ANZICS

core
ANZICS
Centre for Outcome
and Resource Evaluation

Australian and New Zealand Intensive Care Society

Centre for Outcome and Resource Evaluation
Annual Report 2011–12

ANZICS CORE Annual Report

Acknowledgments

CORE would like to extend their appreciation to the doctors, nurses, ward clerks, data managers and data collectors who have contributed to the CORE Data Registries. Without this support, the ANZICS Registries would not continue to provide information for the range of quality and research activities seeking to improve patient outcomes.

Thanks also go to all the authors who have contributed to the development of this report.

CORE is funded by:

Australian Capital Territory Health

Department of Health and Community Services - Northern territory

Department of Health and Human Services – Tasmania

Department of Health - New South Wales

Department of Health - South Australia

Department of Health - Victoria

Health Department of Western Australia

Ministry of Health (New Zealand)

Queensland Health

ANZICS Centre for Outcome and Resource Evaluation (CORE)

Level 3, 10 Ievers Terrace
Carlton VIC 3053

Tel: +61 3 9340 3400

Fax: +61 3 9340 3499

Email: anzics.core@anzics.com.au

Published by ANZICS CORE October 2013

Suggested citation: Centre for Outcome and Resource Evaluation Annual Report 2011-2012, ANZICS Melbourne

ABN: 81 057 619 986

ISBN: 978-1-876980-08-5

Index

Foreword from the ANZICS CORE Chair ... 5
Australia and New Zealand Intensive Care 2011–12 Snapshot ... 6
Who is contributing to CORE? ... 6
Clinical outcomes for adult patients ... 6
Clinical outcomes for paediatric patients ... 6
ICU activity and resources ... 6
ICU staffing ... 6
ANZICS CORE ... 7
Future Directions for CORE ... 7
Structure of ANZICS CORE ... 8
CORE committees ... 8
CORE Registries ... 9
Role of clinical registries ... 9
Adult Patient Database (APD) ... 9
Critical Care Resources Registry (CCR) ... 11
Australian and New Zealand Paediatric Intensive Care (ANZPICR) ... 12
Profile of ICUs in Australia and New Zealand ... 13
Where are the ICU services? ... 13
Characteristics by Hospital Classification ... 18
Admissions to adult ICUs ... 18
Admission source and discharge destination ... 18
Outcomes ... 19
Ventilation ... 20
Other Indicators of ICU Activity ... 21
Adult Patient Database ... 21
Australian and New Zealand Paediatric Intensive Care Registry ... 23
Supporting Quality Data Submission ... 24
Data validation process ... 24
Data audit program ... 24
Training for data collectors and clinicians ... 24
Engaging the ICU clinical community in CORE activities ... 25
Outlier analysis and management process ... 25
CORE Supporting Research ... 26
Information request process ... 26
ANZIC-RC collaboration ... 26
ANZPICR ... 27
Publications Using CORE Data ... 28
Quality of Care Research ... 28
Health Services Research ... 29
Enhancing Registry Methodology ... 29
Appendix 1 – Number of Contributing Sites and Admissions ... 30
Appendix 2 – Sites Contributing to CORE ... 31
Appendix 3 – Scoring Systems ... 37
APACHE II (2nd revision) ... 37
APACHE III-J (3rd revision, 10th recalibration) ... 37
Paediatric Index of Mortality 2 (PIM2) ... 37
Paediatric Index of Mortality 3 (PIM3) ... 37
Abbreviations ... 38
Glossary ... 39

Index *continued*

Tables

Table 1: Contribution to the CCR by hospital type in 2011/12 11
Table 2: Bed numbers, admissions and occupancy in 2011/12 from APD, CCR and ANZPICR 13
Table 3: Characteristics for admissions to adult ICUs from APD 2011/12 14
Table 4: Top 5 admission diagnoses for patients admitted to adult ICUs in 2011/12 15
Table 5: Medical and nursing workforce in adult units in 2011/12 15
Table 6: Admission characteristics for paediatric admissions reported to ANZPICR in 2012 16
Table 7: Top 5 admission diagnoses for paediatric patients admitted in 2012 17
Table 8: Medical and nursing workforce in paediatric units in 2011/12 17
Table 9: Contributing ICUs and admissions reported to the APD in 2011/12 30
Table 10: Contributing ICUs and admissions reported to the ANZPICR in 2012 30
Table 11: Contributing ICUs and admissions reported to the CCR in 2011/12 30

Figures

Figure 1: Contributions to the APD from 2000 10
Figure 2: APACHE III-J SMR funnel plots for 2011/12 10
Figure 3: Contributions to the CCR from 2000 11
Figure 4: Contributions to ANZPIC from 2000 12
Figure 5: PIM2_ANZ11 and PIM3 SMR funnel plots for 2012 12
Figure 6: A profile of all ICUs across Australia and New Zealand. 13
Figure 7: Percentage of admissions to adult ICUs by hospital classification in 2011/12 18
Figure 8: Source of admission to ICU by hospital classification in 2011/12 18
Figure 9: Destination on discharge from hospital following ICU admission by hospital classification in 2011/12 18
Figure 10: Observed hospital mortality compared to predicted mortality by hospital classification in 2011/12 19
Figure 11: APACHE III-J SMR 95% confidence intervals by hospital classification in 2011/12 19
Figure 12: In-hospital mortality for Australian ICU patients 19
Figure 13: In-hospital mortality for New Zealand ICU patients 19
Figure 14: Australian ICU APACHE III-J SMR 20
Figure 15: New Zealand ICU APACHE III-J SMR 20
Figure 16: Requirement for invasive ventilation during the first 24 Hours in ICU by hospital classification in 2011/12 20
Figure 17: Rate of readmitted adult ICU patients 21
Figure 18: Median length of stay in ICU and interquartile range for ICU survivors and non-survivors 21
Figure 19: Proportion of adult ICU admissions that are planned admissions following elective surgery 21
Figure 20: Number of adult patients admitted to ICU for potential organ donation 22
Figure 21: Proportion of adult ICU patients discharged to ward between 18:00 and 06:00 hours 22
Figure 22: Proportion of adult ICU admissions who received VTE prophylaxis within first 24 hours 22
Figure 23: Rate of readmissions to ICUs for paediatric patients 23
Figure 24: Median length of stay in ICU and interquartile range for paediatric ICU survivors and non-survivors 23
Figure 25: Proportion of elective and non elective admissions to ICU among paediatric patients 23

Foreword from the ANZICS CORE Chair

With great thanks to the Australian and New Zealand Intensive Care Society (ANZICS) President and Board, to the Centre for Outcome and Resource Evaluation (CORE) staff and Management Committee members, I am proud to write this foreword to the ANZICS CORE Annual Report for 2011/12.

Over 150,000 adults and children are admitted to Intensive Care Units across Australia and New Zealand each year. Some will have come through the ICU as part of routine post-operative care following major complex surgery, some will have been admitted with life threatening medical conditions, most will eventually return home but all will have seen the huge efforts put in by staff to provide safe high quality care. This report describes not only the overall outcomes of these patients but details the services and high standards of care which are routine in all Australian and New Zealand ICUs.

CORE now manages one of the largest repositories of intensive care patient episodes in the world (over 1.4 million) spanning international borders working closely with the: ANZICS Clinical Trials Group (CTG), ANZICS Safety and Quality Committee, Paediatric Study Group and the Australian and New Zealand Intensive Care Research Centre (ANZIC-RC) based at The School of Public Health and Preventive Medicine at Monash University.

This year also saw the launch of the Central Line Associated Bloodstream Infection (CLABSI) Registry which was a joint initiative between ANZICS and the Australian Commission on Safety and Quality in Health Care (ACSQHC). This registry was established to monitor the rate of CLABSI across all Australian ICU's.

We value the support over recent years from all the jurisdictions including the Ministry of Health in New Zealand, ACSQHC and the Chief Medical Officer of Australia, Professor Chris Baggoley.

My personal thanks go to all the supporters of CORE, particularly the data collectors (without you this report would not be possible) and whole team of individuals within ICU who contribute to the high quality of intensive care medicine described in this report. In addition the CORE team who on a daily basis educate, promote data collection for quality assurance processes and provide reports to the intensive care community.

Thank you,

Associate Professor David Pilcher
Chair, ANZICS CORE

Australia and New Zealand Intensive Care 2011–12 Snapshot

The following data is drawn from across all the CORE registries to provide a snap shot of intensive care services in the 2011/12 financial year.

Who is contributing to CORE?

- There were 191 adult ICUs and 9 Paediatric ICUs (PICUs) in Australia and New Zealand
  - 70% of Australian ICUs and 46% of New Zealand ICUs contributed to the APD
  - 95.% (36/38) of adult tertiary ICUs contributed data to the APD
  - 83% of ICUs contributed data to the CCR
  - 8 PICUs, one NICU/PICU and 17mixed adult/paediatric sites contributed to ANZPIC

Clinical outcomes for adult patients

- Observed hospital mortality in adult patients was 9.7% in Australia and 10.6% in New Zealand*
- Predicted risk of death for adult patients was estimated to be 13.5% in Australia and 13.7% in New Zealand (based on APACHE III-J mortality prediction algorithm)*
- 70.1% of survivors were discharged home from hospital after their ICU stay*

Clinical outcomes for paediatric patients

- The observed hospital mortality for paediatric patients was 3.7%#
- The ICU Mortality for paediatrics patients was 2.6%#
- The predicted risk of death for paediatric patients was 2.7% (estimated based on PIM2 mortality prediction algorithm)#

ICU activity and resources

- 165,144 admissions were treated in 180 Australian and New Zealand ICUs (including PICUs)*#^
  - 39.9% admissions at 142 units received invasive ventilation (including PICUs)^
  - 4.9% patients who survived their initial admission to ICU, were readmitted to ICU at least once during the same hospital stay*
  - 14.7% patients were discharged to the ward between 18:00 and 06:00 hours*
  - 2.0% patients admitted to ICU were transferred to an ICU at another hospital*
  - 4.0% patients were admitted to ICU with a treatment limitation order*
  - 2.4% patients from 112 sites had elective surgery cancelled or deferred due to inadequate resources^
- There were 2,192 ICU beds funded and available for use (including PICUs)^

ICU staffing

- 1012 senior medical positions from 147 units were employed in a total of 627 FTE positions^
  - 90.3% of senior medical staff in 147 units were Intensivists^
- 10,726 registered nurse positions from 154 units were employed in a total of 8,572 FTE positions^
  - 52.4% of registered nurses in 132 units had critical care training^

**APD (2011/12 financial year), #ANZPICR (2012), ^CCR (2011/12 financial year),*

APACHE – Acute Physiological, Age and Chronic Health Evaluation, PIM – Paediatric Index of Mortality, FTE – Full Time Equivalent

ANZICS CORE

ANZICS CORE comprises three clinical registries that collect de-identified data from contributing intensive care units in Australia and New Zealand. The APD collects data on admissions to adult intensive care units, ANZPICR collects data on ICU admissions under the age of 16, and the CCR collects data via an annual survey on ICU infrastructure, staffing and processes. The data collected by the registries is used to compare, monitor and benchmark intensive care performance across institutions, and is then reported back to each ICU and Jurisdictional Liaison Committees for review.

Recruitment of sites to contribute data to CLABSI began in early 2012 with reports to submitting sites made available in late 2012.

