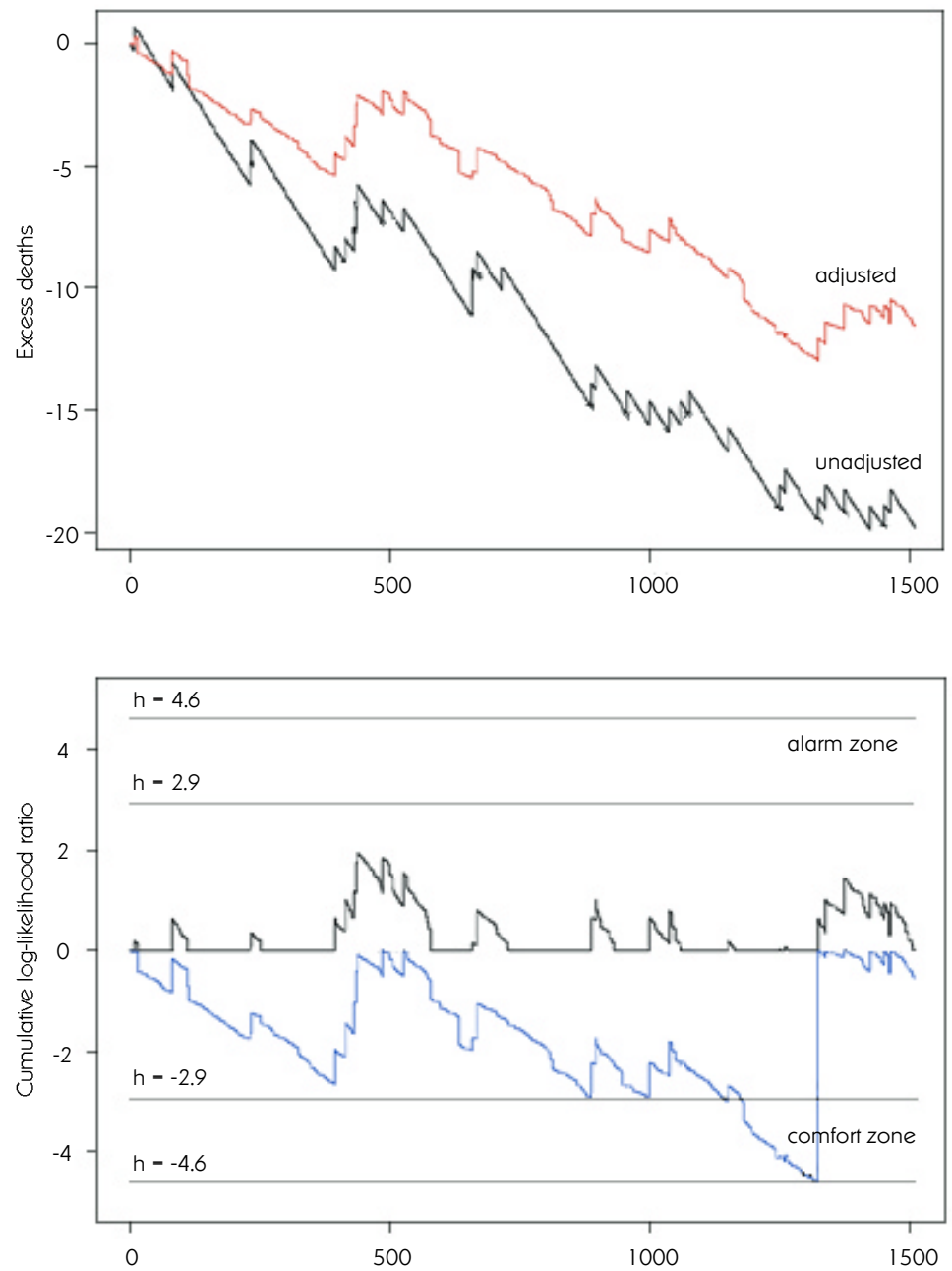


Figure 6.4.1 Sequential cumulative sum control chart for doubling and halving the odds of death for PICU A, 2003 - 2004

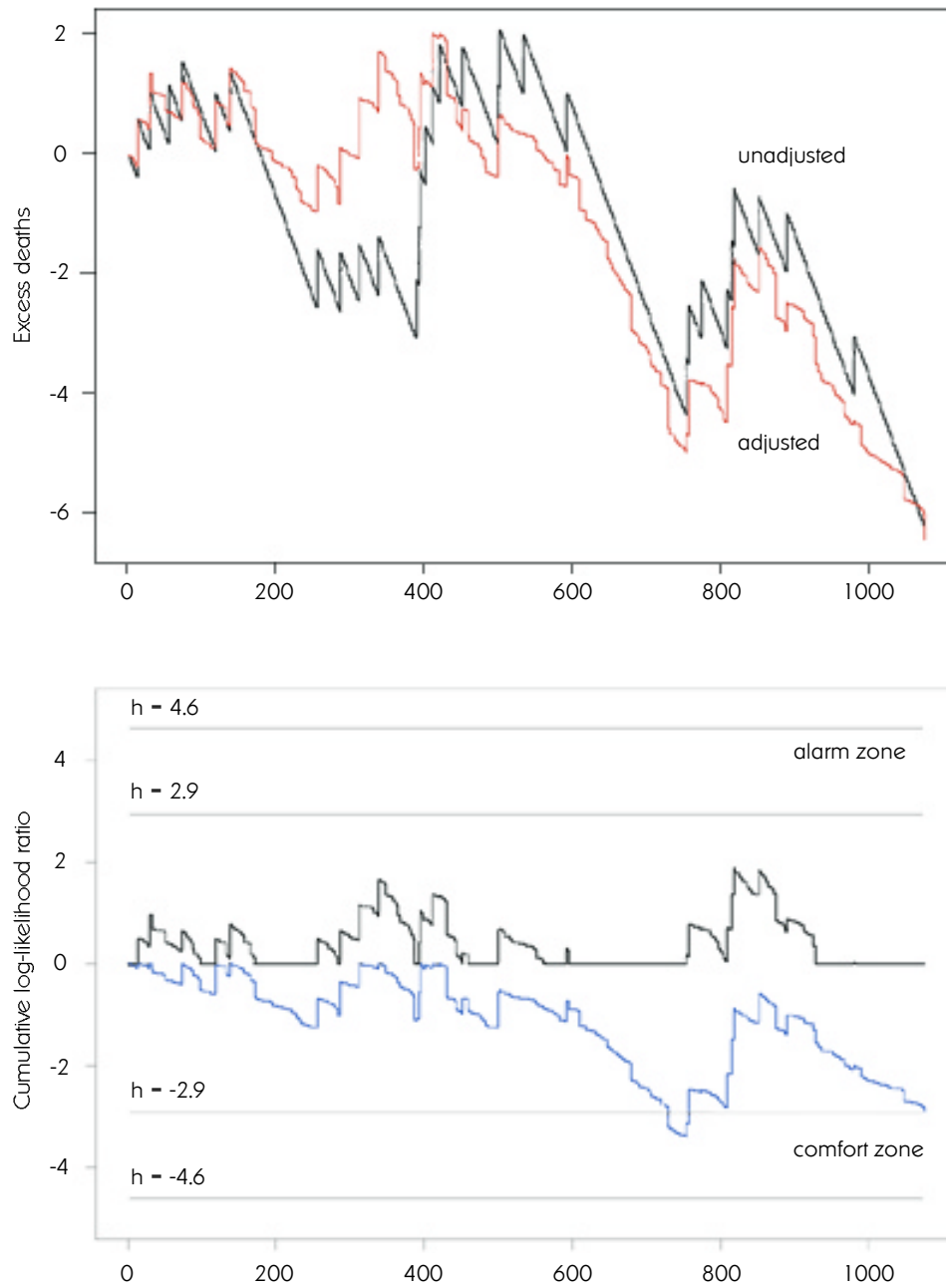


Figure 6.4.2 Sequential cumulative sum control chart for doubling and halving the odds of death for PICU B, 2003 - 2004