CORE is unique in that it offers an overview across regional, state, federal and international jurisdictions. Over time, the datasets have developed into an expansive and invaluable resource for the intensive care community and other health care sectors. It has enabled research, service delivery and more informed resource planning, as well as benchmarking performance. The APD, is now one of the largest single datasets in intensive care in the world, with data from over 1.4 million patient episodes, while ANZPICR holds over 110,500 paediatric ICU admissions. The CCR contains information on critical care resources dating from 1993 to present day.

Future Directions for CORE

The development of the CORE Enterprise Reporting System (CERS) is a major focus that will see improvements in the data submission and reporting processes at ANZICS CORE. Additional funding was provided by the jurisdictions in the 2011-2013 Triennial Agreement. CERS will enable full integration of the CORE registries into a single data warehouse enabling the opportunity to provide cross-registry analysis and the ability to develop tailored reports for sites, jurisdiction and other stakeholders.

CORE is seeking to develop future collaborations with organisations that rely on information from ICUs. While it is a strong principle that site based data is not shared or provided unless there is specific permission from the relevant units, the aggregated data is of value to external agencies and could reduce the demand on units receiving multiple requests for data. Currently collaborations include:

- The College of Intensive Care Medicine to support their Accreditation and Training program
- The Australian Organ and Tissue Donation and Transplant Authority to provide case mix data.

Structure of ANZICS CORE

CORE committees

The National Intensive Care Registry Steering Committee

Membership of this Committee includes representatives of the jurisdictional funding bodies, members of ACSQHC and representatives of ANZICS and ANZICS CORE. The National Intensive Care Registry Steering Committee (NICRSC) provides national oversight of CORE with representation of key funders

The CORE Advisory Committee

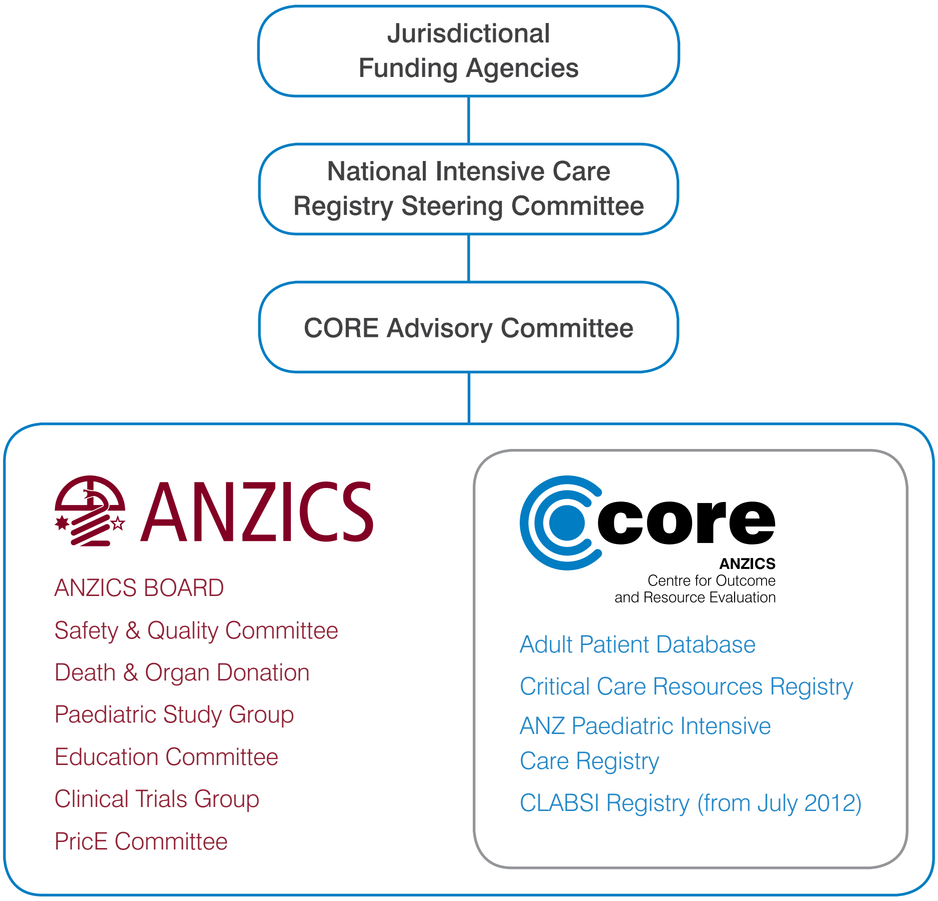
Membership of this Committee includes regional ANZICS representatives and representation from the NICRSC. The Committee provides general oversight and direction for ANZICS CORE's activities.

Paediatric Clinical Advisory Committee

There was a resolution from the Paediatric Study Group in 2011 to establish a group with representation from all PICUs to provide review of unit-identified data and strategic direction to ANZPICR.

CORE Management Committee

This committee provides operational and financial oversight of CORE activities. Membership to this committee includes the Chair of CORE, Directors of each of the CORE registries, the CORE Manager and the ANZICS General Manager.



CORE Registries

Role of clinical registries

Clinical registries collect a standardised set of information. There are now numerous clinical registries in Australia and around the world supporting clinical outcomes monitoring. In Australia these have been listed by ACSQHC as a key method for quality assurance.[1]

As data management is independent of the represented providers, clinical registries are able to:

- Monitor and provide benchmark data to improve healthcare performance across institutions and providers. Registries also assist in the accurate interpretation of results from raw data to outcome.
- Benchmarking information to provide strong impetus for clinicians and institutions to reach their maximum potential in providing quality care.

The ACSQHC document 'Strategic & Operating Principles for Australian Clinical Quality Registries'[2] is used as a guide to prioritise future work and ensure that the standards of the CORE Registries meet those identified in the document.

Adult Patient Database (APD)

De-identified individual patient data is submitted to CORE quarterly where it undergoes extensive validation checks prior to reports being made available to individual sites and published on the CORE secure web portal.

The comparative reports are grouped by hospital classification and analysed by:

- Age distribution
- Length of stay distribution
- APACHE III-J score distribution
- APACHE III-J predicted risk of death
- Standardised Mortality Ratio (SMR)

Regional reports are provided separately to jurisdictional liaison committees to review local hospitals' outcomes. Submission of data to the APD is supported by jurisdictional health departments, private health insurers, and private hospital ownership groups.

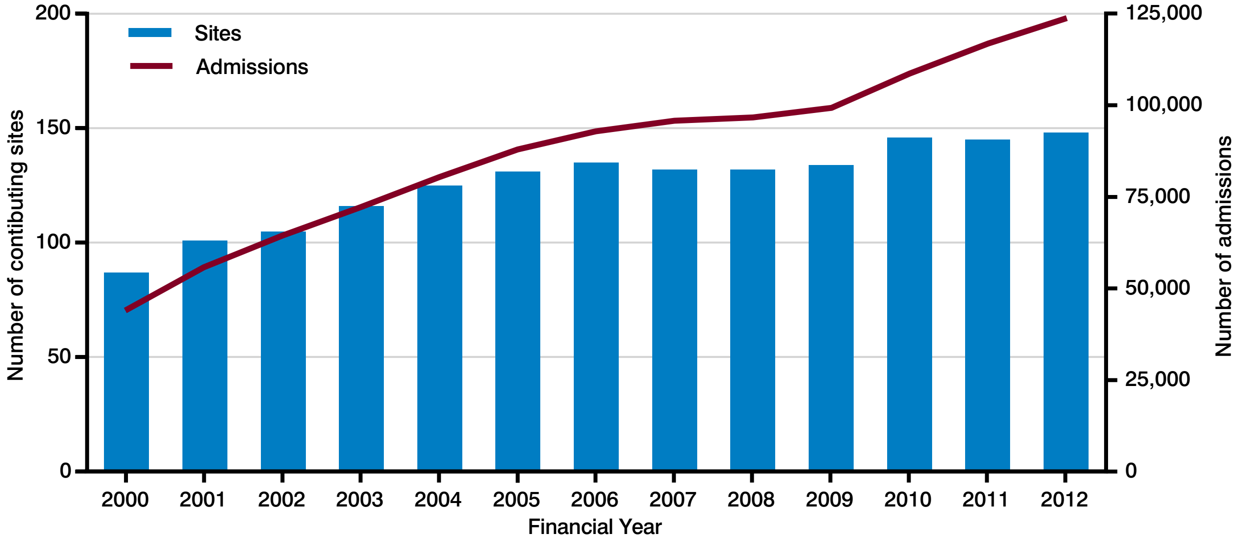
The number of sites contributing to the APD has remained relatively constant since 2010, despite this the number of ICU admissions reported continues to increase, see Figure 1.

[1] *Australian Commission on Safety and Quality in Health Care (2009), Windows into Safety and Quality in Health Care 2009, ACSQHC, Sydney*

[2] *Australian Commission on Safety and Quality in Health Care (2010), Strategic & Operating Principles for Australian Clinical Quality Registries ACSQHC, Sydney*

CORE Registries *continued*

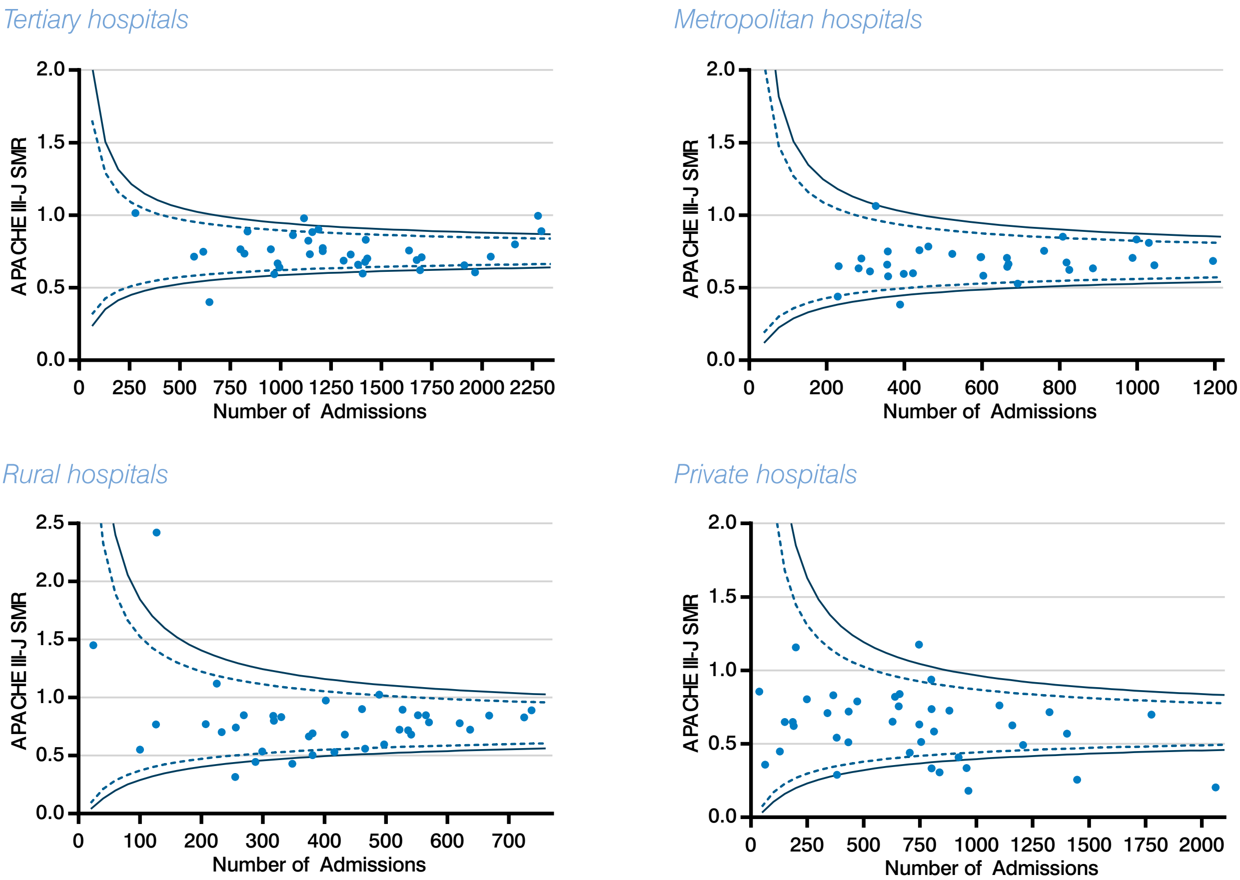
Figure 1: Contributions to the APD from 2000



Source: APD

The funnel plots below provide a visual representation of hospitals by classification (tertiary, metropolitan, rural, and private) based on APACHE III-J SMR. The SMRs are plotted against number of admissions for each site for the reporting period. Confidence intervals for the funnel plot are calculated around the mean SMR of the group shown, the confidence intervals shown are 95 and 99%.

Figure 2: APACHE III-J SMR funnel plots for 2011/12



Source: APD

CORE Registries *continued*

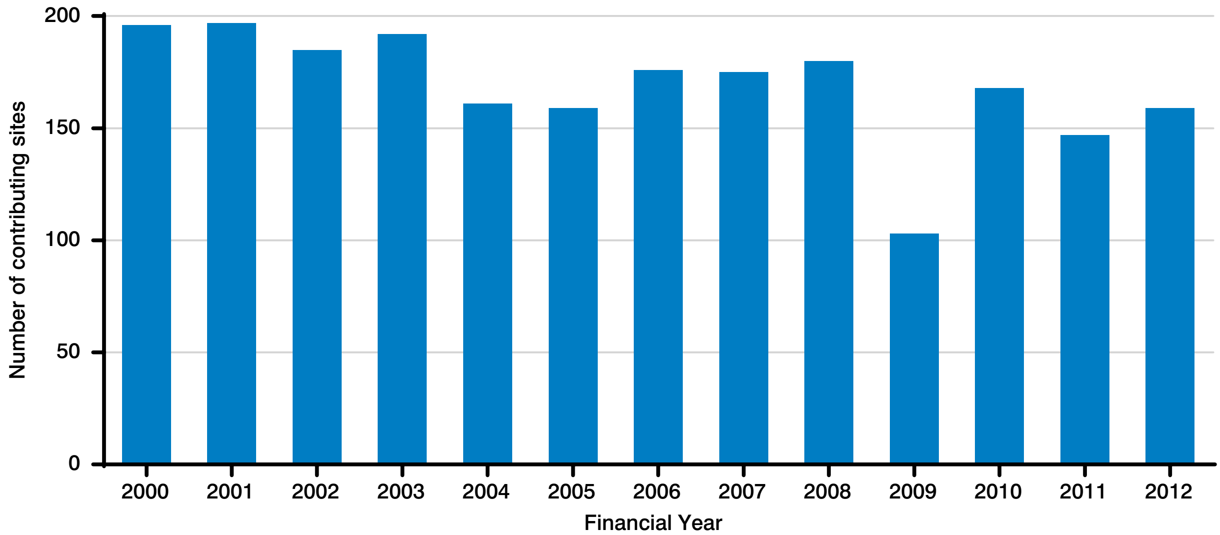
Critical Care Resources Registry (CCR)

The CCR surveys ICUs annually on resources and activity. Data is collected to identify the distribution and attributes of intensive care services in Australian and New Zealand adult and paediatric ICUs, and HDUs under ICU management.

The survey collects a range of information related to infrastructure, staffing and processes of ICUs, including critical care beds, admissions, refusals, ventilation requirements, bed utilisation, and workforce data together with quality of care measures and processes. The 2011/12 CCR survey was sent to 194 ICUs (182 adult and 8 paediatric ICUs) with responses received from 160 units (82.4%).

There was no CCR survey in 2009 due to additional data requirements during the H1N1 influenza epidemic. Sites were asked to complete this retrospectively in 2010.

Figure 3: Contributions to the CCR from 2000



Source: CCR by financial year

Table 1: Contribution to the CCR by hospital type in 2011/12

	Australia	New Zealand	Total
Tertiary	31	7	38
Metropolitan	24	3	37
Rural	34	9	43
Private	43	2	45
PICU	6	1	7
Total	138	22	160

Source: CCR 2011/12

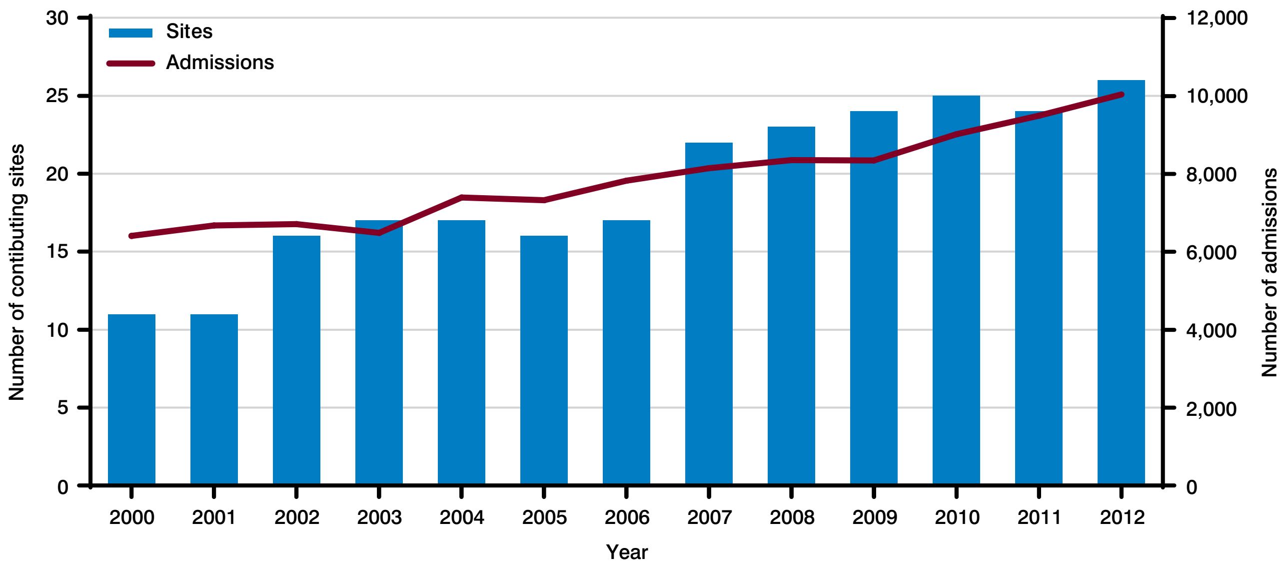
Australian and New Zealand Paediatric Intensive Care Registry (ANZPICR)

ANZPICR was established in 1997 and provides an overview of paediatric intensive care through the six monthly submissions of patient episode information, as well as an audit program to promote quality data submission. The aims of ANZPICR are to:

- Describe paediatric intensive care practices and outcomes in Australia and New Zealand;
- Provide contributing units with reports that compare performance against national and international standards; and
- Facilitate research in paediatric intensive care.

There has been both an increase in the number of sites and admissions submitting data to the ANZPICR.

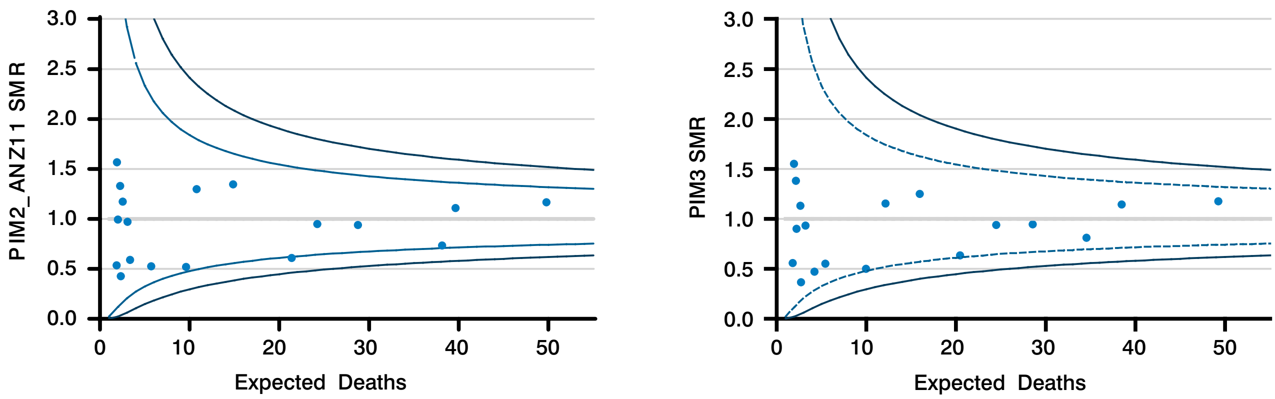
Figure 4: Contributions to ANZPIC from 2000



Source: ANZPICR by calender year

As a comparative report, the funnel plot below compares a unit's SMR against the SMRs of all units contributing to ANZPICR in 2012. This plot can identify potential outliers, as they will fall outside the control lines which have been set as ± 2 & 3 SDs around an SMR of 1. Expected deaths have been used on the x-axis to minimise the potential for identifying units.