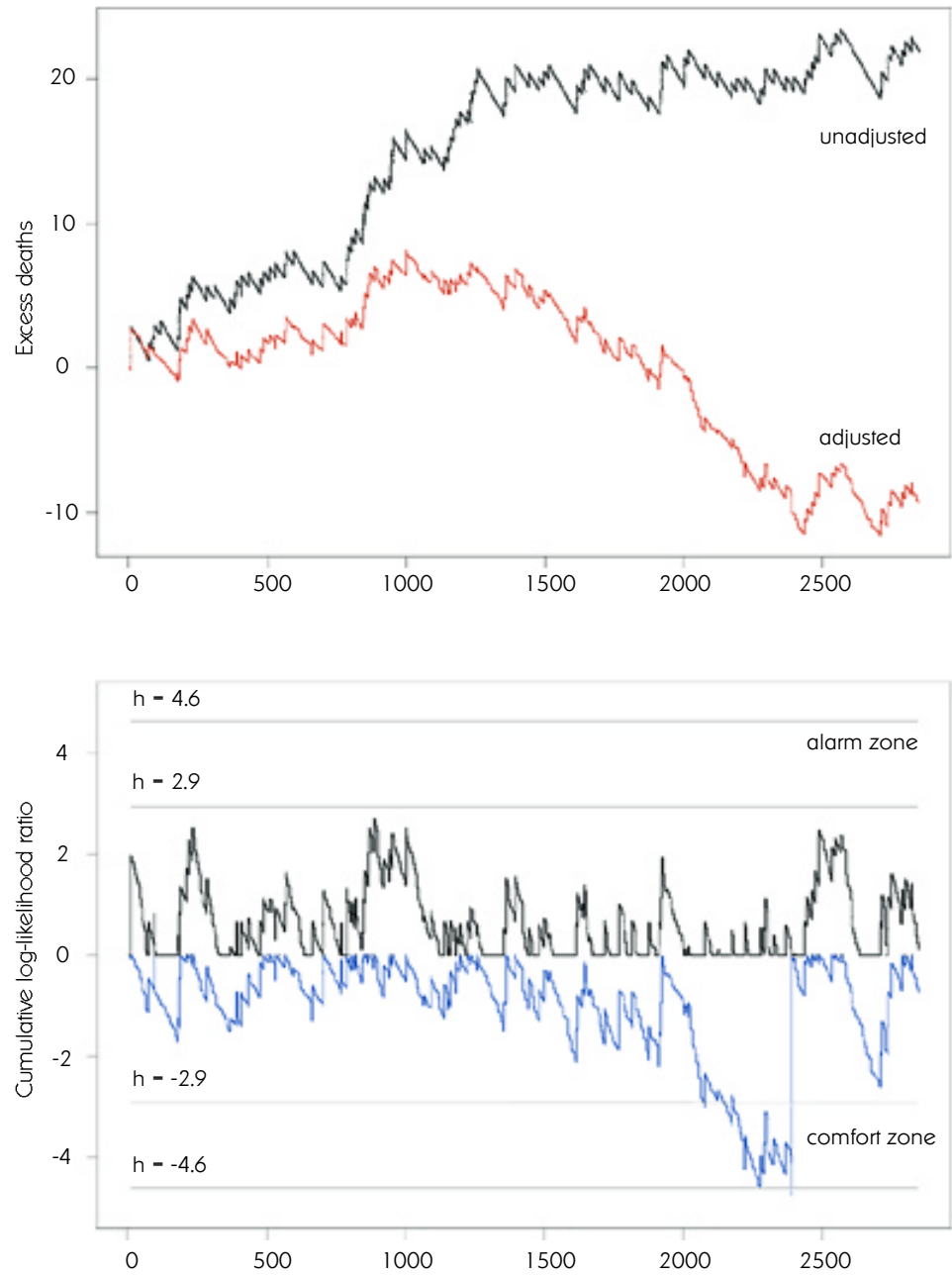


Figure 6.4.3 Sequential cumulative sum control chart for doubling and halving the odds of death for PICU C, 2003 - 2004