Figure 5: PIM2_ANZ11 and PIM3 SMR funnel plots for 2012



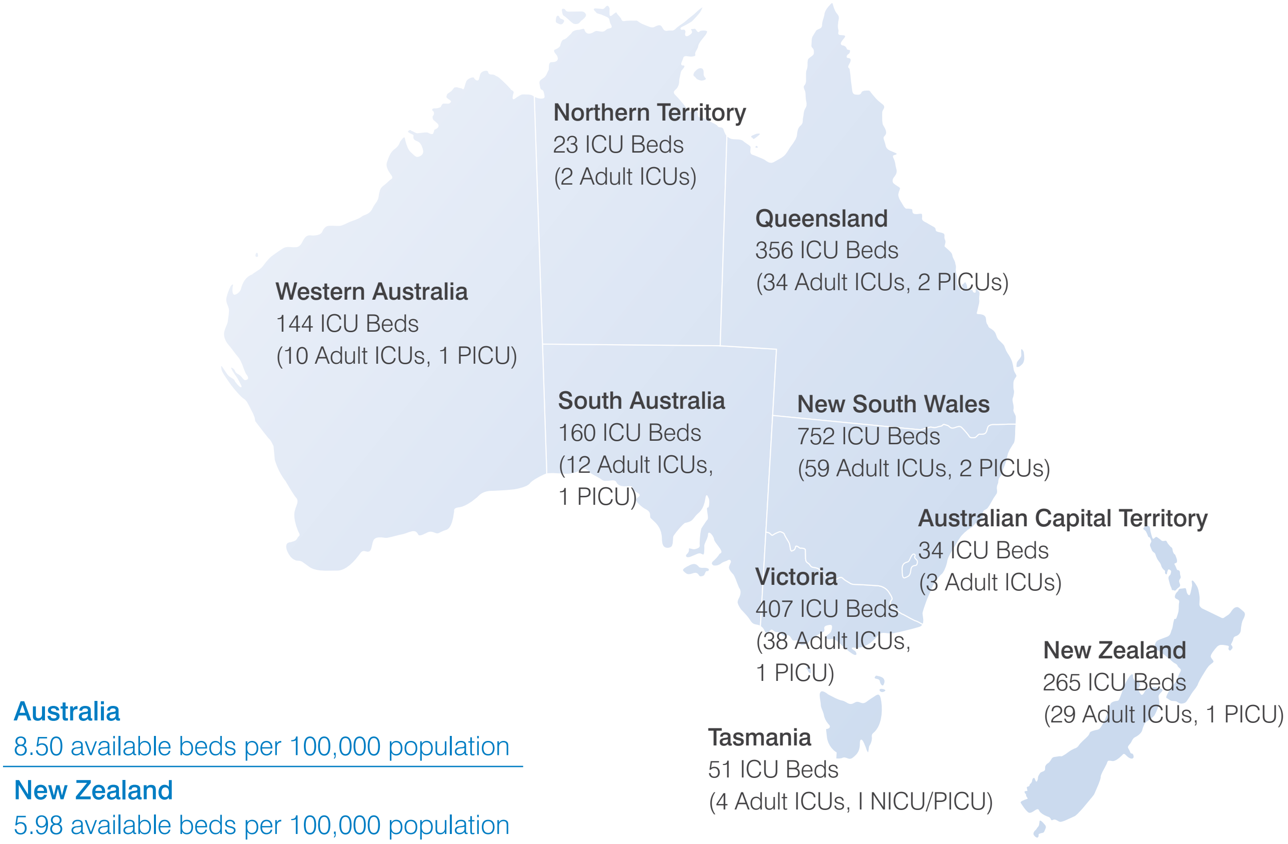
Source: ANZPICR

Profile of ICUs in Australia and New Zealand

Where are the ICU services?

The below figure shows all available ICU and PICU beds in Australia and New Zealand based on the CCR data and follow up of all non-contributing sites to CCR. Non contributing sites are predominantly smaller rural and private ICUs that admit a small number of ICU patients compared with other sites that contribute data to ANZICS CORE.

Figure 6: A profile of all ICUs across Australia and New Zealand



Source: CCR 2011/12 and follow-up of sites by phone to obtain remaining bed numbers not reported through CCR.

Population was 22,683,573 for Australia and 4,431,800 for New Zealand

Sources: http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/0 and http://www.stats.govt.nz/browse_for_stats/population/estimates_and_projections/NationalPopulationEstimates_HOTPJun12qtr.aspx)

Table 2: Bed numbers, admissions and occupancy in 2011/12 from APD, CCR and ANZPICR

	Australia	New Zealand	Total
Available Beds *(as reported through CCR and follow up of non CCR sites)*	1,927 (n=170)	265 (n=30)	2,192 (n=200)
Total Admissions *(as reported through CCR, APD and ANZPIC)*	147,828 (n=157)	17,316 (n=23)	165,144 (180)
Occupancy Rate *(as reported through CCR)*	73.3% (n=125)	56.2% (n=22)	71.1% (n=147)

Profile of ICUs in Australia and New Zealand *continued*

Table 3: Characteristics for admissions to adult ICUs from APD 2011/12

	Australia	New Zealand	Total
Patient Characteristics			
Total Admissions*	112,575	11,248	123,823
Median Age in years*	64.7 (49.8-75.6)	62.1 (45.3-73)	64.5 (49.4-75.3)
Male*	57.4%	57%	57.7%
Planned Admissions to ICU after Elective Surgery*	38.7%	36.9%	38.5%
Ventilated in first 24 Hours of ICU Admission*	36.1%	48.7%	37.3%
Ventilated Overall ^	38.6%	49.5%	39.9%
Length of Stay in ICU in days*	1.8 (0.9-3.6)	1.1 (0.8-2.8)	1.8 (0.9-3.6)
After-Hours Discharges to Ward (18:00 – 06:00) *	15.2%	9.8%	14.7%
Readmissions*	4.8%	5.0%	4.9%
Source of Admission*			
Ward	15.9%	17.2%	16.0%
Operating Theatre	51.2%	48.8%	51.0%
Emergency Department	25.7%	27.9%	25.9%
Other Hospital	6.2%	4.0%	6.0%
Severity of Illness* – Scores			
APACHE III-J	46 (32-63)	48 (34-65)	46 (32-63)
APACHE II	14 (10-19)	14 (10-19)	14 (10-19)
Severity of Illness – APACHE III-J Predicted Risk of Death*			
Mean Predicted Risk of Death	14%	16.0%	14.2%
Median Predicted Risk of Death	4.6% (1.4-16.1%)	5.7% (1.5-19.7%)	4.7% (1.4-16.4%)
Outcomes*			
ICU Mortality	6.0%	7.7%	6.2%
Hospital Mortality	9.7%	10.6%	9.8%
APACHE III-J SMR (95% CI)	0.71	0.77	0.72
Survivors discharged home	70.1%	69.2%	70.1%
Survivors discharged to a chronic care facility	9.2%	5.7%	8.9%

*Source: *APD, ^ CCR*

Legend:

Readmissions are reported as the proportion of patients discharged alive from their first ICU admission who have one or more readmission to ICU within the same hospital stay.

Please see Appendix 3 for an explanation of the scoring systems used by ANZICS CORE.

Profile of ICUs in Australia and New Zealand *continued*

Table 4: Top 5 admission diagnoses for patients admitted to adult ICUs in 2011/12

Australia	Number	Percentage
CABG Surgery	7,213	6.4%
GI Surgery for Neoplasm	5,142	4.6%
Orthopaedic Surgery	5,038	4.5%
Valvular Heart Surgery	4,221	3.7%
Drug Overdose	3,958	3.5%
New Zealand	**Number**	**Percentage**
CABG Surgery	1,360	12.1%
Valvular Heart Surgery	710	6.3%
Drug Overdose	370	3.3%
CABG with valve repair/replacement	352	3.1%
Gastrointestinal bleeding	336	3.0%

Source: APD, CABG – Coronary Artery Bypass Graft, GI – Gastrointestinal

Table 5: Medical and nursing workforce in adult units in 2011/12

	Australia	New Zealand	Total
Total Senior Medical Officer FTE	506.9 (n=122)	85.8 (n=20)	592.7 (n=142)
Total Registrars FTE	789.9 (n=111)	103.5 (n=18)	892.8 (n=129)
Total Registered Nurse FTE	7184.9 (n=128)	870.3 (n=21)	8055.2 (n=149)
Senior Medical Officer Vacancy	3.8% (n=94)	11.9% (n=17)	5.1% (n=111)
Registered Nurse Vacancy	4.9% (n=115)	4.3% (n=21)	4.8% (n=136)
Proportion Intensivists	92.7% (n=116)	73.3% (n=19)	90.2% (n=135)
Proportion CICM Registrars	55.6% (n=111)	43.5% (n=18)	54.2% (n=129)
Proportion Critical Care Nurses	54.5% (n=111)	47.0% (n=16)	53.8% (n=127)

Source: CCR, n= number of contributing units, CICM – College of Intensive Care Medicine

Table 6: Admission characteristics for paediatric admissions reported to ANZPICR in 2012

	Australia	New Zealand	Total
Patient Characteristics			
Total Admissions	8,324 (n=20)	1,772 (n=6)	10,046 (n=26)
Median Age in Months	25.0 (5.0 – 96.8)	15.8 (3.5 - 79.5)	23.3 (4.7 – 93.8)
Male	56.2%	58.5%	56.6%
Patients with Elective Admissions	35.8%	28.0%	34.5%
Ventilated in First Hour of ICU Admission	45.0%	52.2%	46.3%
Ventilated Overall	61.5%	66.1%	62.3%
Length of Stay in ICU in Days	1.6 (0.8 - 3.7)	1.3 (0.8 – 2.9)	1.6 (0.8 - 3.5)
After-Hours Discharges to Ward (18:00 – 06;00)	11.8%	8.4%	11.2%
Readmissions	7.4%	7.7%	7.4%
Severity of Illness – Predicted Risk of Death			
Mean PIM2_ANZ11 Predicted Risk of Death	2.7%	3.1%	2.7%
Median PIM2_ANZ11 Predicted Risk of Death	0.8% (0.2 - 1.8%)	0.8% (0.2 - 2.1%)	0.8% (0.2 - 1.8%)
Mean PIM3 Predicted Risk of Death	2.6%	3.1%	2.7%
Median PIM3 Predicted Risk of Death	0.8% (0.2 - 1.7%)	0.9% (0.4 - 2.1%)	0.8% (0.2 - 1.8%)
Outcomes			
ICU Mortality	2.4%	3.3%	2.6%
Hospital Mortality	3.3%	5.8%	3.7%
PIM2_ANZ11 SMR (95% CI)	0.93 (0.82 – 1.04)	1.09 (0.85 – 1.32)	0.96 (0.86 – 1.06)
PIM3 SMR (95% CI)	0.94 (0.82 – 1.05)	1.10 (0.85 – 1.34)	0.97 (0.86 – 1.07)

Source: ANZPICR, n=number of contributing units

Legend:

All continuous values are reported as medians and interquartile range (IQR) unless stated. Categorical values are reported as proportions.

Readmissions are reported as the proportion of patients discharged alive from their first ICU admission who have one or more readmission to ICU within the same hospital stay.

Please see Appendix 3 for an explanation of the scoring systems used by ANZICS CORE.

Table 7: Top 5 admission diagnoses for paediatric patients admitted in 2012

Australia	Number	Percentage
Bronchiolitis	849	10.2%
Seizures	365	4.4%
Pneumonia or Pneumonitis	326	3.9%
Asthma	311	3.7%
Head Trauma	203	2.4%
New Zealand	**Number**	**Percentage**
Bronchiolitis	310	18.0%
Asthma	88	5.1%
Seizures	78	4.5%
Pneumonia or Pneumonitis	66	3.8%
Central Apnoea	50	2.9%

Source: ANZPICR

Table 8: Medical and nursing workforce in paediatric units in 2011/12

	Australia & New Zealand
Total Senior Medical Officer FTE	39.0 (n=7)
Total Registrars FTE	93.9 (n=7)
Total Registered Nurse FTE	608.9 (n=7)
Senior Medical Officer Vacancy	4.5% (n=5)
Registered Nurse Vacancy	8.9% (n=6)
Proportion Intensivists	100% (n=7)
Proportion CICM Registrars	42.0% (n=7)
Proportion Critical Care Nurses	30.2% (n=5)

Source: CCR, n= number of contributing units. Australia and New Zealand data combined to avoid identification of sites

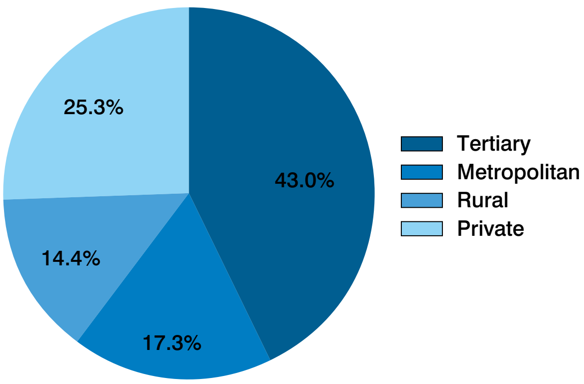
Characteristics by Hospital Classification

Admissions to adult ICUs

The demographics and outcomes of patients admitted to adult ICUs in Australia and New Zealand are generally reported according to the type of hospital. This ensures that hospitals with similar services and case-mix presenting to their ICUs are compared with appropriate peer hospitals wherever possible. Hospitals are classified as tertiary, metropolitan, rural/regional or private. These classifications are based on the location of the hospital and the level of care provided.

Tertiary hospitals account for the largest number of admissions to ICU and have the highest proportion of patients requiring mechanical ventilation.

Figure 7: Percentage of admissions to adult ICUs by hospital classification in 2011/12

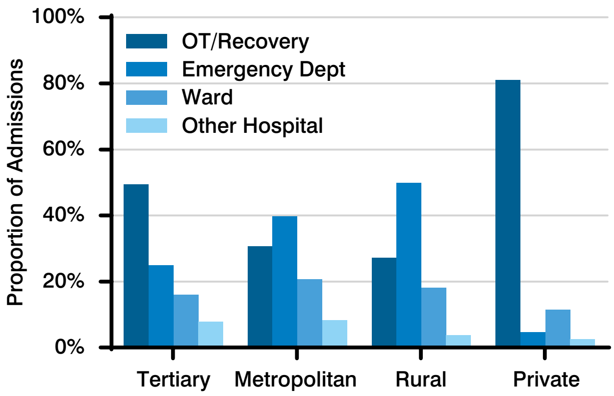


Source: APD

Admission source and discharge destination

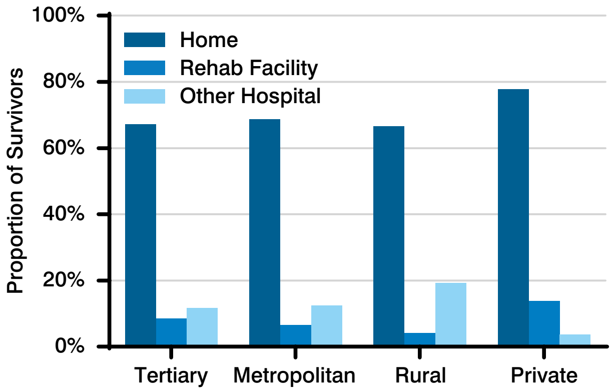
Metropolitan and rural ICUs have a higher proportion of admissions from the emergency department. Private ICUs have a much higher proportion of patients admitted from operating theatres or recovery, the majority of whom are planned admissions following elective surgery (such admissions have a lower predicted risk of death than emergency admissions).

Figure 8: Source of admission to ICU by hospital classification in 2011/12



Source: APD, OT – Operating Theatre

Figure 9: Destination on discharge from hospital following ICU admission by hospital classification in 2011/12



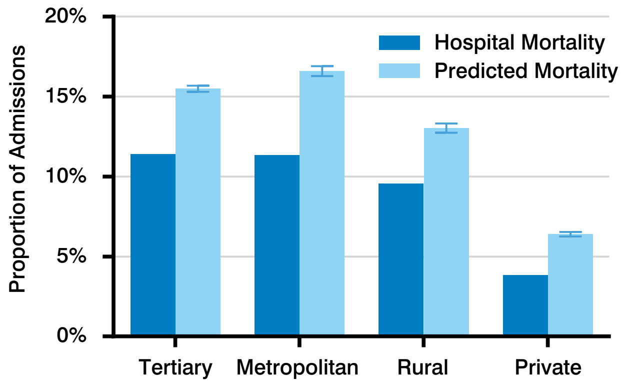
Source: APD

Characteristics by Hospital Classification *continued*

Outcomes

The difference in the observed mortality rate for private ICUs is due to the higher proportion of elective surgical admissions which although needing admission to Intensive Care, have a lower risk of death.

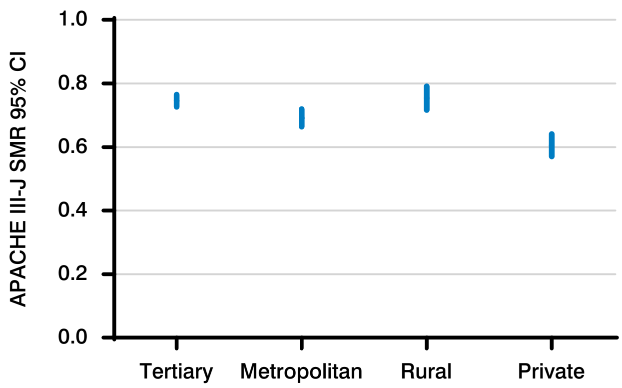
Figure 10: Observed hospital mortality compared to predicted mortality by hospital classification in 2011/12



Source: APD, the Predicted Mortality is derived from the APACHE 111-J Scoring System

The SMR is the observed number of deaths divided by the predicted number of deaths. An SMR of greater than one indicates more deaths than predicted by the APACHE III-J scoring system. Patients less than 16 years old, who are in ICU less than 4 hours, have an unknown hospital outcome, or who are transferred to another ICU are excluded from the calculation of the APACHE III-J SMR.

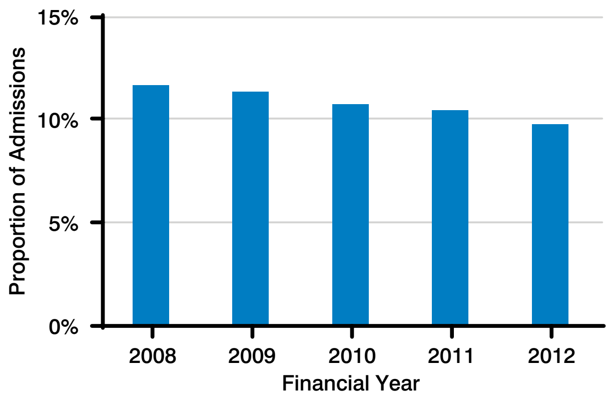
Figure 11: APACHE III-J SMR 95% confidence intervals by hospital classification in 2011/12



Source: APD

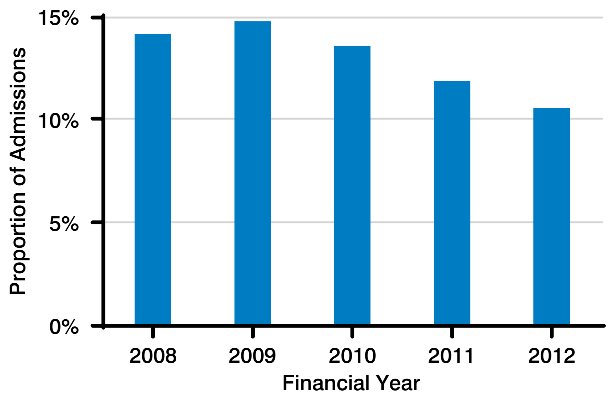
The APACHE III-J SMR for Australian and New Zealand ICUs has decreased between 2007/08 and 2011/12 showing a continuation of the trend downward.

Figure 12: In-hospital mortality for Australian ICU patients



Source: APD

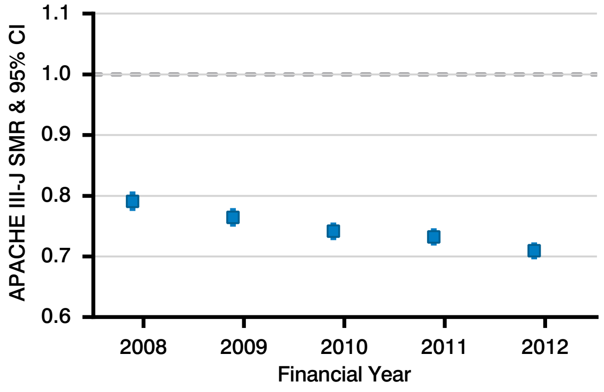
Figure 13: In-hospital mortality for New Zealand ICU patients



Source: APD

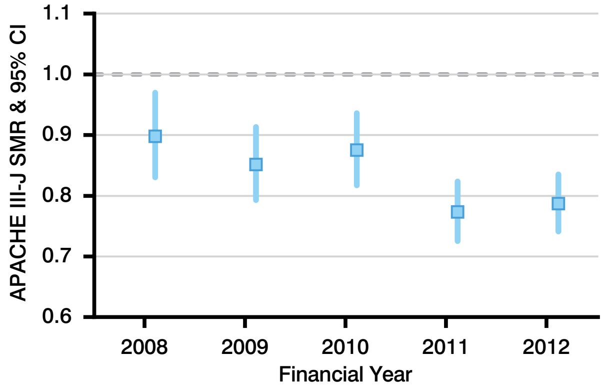
Characteristics by Hospital Classification *continued*

Figure 14: Australian ICU APACHE III-J SMR



Source: APD

Figure 15: New Zealand ICU APACHE III-J SMR

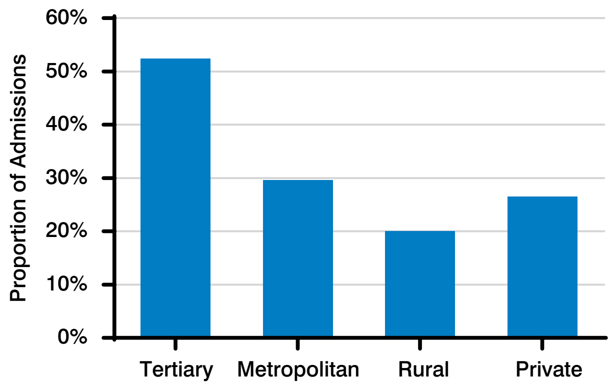


Source: APD

Ventilation

The APD considers a patient to be mechanically ventilated when they are ventilated invasively at the time the highest scoring arterial blood gas was taken during the first 24 hours in ICU based on the Apache III-J scoring system. Some patients require mechanical ventilation after the first 24 hours of ICU admission and are not represented in this data.

Figure 16: Requirement for invasive ventilation during the first 24 hours in ICU by hospital classification in 2011/12



Source: APD

Other Indicators of ICU Activity

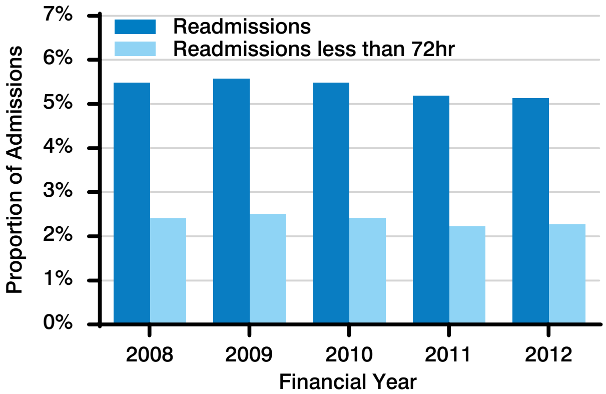
The following section displays data related to ICU activity across a range of variables for the financial years from 2007/08 to 2011/12.

Adult Patient Database

Readmission to ICU

Overall rates of readmission and readmissions within 72 hours have not significantly changed over the past five years. Patients who require readmission to ICU have a higher mortality than other ICU admissions.[3]

Figure 17: Rate of readmitted adult ICU patients

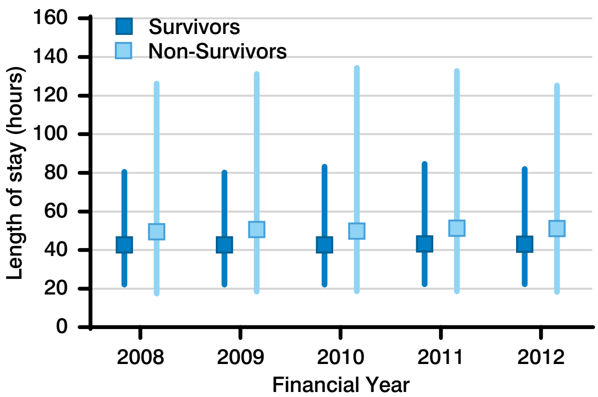


Source: APD

ICU length of stay

There has been little change in the ICU length of stay for survivors and non-survivors over the last five financial years.