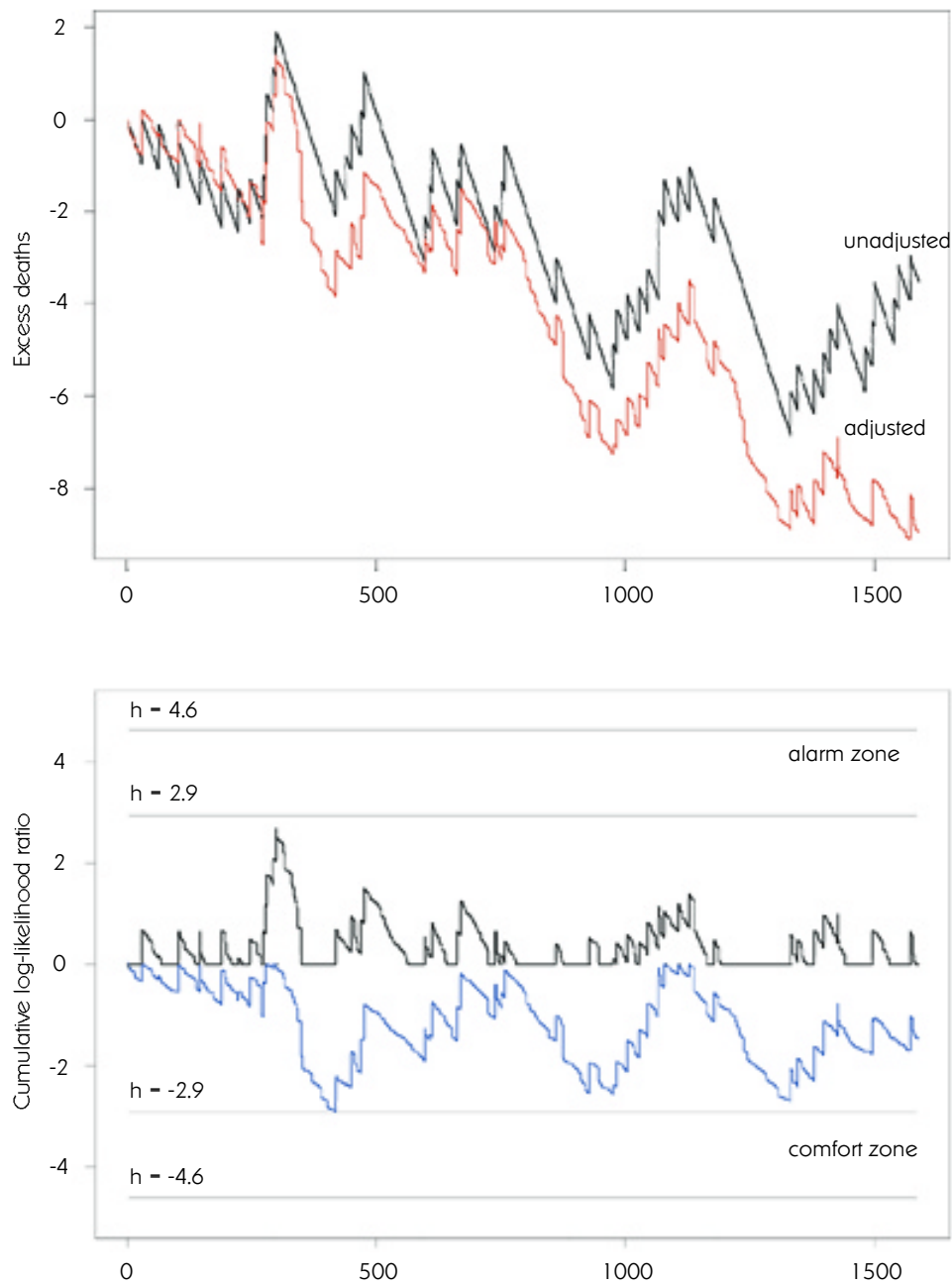


Figure 6.4.4 Sequential cumulative sum control chart for doubling and halving the odds of death for PICU D, 2003 - 2004

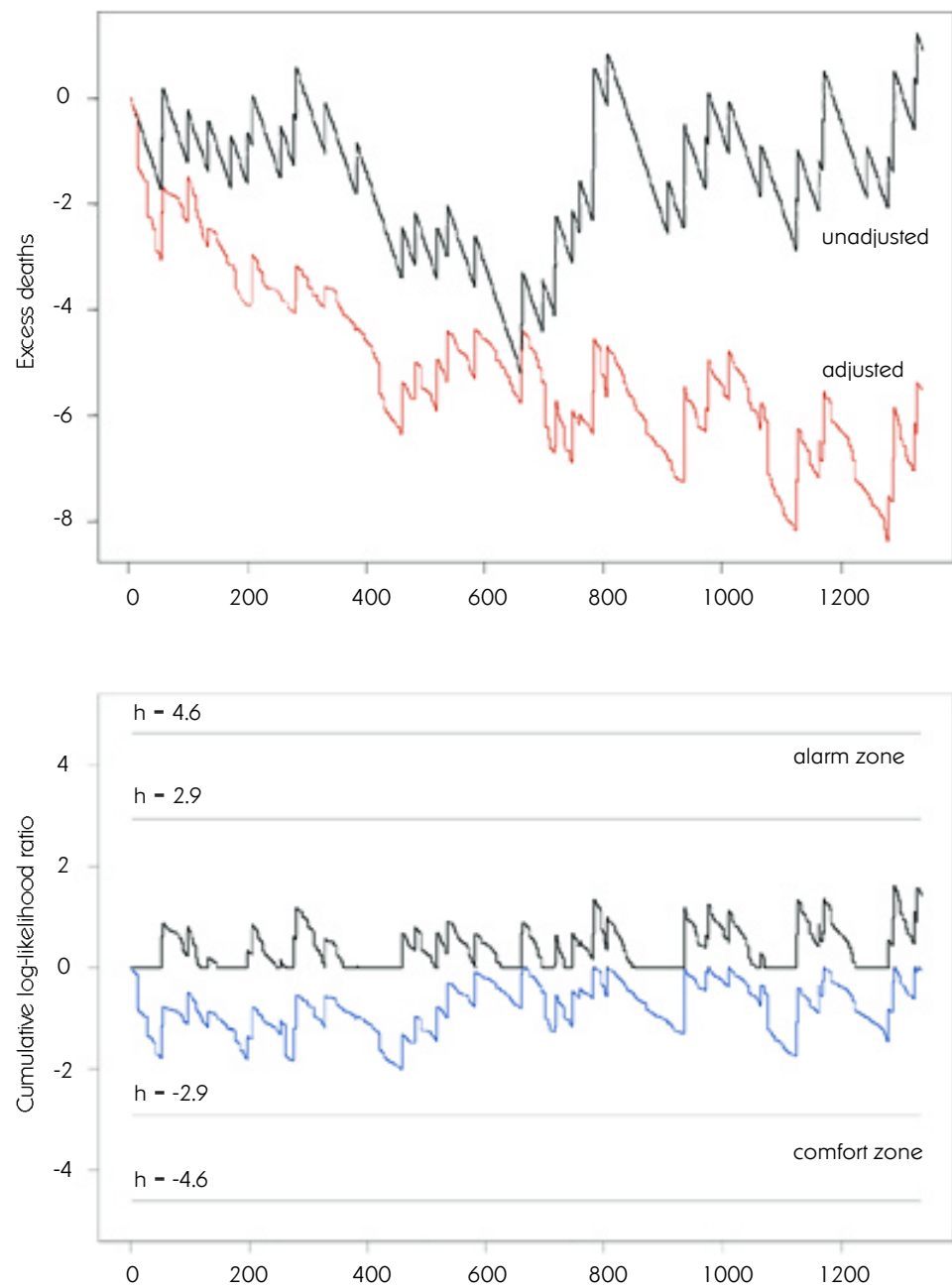


Figure 6.4.5 Sequential cumulative sum control chart for doubling and halving the odds of death for PICU E, 2003 - 2004

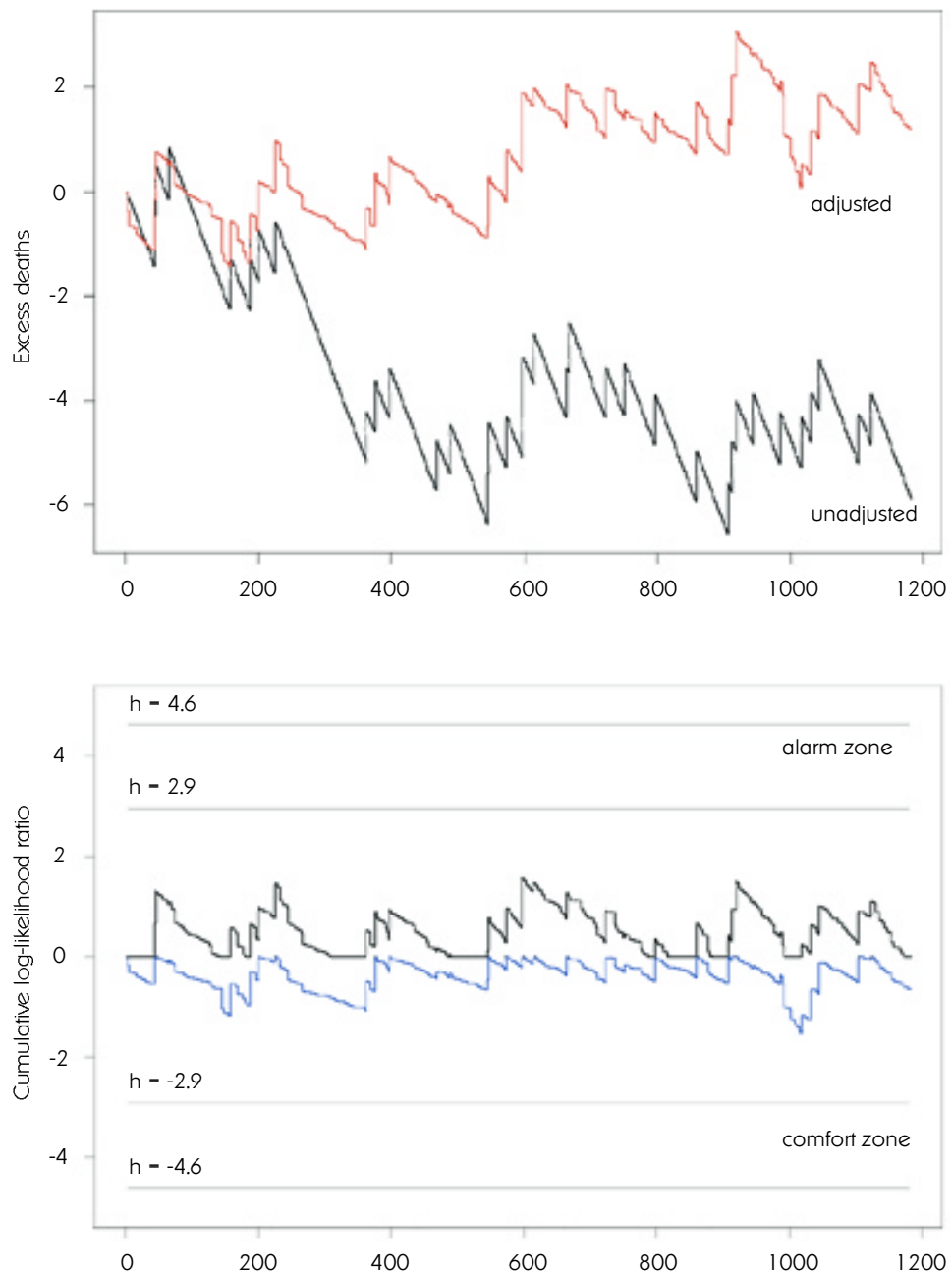


Figure 6.4.6 Sequential cumulative sum control chart for doubling and halving the odds of death for PICU F, 2003 - 2004

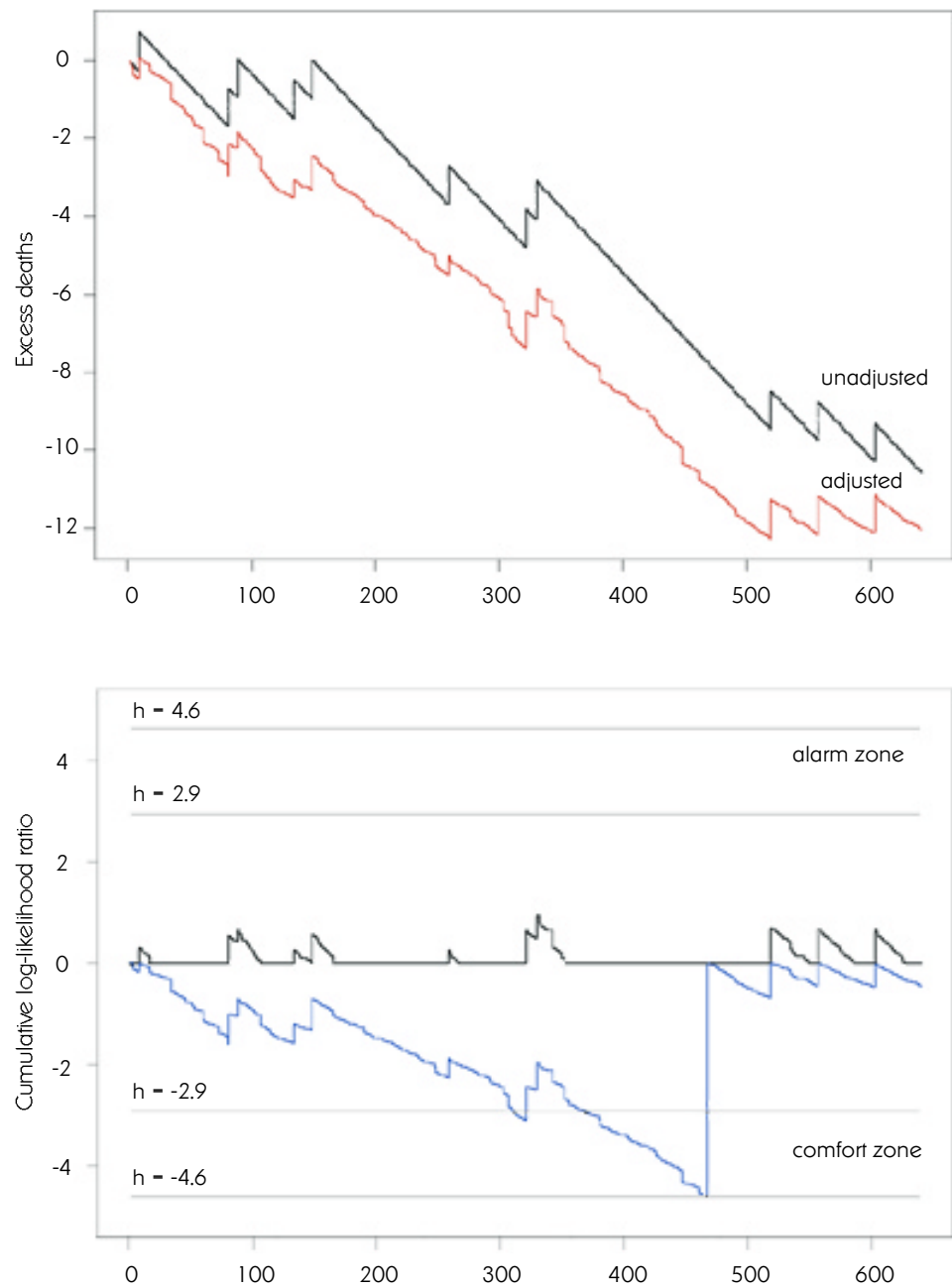


Figure 6.4.7 Sequential cumulative sum control chart for doubling and halving the odds of death for PICU G, 2003 - 2004