Figure 18: Median length of stay in ICU and interquartile range for ICU survivors and non-survivors

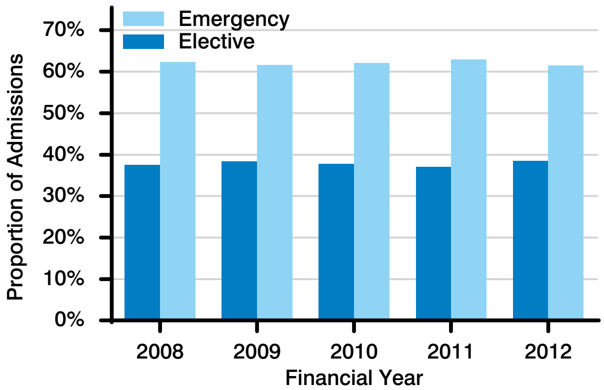


Source: APD

Proportion of planned admissions following elective surgery

The APD classifies an elective admission as a planned admission to ICU following elective surgery e.g. Cardiac Surgery.

Figure 19: Proportion of adult ICU admissions that are planned admissions following elective surgery



Source: APD

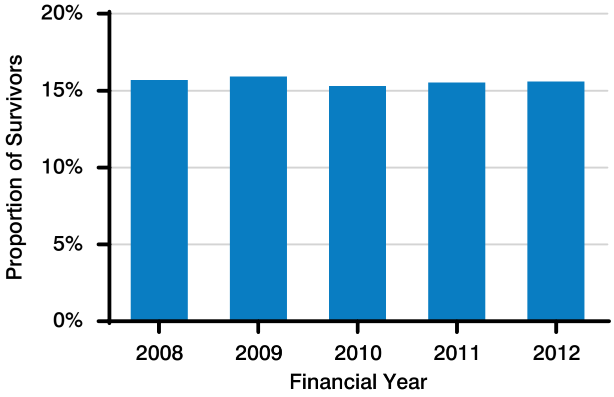
[3] *Increased mortality associated with after-hours and weekend admission to the intensive care unit: a retrospective analysis. Bhonagiri D, Pilcher DV, Bailey MJ. Med J Aust. 2011 Mar;194(6):287-92.*

Other Indicators of ICU Activity *continued*

After hours discharge

After hours discharge from ICU is associated with an increased risk of death.[5,6] Over the past five years, there has been little change in the proportion of patients discharged after hours.

Figure 20: Proportion of adult ICU patients discharged to ward between 18:00 and 06:00 hours

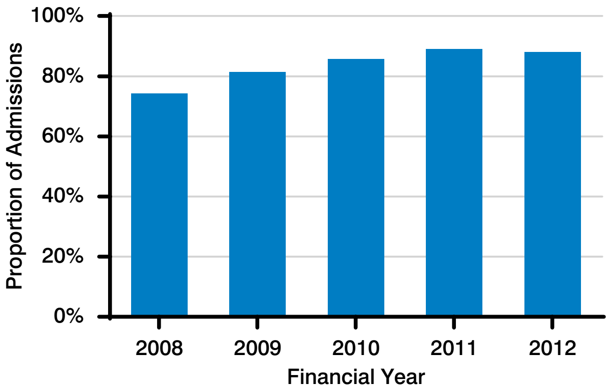


Source APD

Provision of venous thrombo-embolism prophylaxis

Omission of venous thrombo-embolism (VTE) prophylaxis is associated with an approximate 20% increase in risk of death. Patients where there was no information recorded and in whom VTE prophylaxis was contra-indicated or not indicated were excluded from this analysis.[4]

Figure 21: Proportion of adult ICU admissions who received VTE prophylaxis within first 24 hours

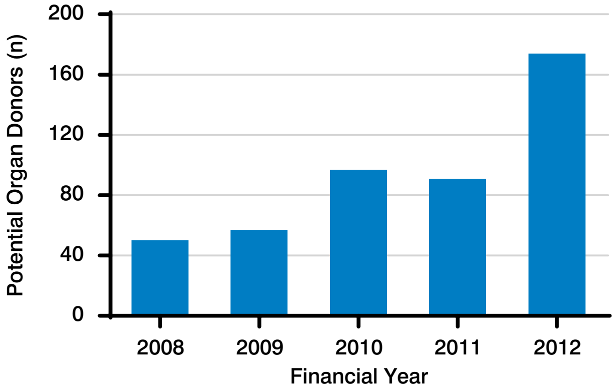


Source: APD

Number of patients who were admitted to ICU to assess for potential organ donation

The Australian Organ and Tissue Donation and Transplantation Authority was established in 2009. Over recent years there has been increased identification of patients who might become organ donors. One organ donor can potentially lead to seven lifesaving organ transplants. The increase in 2012 may be a result of increased identification of potential donors and awareness of organ donation through work lead by Organ Donation Agencies in Australia and New Zealand.

Figure 22: Number of adult patients admitted to ICU for potential organ donation



Source APD

[4] Omission of Early Thromboprophylaxis and Mortality in Critically Ill Patients: a Multicenter Registry Study. Ho, Kwok M, Shaila Chavan, and David Pilcher. Chest 140, no. 6 (December 2011): 1436–1446.

[5] Afterhours discharge from intensive care increases the risk of readmission and death. Pilcher DV, Duke GJ, George C, Bailey MJ, Hart G. Anaesth Intensive Care. 2007 Aug;35(4):477-85.

[6] Consequences of discharges from intensive care at night. Goldfrad C, Rowan K. Lancet. 2000 Apr 1;355(9210):1138-42.

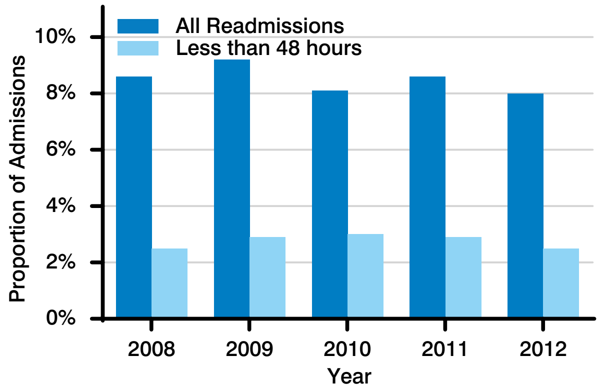
Other Indicators of ICU Activity *continued*

Australian and New Zealand Paediatric Intensive Care Registry

Readmission to ICU for ANZPICR

The rate of readmission within 48hrs post ICU discharge has stayed at approximately 3% for the years 2008 to 2012. Readmissions include both planned and unplanned readmissions.

Figure 23: Rate of readmissions to ICUs for paediatric patients

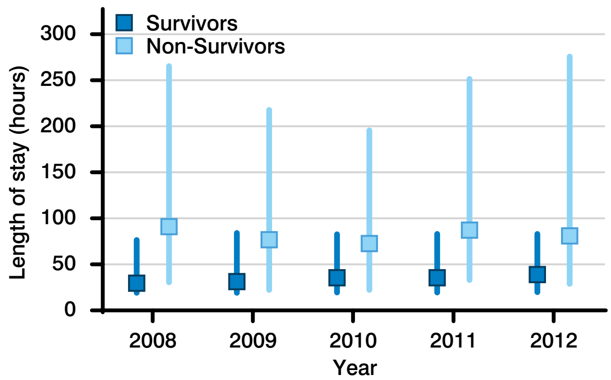


Source: ANZPICR

Length of stay for paediatric patients requiring intensive care

Both ICU survivors and non-survivors show minimal change in median length of stay over the five year period.

Figure 24: Median length of stay in ICU and interquartile range for paediatric ICU survivors and non-survivors

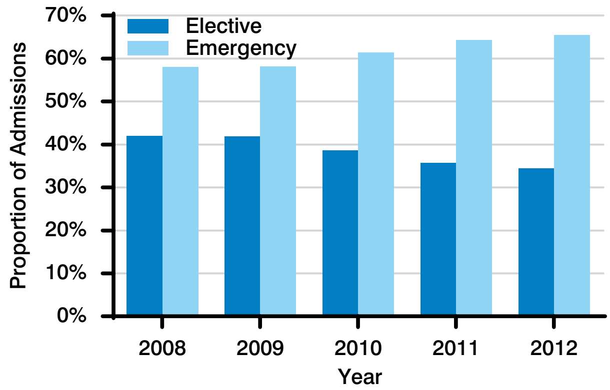


Source: ANZPICR

Elective and non-elective admissions for paediatric patients

The percentage of elective admissions has been slowly decreasing over the period from 2008 to 2012. An ANZPIC Registry admission is classed as elective when planned or foreseen. Unexpected admissions after elective surgery are not considered to be elective admissions.

Figure 25: Proportion of elective and non-elective admissions to ICU among paediatric patients



Source: ANZPICR

Supporting Quality Data Submission

CORE provides services to support high quality data submission to the registries through:

- Standardised data collection tools
- Validation of submitted data
- APD and ANZPICR data audit program
- Training for data collectors
- Outlier analysis

Data validation process

Data that is submitted to the APD quarterly and ANZPICR six-monthly undergoes extensive validation checks to ensure completeness, reliability and quality, prior to being loaded onto the CORE central databases. Validation, query and exclusion reports are generated for individual sites identifying variables that require checking and/or correction.

Data audit program

Both the APD and ANZPICR have data audit programs to assess the reliability of data being submitted. The aims of the programs are to:

- Identify causes of variation and bias in the data collection
- Assess the inter-observer reliability of the disease severity scores and Risk of Death calculations

APD audits

The CORE APD data audit program is currently in its second 3 year cycle with results to be published in late 2013. Although all sites are encouraged to take part in the audit, participation is voluntary. The reports provided to individual sites describe the:

- Level of missing data and level of correct or reliable data
- Effects of Errors on APACHE III–J score and risk of death calculations
- Main problems areas and how they can be addressed

Audited units are provided with tools to improve data quality and to inform the content of APD training sessions, ensuring all units benefit from lessons learnt.

ANZPICR audits

ANZPICR conducts biennial audits of all PICUs plus any ICU with more than 200 paediatric admissions per year for two consecutive years. The audit process is based on a random sample of 50 records for PICUs and 20 records for ICUs, and stratified by the risk of death, predicted by PIM2, to ensure that the sample includes patients with a representative range of mortality risk. All units receive an interim and final audit report and are expected to provide feedback on data discrepancies.

Findings from the data audit program are used to recommend changes to:

- Data collection methods
- Content of APD data collectors Training Workshops/ Paediatric Study Day
- Procedures to improve data quality at point of submission

Training for data collectors and clinicians

APD workshops

The APD provides training workshops in most jurisdictions annually for data collectors, managers and intensive care staff as an introduction and refresher to the APD data collection process. The workshops focus on identifying the correct data collection of variables from patient records for the submission of data and developing queries for site based customised reports using AORTIC, an application developed specifically for local management of data collected for both the APD and ANZPICR.