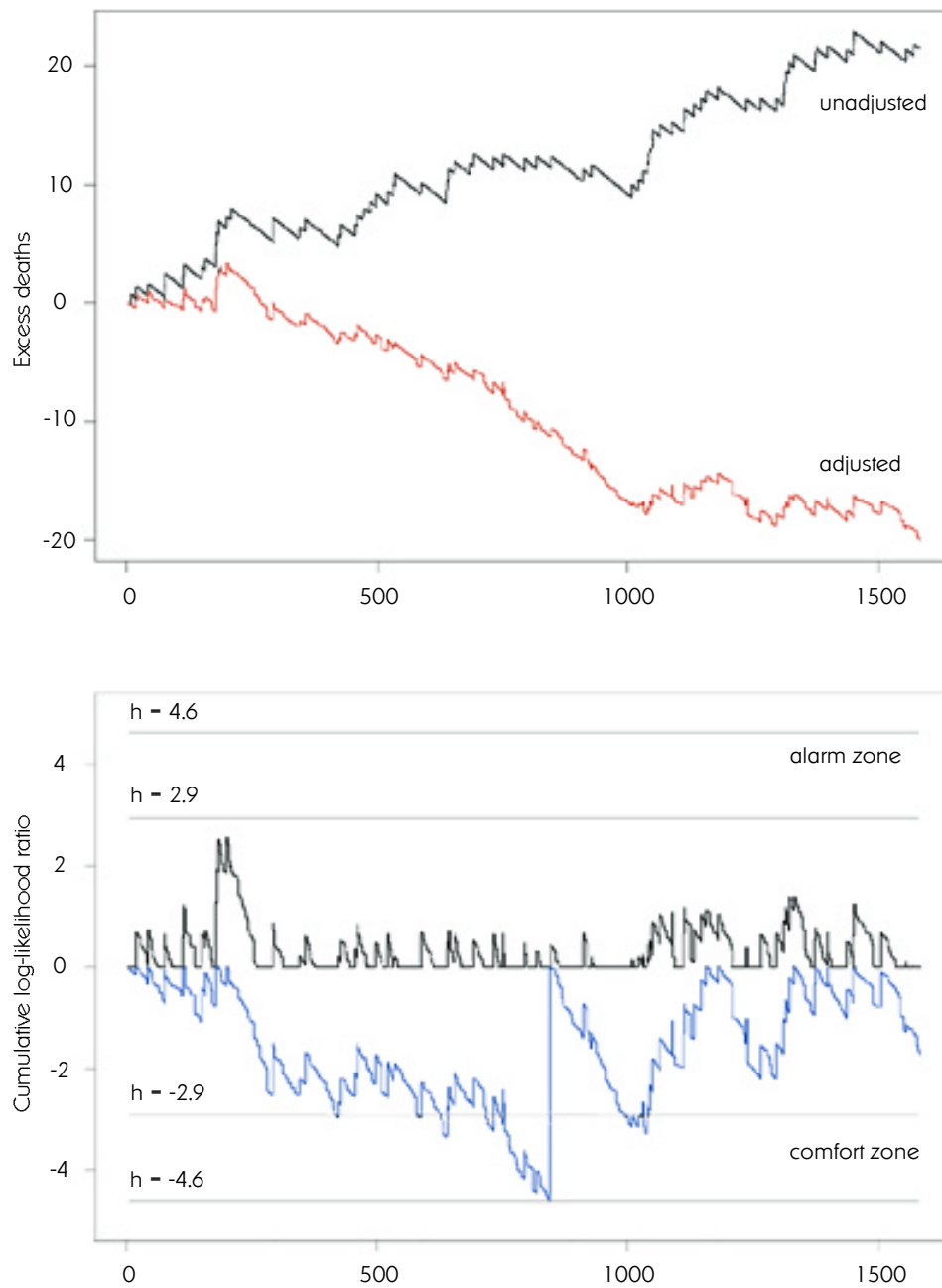


Figure 6.4.8 Sequential cumulative sum control chart for doubling and halving the odds of death for PICU H, 2003 - 2004

Appendix I

Minimum data set variables

Date of birth
Date of birth of the patient.
dd/mm/yyyy

Sex
Sex of the patient
M male
F female

Ethnicity
Ethnic origin of the patient, as identified by the patient or next of kin.

- 1 Caucasian - of Caucasoid heritage (includes European, Russian, Middle Eastern and Arabic)
- 2 Aboriginal - of Aboriginal or Torres Strait Islander (TI) descent, who identifies as an Aboriginal or TI and is accepted as such by the community with which the patient is associated
- 3 Maori - determined by patient/ next of kin self identification
- 4 Pacific Peoples - patient whose ethnic background originates from the countries of Pacific Oceania, excluding Maori
- 5 Asian - patient whose ethnic background originates from the countries of Asia, South East Asia and Indian subcontinent

Weight
The weight of the patient on admission.
Measured in kilograms.

Post Code
Post code of patient's home address.

Hospital admission source
Patient's location prior to admission to hospital.

- 1 home / scene - admitted from home or the scene of an injury
- 2 other hospital - emergency department - patient transferred from the emergency department of another hospital
- 3 other hospital - OT/recovery - patient transferred from the operating theatre or recovery room of another hospital
- 4 other hospital - ICU/NICU - patient transferred from the intensive care unit or the neonatal intensive care unit of another hospital
- 5 other hospital - ward - patient transferred from any other inpatient area of another hospital
- 6 inborn - patient was born at this hospital

Retrieval

Describes the mechanism whereby a patient is transported to the hospital by a specialist paediatric ICU transport team or equivalent.

- 0 no
- 1 yes

ICU admission source

Patient's location immediately prior to admission to the ICU.

- 1 OT/recovery - patient admitted to ICU from the operating theatre or recovery room
- 2 Emergency department - patient admitted to ICU from the emergency department
- 3 Ward - patient admitted to ICU from any other inpatient area
- 4 Other ICU/NICU same hospital - patient admitted to ICU from another ICU or NICU within the same hospital
- 5 Direct ICU admission - patient admitted directly to ICU, for example following a retrieval

Previous ICU admission during this hospital admission

Has the patient been previously admitted to intensive care during this episode of care.

- 0 no
- 1 yes - readmitted within 48 hours of previous ICU discharge
- 2 yes - readmitted after 48 hours of previous discharge

ICU admission date and time

The date and time on which the patient commenced an episode of ICU care.
dd/mm/yyyy: hh/mm

ICU discharge date and time

The date and time on which the patient completes an episode of ICU care.
dd/mm/yyyy: hh/mm

Principal ICU diagnosis

The reason most directly responsible for the patient's admission to ICU. Use the ANZPIC Registry diagnoses codes (Appendix II). For patients admitted primarily for recovery after a procedure, use a post procedural diagnosis for the principal diagnosis. Do not use injury mechanism or infection codes for the principal diagnosis.

Principal underlying diagnosis

The underlying diagnosis which has contributed to the need for admission to ICU. For example, an ex-premature infant with bronchiolitis will have a principal ICU diagnosis of bronchiolitis with an underlying diagnosis of prematurity.

Associated diagnoses

The presence of any other conditions in addition to that listed as the principal diagnosis. For patients having an operative procedure during the ICU admission, a post-procedural diagnosis should be listed as an associated diagnosis.

Outcome

The patients destination on completion of the ICU episode of care.

- 1 discharged to ward (includes transfer to another hospital ward) or home
- 2 died in ICU
- 3 transferred to another ICU/NICU
- 4 still in ICU

ICU / NICU transferred to

Name of the hospital to which the patient is transferred.

Paediatric Index of Mortality Variables

Record the first value of each variable measured at or about the time of first face to face contact between the patient and a doctor from your ICU (or a specialist paediatric retrieval team). Use the first values measured within the period from shortly before first contact to one hour after arrival in your own ICU. The first contact may be in the ICU, the emergency department, another inpatient area of the hospital or in another hospital (for example, on a retrieval). If the variable was not measured record 999.

Elective

An ICU admission or an operation is considered elective if it could be postponed for more than 6 hours without an adverse effect.

- 0 non-elective - all other admissions
- 1 elective - include admission after elective surgery, for an ICU procedure (for example, central line insertion), for diagnostic monitoring or review of a home ventilation patient

Recovery from surgery

Includes a radiology procedure or cardiac catheter. Do not include patients admitted from the operating theatre where recovery from surgery is not the main reason for ICU admission (for example, a patient with a head injury who is admitted from theatre after insertion of an ICP monitor, in this patient the main reason for ICU admission is the head injury)

- 0 no
- 1 yes

Admitted following cardiac bypass
Also code as recovery from surgery

- 0 no
- 1 yes

Systolic Blood Pressure
Measured in mmHg. If not measured within one hour of admission record 999.

Pupillary responses to bright light
Pupillary reactions to bright light are used as an index of brain function. Do not record abnormal findings due to drugs, toxins or local eye injury.

- 0 all other responses, including unknown
- 1 both fixed and > 3mm

PaO₂
The arterial oxygen tension, in mmHg, as measured in an arterial blood gas sample.

FiO₂
The fraction of inspired oxygen being delivered to the patient via endotracheal tube (ETT) or headbox. Measured at the same time as the PaO₂.

Base excess
The base excess measured in arterial or capillary blood, in mmol/l.

PIM2 low risk conditions
Specific conditions associated with reduced mortality risk

- 0 none
- 1 asthma is the main reason for ICU admission
- 2 bronchiolitis is the main reason for ICU admission
- 3 croup is the main reason for ICU admission
- 4 obstructive sleep apnoea is the main reason for ICU admission, include admissions following adenoidectomy &/or tonsillectomy in whom OSA is the main reason for ICU admission
- 5 diabetic ketoacidosis is the main reason for ICU admission

PIM2 high risk conditions

Specific conditions associated with increased mortality risk

- | | |
|----|---|
| 0 | none |
| 1 | cardiac arrest out of hospital - requires either documented absent pulse or the requirement for external cardiac massage (do not include past history of cardiac arrest) |
| 11 | cardiac arrest in hospital - preceding ICU admission requires either documented absent pulse or the requirement for external cardiac massage (do not include past history of cardiac arrest) |
| 2 | severe combined immune deficiency - requires the documented diagnosis of SCID |
| 3 | lymphoma or leukemia after first induction |
| 4 | spontaneous cerebral haemorrhage - haemorrhage must be spontaneous (for example, from an aneurysm or AVM) (do not include traumatic cerebral haemorrhage or intracranial haemorrhage that is not intracerebral) |
| 5 | cardiomyopathy or myocarditis - requires the documented diagnosis of myocarditis or cardiomyopathy |
| 6 | hypoplastic left heart syndrome - include only cases where a Norwood procedure, or equivalent, is required to sustain life |
| 7 | HIV infection - requires the documented diagnosis of HIV |
| 8 | IQ < 35 (worse than Downs) |
| 9 | neurodegenerative disorder - requires a history of progressive loss of milestones or a diagnosis where this will inevitably occur |
| 10 | liver failure - acute or chronic, include patients admitted for recovery following liver transplantation for acute or chronic liver failure |

Mechanical ventilation

Record whether the patient was mechanically ventilated within the first hour of admission to ICU. Mechanical ventilation refers to both invasive (ETT or tracheostomy) and non-invasive (nasopharyngeal airway, mask or nasal prongs) methods of augmenting work of breathing. Using conventional mechanical ventilation (CMV), continuous positive airway pressure (CPAP), biphasic positive airway pressure (BiPAP) or negative pressure ventilation (NPV).

- | | |
|---|-----|
| 0 | no |
| 1 | yes |

Intubation commenced date and time

The date and time on which the patient was intubated. Intubation refers to ETT or tracheostomy. Two separate episodes of intubation can be recorded.

dd/mm/yyyy:hh/mm

Intubation ceased date and time

The date and time on which the patient was extubated, or discharged, if the patient has a tracheostomy. Two separate episodes of extubation can be recorded.

dd/mm/yyyy: hh/mm

Intubation additional hours

If more than 2 episodes of intubation occur during a patients ICU admission further episodes are recorded as additional hours of intubation. Alternatively the total number of intubation hours for all episodes can be calculated and recorded in this field.

Respiratory support commenced date and time

The date and time on which the patient commenced respiratory support. Respiratory support refers to CMV, CPAP, BiPAP or NPV. Two separate episodes of intubation can be recorded. dd/mm/yyyy:hh/mm

Respiratory support ceased date and time

The date and time on which the patient ceased respiratory support. Two separate episodes of respiratory support can be recorded.

dd/mm/yyyy: hh/mm

Respiratory support additional hours

If more than 2 episodes of respiratory support occur during a patients ICU admission further episodes are recorded as additional hours of respiratory support. Alternatively the total number of respiratory support hours for all episodes can be calculated and recorded in this field.