Feedback from participants:

“Well run with good training exercises which really helped me to learn how to customise my database to get the best outcome, and makes my data entry a lot easier”

“Made it less complicated and daunting”

“Hands on was great thanks. Enjoyable and informative day. Knowledge gained has clarified a lot. Thanks”

“The course was wonderful and comprehensive. Thanks for an informative 2 days”

Supporting Quality Data Submission *continued*

Engaging the ICU clinical community in CORE activities

Clinician seminars

A new CORE initiative in 2011/12 was the introduction of seminars for clinicians with the aim of encouraging local site-based engagement in the use of CORE data, and demonstrating how CORE data can be used to support quality activities and research. The seminars also provide opportunities for clinicians to become familiar with the features of the AORTIC software, which is freely available from CORE to interrogate local data sets.

Feedback from participants:

"The talks on regional use of the APD data were very useful. Very good overview of APD and uses"

"Found it very good – networking great. Found we now know what we can potentially use the database for. Very impressed – suggest new people do this in 1st year"

Paediatric study day

ANZPICR aims to hold an annual study day for data managers and other site staff involved in the collection and coding of patient episode data for the Registry. The study day focuses both on coding accuracy and consistency through practical coding sessions, as well as providing a forum for site staff input into future changes in the Registry's data collection.

Outlier analysis and management process

An outlier is identified when an ICU's SMR is outside of the 'funnel plot' for their classification, where control limits are drawn using 95% and 99% confidence intervals from the mean SMR of the group. A structured process of analysis and reporting is undertaken to identify data quality and case mix issues that may explain the findings.

In 2012 a new 'Outlier Working Group' was established including members of the CORE management committee and other ICU clinicians with strong statistical backgrounds. The group will help to ensure that the analysis provided to units is as complete and appropriate as possible, as well as providing a regional perspective where possible.

Audits are offered where no explanation for outlier status can be identified. Where appropriate, additional factors are examined such as staffing, resources and other markers. The results of these analyses are fed back to the ICU in question and to the relevant jurisdictional liaison committee where they can be interpreted by the appropriate governance groups. All outlier analyses remain confidential.

CORE Supporting Research

Information request process

CORE engages in, and supports, a number of research projects through the formal information request process and through collaborations with the ANZIC-RC at Monash University and the ANZICS CTG.

Requests for data are encouraged from all ANZICS members and others interested in research related to improving care and quality outcomes for intensive care medicine in Australia and New Zealand.

In the 2011/12 period there were 48 requests for information across all registries.

ANZIC-RC collaboration

The ANZIC-RC is a clinical trials methods centre run through Monash University. ANZICS CORE collaborates closely with the ANZIC-RC on primary research using CORE data to examine processes and outcomes of intensive care patients in Australia and New Zealand and works with the ANZIC-RC on background epidemiological research to inform the development of prospective clinical trials.

PhD scholarship update progress

The Development of a Mortality Prediction Model for Australia and New Zealand

Eldho Paul (Monash University)

This PhD examines the ongoing applicability of APACHE III-J as a prognostic model in Australia and New Zealand. The first publication from this PhD detailing the performance of APACHE III-J over ten years was accepted for publication in June 2012. Most recent work has focussed on the development of a new Australian and New Zealand Risk of Death (ANZROD) prediction model. This will be submitted for publication in 2012. Testing of the ANZROD model using data from the APD will begin in 2013.

Other research projects

- The relationships between CO2 and mortality
- The effect of hospital admission time definition on Emergency Department waiting times
- Trauma hospital volume and outcomes after admission to ICU
- Temperature and mortality in ICU
- Markers of access to ICU, related to patient outcomes
- Relationship between sodium and mortality
- Impact of delayed discharge from ICU on patient outcomes
- The impact of hyperoxia in patients who have cardiac arrest and patients undergoing cardiac surgery
- Admission to ICU for palliative care and organ donation

CORE Supporting Research *continued*

ANZPICR

Paediatric Index of Mortality 3 (PIM3)

In collaboration with PICANet in the UK, ANZPICR is involved in the development of an updated version of the PIM2 mortality prediction model. The new model used a contemporary dataset (2010 & 2011 data) from both the ANZ and UK regions which was sourced from 60 ICUs, and comprised over 53,000 paediatric admission records. This new international risk adjustment model is currently under peer review.

Data Linkage Project

In collaboration with researchers from the Hunter Medical Research Institute, National Enterovirus Reference Laboratory and the Universities of Sydney and New England a data linkage project was undertaken to enhance the compliance and completeness of Acute Flaccid Paralysis (AFP) surveillance reporting in Australia. The results of this project are to be published in a peer-reviewed journal in 2013.

Completed PhD Scholarship

"Measuring Quality and Performance in the Paediatric Intensive Care Unit" – Lahn Straney. Lahn worked with ANZPICR in developing paediatric ICU risk-adjustment methods for objectively comparing performance amongst contributing units over time. The research used over 10 years of ICU admission data from all PICUs in Australia and New Zealand to examine the relationships between patient characteristics and patient outcomes and to facilitate objective interpretations of performance. The results of the research provide novel methods for comparing ICU outcomes, including length of stay, which has posed difficulty for modelling. The findings of this research provide practical insights into the performance of Australian and New Zealand PICUs, and in doing so, provide direction for potential quality improvement. Lahn was awarded his PhD in December, 2011.

Publications Using CORE Data

Quality of Care Research

Straney L, Clements A, Alexander J, Slater A. **A Two-Compartment Mixed Effects Gamma Regression Model for Quantifying Between Unit Variability in Length of Stay among Children Admitted to Intensive Care.** *Health Services Research*. 2012 May 17

Bellomo R, Bailey M, Eastwood GM, Nichol A, Pilcher D, Hart GK, et al. **Arterial hyperoxia and in-hospital mortality after resuscitation from cardiac arrest.** *Crit Care Resusc.* 2011;15(2):R90.

Eastwood G, Bellomo R, Bailey M, Taori G, Pilcher D, Young P, et al. **Arterial oxygen tension and mortality in mechanically ventilated patients.** *Intensive Care Med.* 2012 Jan;38(1):91–8.

ANZIC Influenza Investigators, Webb SAR, Aubron C, Bailey M, Bellomo R, Howe B, et al. **Critical care services and the H1N1 (2009) influenza epidemic in Australia and New Zealand in 2010: the impact of the second winter epidemic.** *Crit Care Resusc.* 2011;15(3):R143.

Miles LF, Bailey M, Young P, Pilcher DV. **Differences in mortality based on worsening ratio of partial pressure of oxygen to fraction of inspired oxygen corrected for immune system status and respiratory support.** *Crit Care Resusc.* 2012 Mar;14(1):25–32.

Young P, Saxena M, Beasley R, Bellomo R, Bailey M, Pilcher D, et al. **Early peak temperature and mortality in critically ill patients with or without infection.** *Intensive Care Med.* 2012;38(3):437–44.

Renton J, Pilcher DV, Santamaria JD, Stow P, Bailey M, Hart G, et al. **Factors associated with increased risk of readmission to intensive care in Australia.** *Intensive Care Med.* 2011 Nov;37(11):1800–8.

Ho KM, Chavan S, Pilcher D. **Omission of early thromboprophylaxis and mortality in critically ill patients: a multicenter registry study.** *Chest.* 2011 Dec;140(6):1436–46.

Karalapillai D, Story D, Hart GK, Bailey M, Pilcher D, Cooper DJ, et al. **Postoperative hypothermia and patient outcomes after elective cardiac surgery.** *Anaesthesia.* 2011 Sep;66(9):780–4.

Schneider AG, Lipcsey M, Bailey M, Pilcher DV, Bellomo R. **Relationship between illness severity scores in acute kidney injury.** *Crit Care Resusc.* 2012 Mar;14(1):53–5.

Young P, Beasley R, Bailey M, Bellomo R, Eastwood GM, Nichol A, et al. **The association between early arterial oxygenation and mortality in ventilated patients with acute ischaemic stroke.** *Crit Care Resusc.* 2012 Mar 1;14(1):14–9.

Publications Using CORE Data *continued*

Health Services Research

12. ANZICS-CORE MET dose Investigators, Jones D, Drennan K, Hart GK, Bellomo R, Web SAR. **Rapid Response Team composition, resourcing and calling criteria in Australia.** *Resuscitation.* 2012 May;83(5):563–7. .

13. Bohensky MA, Jolley D, Pilcher DV, Sundararajan V, Evans S, Brand CA. **Prognostic models based on administrative data alone inadequately predict the survival outcomes for critically ill patients at 180 days post-hospital discharge.** *J Crit Care.* 2012 Aug;27(4):422.e11–21.

14. Godfrey G, Pilcher D, Hilton A, Bailey M, Hodgson CL, Bellomo R. **Treatment limitations at admission to intensive care units in Australia and New Zealand: prevalence, outcomes, and resource use.** *Crit Care Med.* 2012 Jul;40(7):2082–9.

15. Moran JL, Solomon PJ, ANZICS Centre for Outcome and Resource Evaluation of the Australian and New Zealand Intensive Care Society. **Mortality and intensive care volume in ventilated patients from 1995 to 2009 in the Australian and New Zealand binational adult patient intensive care database**[*]. *Crit Care Med.* 2012 Mar;40(3):800–12.

16. Trinkle RM, Flabouris A. **Medical reviews before cardiac arrest, medical emergency call or unanticipated intensive care unit admission: their nature and impact on patient outcome.** *Crit Care Resusc.* 2011 Sep;13(3):175–80.

17. Yung M, Slater A, Festa M, Williams G, Erickson S, Pettila V, et al. **Pandemic H1N1 in children requiring intensive care in Australia and New Zealand during winter 2009.** *Pediatrics.* 2011 Jan;127(1):e156–163.

Enhancing Registry Methodology.

18. Moran JL, Solomon PJ, ANZICS Centre for Outcome and Resource Evaluation (CORE) of the Australian and New Zealand Intensive Care Society (ANZICS). **A review of statistical estimators for risk-adjusted length of stay: analysis of the Australian and New Zealand Intensive Care Adult Patient Data-Base, 2008-2009.** *BMC Med Res Methodol.* 2012;12:68.