INJURY		NEUROLOGICAL		RENAL	
100	Injury - Other	300	Neurological - Other	500	Renal - Other
101	Anaphylaxis	301	Botulism	501	Haemolytic Uraemic Syndrome
102	Burns	302	Brain Abscess	502	Nephrotic and/or Nephritic Syndrc
103	Carbon Monoxide Poisoning	303	Brain AV Malformation	505	Previous Renal Transplant
104	Drug Toxicity - Iatrogenic	304	Brain Death	503	Renal Failure - Acute
105	Electrocution	305	Brain Infarction or Stroke	504	Renal Failure - Chronic
106	Envenomation	306	Brain Tumour	506	Urinary Tract Infection
107	Hanging or Strangulation	324	Cerebral Aneurysm		
108	Hyperthermia	307	CSF Shunt Malfunction or Infection	GASTROINTESTINAL	
109	Hypothermia	308	Encephalitis	600	Gastrointestinal - Other
110	Immersion (Near Drowning)	309	Encephalopathy, Acute - Hypoxic	620	Biliary Atresia
111	Ingestion		Ischaemic	601	Bowel Obstruction
112	Smoke Inhalation	310	Encephalopathy, Acute - Other	621	Bowel Perforation
113	Trauma - Other	311	Encephalopathy, Chronic Degenerative (eg Leigh's Syndrome)	602	Colitis
114	Trauma - Abdominal		Encephalopathy, Chronic Static (eg Cerebral Palsy)	603	Gastroenteritis
115	Trauma - Chest	312	Guillain Barre Syndrome	604	Gastrointestinal Haemorrhage
116	Trauma - Facial		Hydrocephalus	605	Gastrostichis or Exomphalos
117	Trauma - Head	313	Intracranial Haemorrhage - Spontaneous	606	Hepatitis
118	Trauma - Skeletal	314	Intracranial Hypertension (Raised ICP)	622	Hirschsprung's Disease
119	Trauma - Spinal	315	Meningitis	607	Intussusception
		316	Meningomyelocele or Spina Bifida	608	Liver Disorder - Other
INJURY MECHANISM *		317	Muscular Dystrophy	609	Liver Failure - Acute
* DO NOT USE FOR PRINCIPAL DIAGNOSIS*		318	Myasthenia Gravis	610	Liver Failure - Chronic
150	Injury Mechanism - Other	325	Myopathy	611	Necrotising Enterocolitis
162	Crush Injury	320	Neuropathy	623	Neonatal Jaundice
151	Cyclist	321	Seizures	612	Oesophageal Atresia
152	Fall	322	Spinal Cord Lesion	624	Oesophageal Foreign Body
153	Farm Equipment	327	Tetanus	613	Pancreatitis
154	Firearm Injury	323	Venous Sinus Thrombosis	614	Peritonitis
161	Motor Bike Rider / Passenger			615	Portal Hypertension
155	MVA - Passenger	RESPIRATORY		626	Previous Liver Transplant
156	MVA - Pedestrian	UPPER AIRWAY		615	Pyloric Stenosis
157	Non Accidental Injury	400	Upper Airway - Other	616	Short Gut Syndrome
158	Self Injury	401	Choanal Atresia or Stenosis	617	Ulcer - Duodenal
159	Sports Injury	402	Epiglottitis	618	Ulcer - Gastric or Gastritis
160	Stab Injury	403	Foreign Body - Inhaled	619	Varices - Oesophageal or Gastric
		404	Laryngotracheobronchitis (Croup)	627	Volvulus
CARDIOVASCULAR		405	Obstructive Sleep Apnoea		
CONGENITAL		406	Pierre Robin Syndrome	INFECTION *	
200	Cardiovascular - Congenital - Other	407	Retropharyngeal Abscess	* DO NOT USE FOR PRINCIPAL	
201	Absent Pulmonary Valve	413	Subglottic Haemangioma	DIAGNOSIS*	
202	Anomalous Coronary Artery	408	Subglottic Stenosis	700	Infection - Other
203	Aortic Insufficiency	409	Tracheitis	701	Adenovirus
204	Aortic Stenosis	410	Upper Airway Obstruction - Other	702	Bacterium - Other
224	AP Window	411	Upper Respiratory Infection - Other	703	Bacterium - Gram Negative - Oth
205	ASD	412	Vocal Cord Paresis	704	Bacterium - Gram Positive - Other
225	AV Malformation			705	Candida
206	AVSD (AV Canal)	LOWER AIRWAY		706	Clostridium
207	Coarctation	430	Lower Airway - Other	707	CMV
208	Cor triatriatum	431	Asthma	708	EBV
226	Double Outlet Right Ventricle	432	Bronchiolitis	730	E Coli
209	Ebstein's Anomaly	433	Chronic Lung Disease (Includes BPD)	709	Enterovirus
210	Hypoplastic Left Heart Syndrome	434	Malacia - Trachea and/or Bronchi	710	Fungus - Other
211	Interrupted or Hypoplastic Aortic Arch	435	Mediastinal Mass	711	Haemophilus Influenzae Type b
227	LV Outflow Obstruction	436	Stenosis - Trachea and/or Bronchi	712	Hepatitis - Viral
212	Mitral Insufficiency	437	Tracheo-oesophageal Fistula	713	Herpes Simplex Virus
213	Mitral Stenosis	438	Vascular Ring	714	HIV
214	PDA			715	Influenza Virus
215	Pulmonary Atresia or Stenosis	OTHER		731	Klebsiella
228	Pulmonary Insufficiency	450	Respiratory - Other	716	Legionella
229	RV Outflow Obstruction	451	Air Leak Syndrome	732	Malaria
216	Single Ventricle	452	Apnoea - Central	735	Measles Virus
217	TAPVD	453	ARDS	717	Meningococcus
218	Tetralogy of Fallot	454	Aspiration	718	Mycoplasma
219	Transposition of Great Arteries (dTGA)	455	Chylothorax	719	Parainfluenzae Virus
220	Tricuspid Atresia or Stenosis	456	Congenital Diaphragmatic Hernia	720	Pertussis
221	Tricuspid Insufficiency	457	Congenital Lung Anomaly	721	Pneumococcus
222	Truncus Arteriosus	458	Cystic Fibrosis	722	Pneumocystis Carinii
223	VSD	459	Empyema	733	Pseudomonas
		460	Hyaline Membrane Disease	723	Rotavirus
AQUIRED		461	Hypoventilation - Central	724	RSV
250	Cardiovascular - Acquired - Other	462	Lower Respiratory Infection - Other	725	Salmonella
251	Cardiac Failure	463	Lung Abscess	726	Staphylococcus
252	Cardiac Tumour	470	Meconium Aspiration Syndrome	734	Streptococcus Group B
253	Cardiomyopathy	464	Pertussis Syndrome	727	Streptococcus - Other
254	Dysrhythmia - Supraventricular	465	Pleural Effusion	728	Varicella
255	Dysrhythmia - Ventricular	471	Pneumonia or Pneumonitis	729	Virus - Other
256	Endocarditis	466	Previous Lung Transplant	799	No Organism Identified
257	Hypertension - Pulmonary	467	Pulmonary Hypoplasia		
258	Hypertension - Systemic	468	Pulmonary Oedema		
259	Kawasaki's Disease	472	Respiratory Failure		
260	Pericardial Effusion or Tamponade		Transient Tachypnoea of the Newborn		
263	Previous Heart Lung Transplant				
264	Previous Heart Transplant				
261	Vascular Thrombosis				
262	Vasculitis				

MISCELLANEOUS		POST PROCEDURAL DIAGNOSES
800	Miscellaneous – Other	
801	Acute Life Threatening Event (Near Miss SIDS)	
802	Cardiac Arrest - In Hospital	
803	Cardiac Arrest - Out of Hospital	
804	Chromosomal Anomaly	
805	Coagulopathy	
839	Craniosynostosis	
806	Dehydration	
807	Dermatological Disorder	
808	Diabetes Insipidus	
809	Diabetes Mellitus with Ketoacidosis	
810	Diabetes Mellitus without Ketoacidosis	
811	Electrolyte Disorder	
812	Endocrine Disorder	
813	Gas Gangrene	
847	Haematological Disorder	
814	Home Ventilation Patient	
815	Hypoglycaemia	
816	ICU Diagnostic Monitoring - Elective	
817	ICU Procedure (eg CVC Insertion)	
818	Immunodeficiency - Congenital	
819	Immunosuppression - Acquired	
820	Inborn Error of Metabolism	
821	Leukaemia or Lymphoma	
822	Necrotising Fasciitis	
840	Neonate – Hydrops Fetalis	
841	Neonate – Infant of Diabetic Mother	
842	Neonate – IUGR	
823	Neutropenia	
848	Organ Donor	
824	Pancytopenia	
825	Phaeochromocytoma	
826	Prematurity	
843	Previous Bone Marrow Transplant	
827	Respiratory Arrest - In Hospital	
828	Respiratory Arrest - Out of Hospital	
844	Scoliosis	
829	Sepsis	
830	Shock – Cardiogenic	
831	Shock – Hypovolaemic	
832	Shock – Septic	
833	SIRS	
834	Solid Neoplasm – Malignant (not Lymphoma)	
835	Solid Neoplasm – Non Malignant	
836	Syndrome or Malformation (not Chromosomal)	
837	Toxic Shock Syndrome	
838	Transplant - Bone Marrow	
845	Tumor Lysis Syndrome	
846	Wound Infection	
ICU PROCEDURES / THERAPIES*		
* DO NOT USE FOR PRINCIPAL DIAGNOSIS		
901	Cardioversion / Defibrillation	
902	Dialysis - Haemo (intermittent)	
903	Dialysis - Peritoneal	
904	ECMO	
905	Haemofiltration (eg CVWH, CWHD)	
906	High Frequency Oscillation	
909	Inhaled Nitric oxide	
907	Plasma Filtration	
908	Ventricular Assist Device	
	MISCELLANEOUS / ANAESTHETIC	
	1100 Post Procedure - Other	
	1101 Anaesthetic Complication	
	1106 Cardiac Catheter – Balloon Septostomy	
	1102 Cardiac Catheter – Diagnostic	
	1107 Cardiac Catheter – Interventional	
	1103 Ex-prem, Post GA	
	1104 Invasive Radiology Procedure	
	1105 Massive Intraop Transfn (> 1 blood vol)	
	CARDIAC SURGERY	
	CLOSED	
	1200 Cardiac Surgery Closed – Other	
	1201 Coarctation Repair	
	1202 PA Band	
	1203 Pacemaker Insertion or Revision	
	1204 PDA Ligation	
	1205 Systemic-Pulmonary Shunt	
	1206 Valvotomy – Closed	
	OPEN	
	1230 Cardiac Surgery Open – Other	
	1231 Aortic Arch Reconstruction	
	1232 Arterial Switch	
	1233 ASD Repair	
	1234 AVSD Repair (AV Canal)	
	1235 Cardiac Tumour Resection	
	1236 Cavo-Pulmonary Shunt	
	1252 Conduit Repair or Replacement	
	1253 Coronary Artery Repair	
	1237 Fontan	
	1238 LV Outflow Reconstruction	
	1254 MAPCAs Surgery	
	1239 Norwood - Stage I	
	1240 PA Plasty or Repair	
	1241 RV Outflow Reconstruction	
	1242 Senning	
	1243 TAPVD Repair	
	1244 Tetralogy of Fallot Repair	
	1245 Transplant – Heart	
	1246 Transplant – Heart Lung	
	1247 Transplant – Lung	
	1248 Truncus Repair	
	1249 Valve Repair or Replacement	
	1250 Valvotomy – Open	
	1251 VSD Repair	
	NEUROSURGERY	
	1300 Neurosurgery – Other	
	1301 Craniotomy – Anterior Fossa	
	1302 Craniotomy – Posterior Fossa	
	1303 CSF Shunt Insertion or Revision	
	1304 Decompression - Cranial	
	1305 Decompression - Spinal Cord	
	1306 Hemispherectomy or Lobectomy	
	1307 ICP Monitor or Vent. Drain Insertion	
	1308 Intracranial Haematoma Evacuation	
	THORACIC SURGERY	
	1400 Thoracic Surgery - Other	
	1401 Diaphragm Plication	
	1402 Diaphragm Repair	
	1403 Lung Biopsy	
	1404 Lung Decortication	
	1405 Oesophageal Atresia Repair	
	1406 Pneumonectomy or Lobectomy	
	1407 Thoracic Tumour Resection	
	1408 Tracheo-oesophageal Fistula Repair	
	1409 Tracheopexy	
	ENT SURGERY	
	1500 ENT - Other	
	1501 Adenoidectomy and/or Tonsillectomy	
	1502 Choanal Atresia Repair	
	1503 Cricoid Split	
	1504 Laryngeal Reconstruction	
	1505 Laryngobronchoscopy	
	1506 Tracheostomy	
	ABDOMINAL / GENERAL SURGERY	
	1600 General Surgery – Other	
	1601 Abdominal Tumour Resection	
	1602 Appendectomy	
	1603 Bladder Extrophy Repair	
	1604 Burns Surgery	
	1605 Fundoplication	
	1606 Gastroschisis or Exomphalos Repair	
	1607 GI Endoscopy and/or Sclerotherapy	
	1608 Intussusception Repair	
	1609 Kasai	
	1610 Laparotomy	
	1615 Laparotomy – Bowel Obstruction	
	1616 Laparotomy – Bowel Perforation	
	1617 Laparotomy – GI Haemorrhage	
	1618 Laparotomy – Necrotising Enterocolitis	
	1619 Laparotomy – Peritonitis	
	1620 Laparotomy – Trauma	
	1611 Transplant – Kidney	
	1612 Transplant – Liver	
	1613 Transplant – Small Bowel	
	1614 Urogenital Surgery – Other	
	CRANIOFACIAL SURGERY	
	1700 Craniofacial Surgery – Other	
	1706 Cleft Palate Repair	
	1701 Cranial Vault Reshaping	
	1702 Dental Surgery	
	1703 Facial Cleft Repair	
	1704 Mandibular Mobilisation	
	1705 Midface Mobilisation	
	ORTHOPAEDIC SURGERY	
	1800 Orthopaedic Surgery - Other	
	1801 Fracture Fixation	
	1802 Spinal Instrumentation	

Instructions for using the ANZPIC registry diagnostic codes

- Code the reason most directly responsible for ICU admission as the Principal Diagnosis.
- Code up to 5 Associated Diagnoses.
- For patients admitted primarily for recovery after a procedure, use a Post Procedural Diagnosis for Principal Diagnosis.
- For patients having an operative procedure during the admission code the Post Procedural Diagnosis as an Associated Diagnosis.
- Do not use Injury Mechanism or Infection codes for the Principal Diagnosis (eg for RSV bronchiolitis code bronchiolitis as the Principal Diagnosis and RSV as an Associated Diagnosis).
- If new information (eg a test result) becomes available during the admission that allows more accurate coding, amend the original codes but ensure that the Principal Diagnosis still indicates the reason most directly responsible for ICU admission.

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