Appendix 1 – Number of Contributing Sites and Admissions

Table 9: Contributing ICUs and admissions reported to the APD in 2011/12

	Australia		New Zealand	
Hospital Classification	Number of Hospitals	Number of ICU Admissions	Number of Hospitals	Number of ICU Admissions
Tertiary	30	45,081	6	8,133
Metropolitan	29	19,861	3	1,572
Rural	35	16,301	3	1,522
Private	41	31,332	1	21
Total	135	112,578	13	11,248

Source: APD. Please note, one site changed from Metropolitan to Tertiary in the reporting period

Table 10: Contributing ICUs and admissions reported to ANZPICR in 2012

ICU Classification	Australian Contributing Sites	New Zealand Contributing Sites	Total Admission Numbers
PICU	7	1	8,369
NICU/PICU	1	–	
ICU	12	5	1,677
Total	20	6	10,046

Source: ANZPICR, NICU – Neonatal Intensive Care Unit

Table 11: Contributing ICUs and admissions reported to the CCR in 2011/12

	Australia		New Zealand	
Hospital Classification	Number of Hospitals	Number of ICU Admissions	Number of Hospitals	Number of ICU Admissions
Tertiary	31	55,377	7	9,534
Metropolitan	24	18,063	3	1,868
Rural	34	18,875	9	4,222
Private	43	38,683	2	244
PICU	6	5,259	1	1,175
Total	138	136,257	22	17,043

Source: CCR

Appendix 2 – Sites Contributing to CORE

Australian Capital Territory	APD	CCR	ANZPICR
Calvary Hospital	✓	✓	
Calvary John James Hospital	✓	✓	
Canberra Hospital	✓	✓	✓

New South Wales	APD	CCR	ANZPICR
Armidale Rural Referral Hospital		✓	
Bankstown-Lidcombe Hospital	✓	✓	
Bathurst Base Hospital	✓	✓	
Blacktown Hospital	✓		
Brisbane Waters Private Hospital	✓		
Calvary Health Care Riverina		✓	
Calvary Mater Newcastle	✓	✓	
Campbelltown Hospital	✓	✓	
Canterbury Hospital		✓	
Coffs Harbour Health Campus	✓	✓	
Concord Hospital	✓	✓	
Dalcross Adventist Hospital		✓	
Figtree Private Hospital		✓	
Gosford Hospital	✓	✓	
Gosford Private Hospital	✓		
Goulburn Base Hospital	✓	✓	
Grafton Base Hospital	✓		
Griffith Base Hospital	✓	✓	✓
Hornsby Ku-ring-gai Hospital	✓	✓	
John Hunter Hospital	✓	✓	✓
Lake Macquarie Private Hospital		✓	
Lismore Base Hospital	✓	✓	
Liverpool Hospital	✓	✓	
Macquarie University Hospital	✓	✓	
Manly Hospital & Community Health	✓	✓	
Manning Rural Referral Hospital	✓	✓	

Appendix 2 – Sites Contributing to CORE *continued*

New South Wales	APD	CCR	ANZPICR
Mater Private Hospital, Sydney	✓	✓	
Nepean Hospital	✓	✓	
Newcastle Private Hospital	✓	✓	
North Shore Private Hospital	✓	✓	
Norwest Private Hospital	✓	✓	
Orange Base Hospital	✓	✓	
Port Macquarie Base Hospital	✓	✓	
Prince of Wales Hospital		✓	
Prince of Wales Private Hospital	✓		
Royal North Shore Hospital	✓	✓	
Royal Prince Alfred Hospital	✓	✓	
Shoalhaven Hospital	✓		
St George Hospital	✓	✓	
St George Private Hospital	✓	✓	
St Vincent's Hospital	✓	✓	
St Vincent's Private Hospital		✓	
Strathfield Private Hospital		✓	
Sutherland Hospital & Community Health Services	✓	✓	
Sydney Adventist Hospital	✓	✓	
Sydney Children's Hospital		✓	✓
Tamworth Base Hospital	✓	✓	✓
The Children's Hospital at Westmead		✓	✓ (PICU)
Tweed Heads District Hospital	✓	✓	
Wagga Wagga Base Hospital	✓	✓	
Westmead Hospital	✓	✓	
Westmead Private Hospital	✓	✓	
Wollongong Hospital	✓	✓	
Wyong Hospital	✓	✓	

Appendix 2 – Sites Contributing to CORE *continued*

Northern Territory	APD	CCR	ANZPICR
Alice Springs Hospital	✓	✓	
Royal Darwin Hospital	✓	✓	✓

Queensland	APD	CCR	ANZPICR
Allamanda Private Hospital		✓	
Brisbane Private Hospital	✓	✓	
Bundaberg Base Hospital	✓	✓	
Caboolture Hospital	✓		
Cairns Base Hospital	✓	✓	✓
Gold Coast Hospital	✓	✓	
Greenslopes Private Hospital	✓		
Hervey Bay Hospital	✓		
Holy Spirit Northside Hospital	✓	✓	
Ipswich Hospital	✓	✓	
John Flynn Private Hospital	✓	✓	
Logan Hospital	✓	✓	
Mackay Base Hospital	✓	✓	✓
Mater Adults Hospital	✓	✓	
Mater Children's Hospital		✓	✓ (PICU)
Mater Private Hospital, Brisbane	✓	✓	
Mater Private Hospital, Townsville	✓	✓	
Mount Isa Hospital	✓	✓	
Nambour General Hospital	✓	✓	
Noosa Hospital	✓	✓	
Pindara Private Hospital	✓		
Princess Alexandra Hospital	✓	✓	
Queen Elizabeth II Jubilee Hospital	✓	✓	
Redcliffe Hospital	✓	✓	
Robina Hospital	✓	✓	
Rockhampton Hospital	✓	✓	✓
Royal Brisbane and Women's Hospital	✓	✓	
Royal Children's Hospital		✓	✓ (PICU)
St Andrew's Hospital, Toowoomba	✓	✓	
St Andrew's War Memorial Hospital	✓	✓	
St Vincent's Hospital, Toowoomba	✓		
The Prince Charles Hospital	✓	✓	

Appendix 2 – Sites Contributing to CORE *continued*

Queensland	APD	CCR	ANZPICR
The Sunshine Coast Private Hospital	✓	✓	
The Townsville Hospital	✓	✓	✓
The Wesley Hospital	✓	✓	
Toowoomba Hospital	✓	✓	

South Australia	APD	CCR	ANZPICR
Ashford Community Hospital	✓	✓	
Calvary Wakefield Hospital	✓	✓	
Flinders Medical Centre	✓	✓	
Flinders Private Hospital	✓	✓	
Lyell McEwin Hospital	✓	✓	
Modbury Public Hospital	✓		
Repatriation General Hospital	✓	✓	
Royal Adelaide Hospital	✓	✓	
St Andrew's Hospital	✓	✓	
The Memorial Hospital	✓	✓	
The Queen Elizabeth Hospital	✓	✓	
Women's and Children's Hospital			✓ (PICU)

Tasmania	APD	CCR	ANZPICR
Calvary Hospital, Lenah Valley		✓	
Launceston General Hospital	✓	✓	✓
North West Regional Hospital	✓	✓	
Royal Hobart Hospital	✓		✓ (NICU/PICU)

Victoria	APD	CCR	ANZPICR
Albury Base Hospital	✓	✓	
Alfred Hospital	✓	✓	
Austin Hospital	✓	✓	✓
Ballarat Health Services	✓	✓	
Bendigo Health Care Group	✓	✓	
Box Hill Hospital	✓	✓	
Cabrini Hospital		✓	
Central Gippsland Health Service	✓	✓	
Dandenong Hospital	✓	✓	

Appendix 2 – Sites Contributing to CORE *continued*

Victoria	APD	CCR	ANZPICR
Epworth Eastern Private Hospital	✓	✓	
Epworth Freemasons Hospital	✓	✓	
Epworth Hospital	✓	✓	
Frankston Hospital	✓	✓	
Geelong Hospital	✓	✓	
Goulburn Valley Health	✓	✓	
John Fawkner Hospital	✓	✓	
Knox Private Hospital	✓	✓	
Latrobe Regional Hospital	✓	✓	
Maroondah Hospital	✓		
Melbourne Private Hospital	✓	✓	
Mildura Base Hospital	✓	✓	✓
Monash Medical Centre Clayton	✓	✓	✓
Northeast Health Wangaratta	✓	✓	
Peter MacCallum Cancer Institute	✓	✓	
Royal Children's Hospital		✓	✓ (PICU)
Royal Melbourne Hospital	✓	✓	
South West Healthcare	✓	✓	
St John of God Hospital, Bendigo	✓	✓	
St John of God Hospital, Geelong	✓		
St Vincent's Hospital	✓	✓	
The Northern Hospital	✓		
The Valley Private Hospital	✓	✓	
Warringal Private Hospital	✓	✓	
Western District Health Service	✓	✓	
Western Hospital	✓	✓	
Wimmera Health Care Group	✓	✓	

Western Australia	APD	CCR	ANZPICR
Armadale Health Service	✓		
Fremantle Hospital	✓	✓	
Mount Hospital	✓	✓	

Appendix 2 – Sites Contributing to CORE *continued*

Western Australia	APD	CCR	ANZPICR
Princess Margaret Hospital for Children		✓	✓ (PICU)
Rockingham General Hospital	✓	✓	
Royal Perth Hospital	✓	✓	
Sir Charles Gairdner Hospital	✓	✓	
St John of God Health Care, Subiaco		✓	

New Zealand	APD	CCR	ANZPICR
Auckland City Hospital		✓	
Auckland City Hospital – CV ICU		✓	
Christchurch Hospital	✓	✓	✓
Dunedin Hospital	✓	✓	
Hawkes Bay Hospital	✓	✓	
Hutt Hospital		✓	
Middlemore Hospital	✓	✓	✓
Nelson Hospital	✓	✓	
North Shore Hospital		✓	
Palmerston North Hospital		✓	
Southern Cross Hospital, Hamilton		✓	
Southland Hospital		✓	
Starship Children's Hospital		✓	✓ (PICU)
Taranaki Base Hospital	✓	✓	✓
Tauranga Hospital	✓	✓	
Timaru Hospital	✓		
Waikato Hospital	✓	✓	✓
Wairau Hospital		✓	
Wakefield Hospital		✓	
Wanganui Hospital		✓	
Wellington Hospital	✓	✓	
Whakatane Hospital		✓	
Whangarei Hospital	✓	✓	✓

Appendix 3 – Scoring Systems

Prognostic models are used to provide case mix-adjusted analysis for comparison between units and a foundation for research into therapeutic efforts and the economics of care in the ICU. The APD currently reports on APACHE II and APACHE III-J. ANZPICR reports on PIM2. While an estimated APACHE or PIM2 probability of death is calculated for each patient, the aim of APACHE/PIM2 is to estimate the expected mortality for a population (or unit) overall.

All readmission episodes to ICU are excluded from calculation of predicted mortality, observed mortality (ICU and Hospital) and Standardised Mortality Ratio (SMR).

APACHE II (2nd revision)

The APACHE II predicted risk of death is calculated using the worst physiological values in the first 24 hours of ICU admission, age, type of admission (planned/unplanned), chronic health status prior to hospital admission, ICU source of admission and diagnostic reason for ICU admission.

The exclusion criteria for the APACHE II reports include:

- Length of stay < 8 hours
- Age < 16 years
- Unknown hospital outcome
- Missing or non-valid APACHE II diagnostic codes
- 12 physiological variables required for the APACHE II score calculation are all missing

APACHE III-J (3rd revision, 10th recalibration)

The APACHE III-J predicted risk of death is calculated using the worst physiological values in the first 24 hours, age, pre-ICU length of stay, type of admission (planned/unplanned), chronic health status prior to hospital admission, ICU source of admission and a more specific diagnostic reason for ICU admission (as compared to APACHE II). APACHE III-J takes into account whether Acute Myocardial Infarction (AMI)/heart attack patients have received thrombolytic therapy and also includes cardiac patients, taking into account whether these patients have received multiple grafts.

The exclusion criteria for the APACHE III-J reports include:

- Length of stay < 4 hours
- Age < 16 years
- Unknown hospital outcome
- Missing or non-valid APACHE III diagnostic codes
- 16 physiological variables required for the APACHE III-J score calculation are all missing

Paediatric Index of Mortality 2 (PIM2)

PIM2 is an internationally recognised mortality prediction model for children in intensive care and is used by ANZPICR. Data for PIM2 is collected within the first hour of admission, which aims to avoid potential bias from the effects of treatment after admission. The PIM2 model is based on the combined effect of ten risk factors collected at the time of admission to intensive care, seven of which are associated with increased risk, and three associated with decreased risk. In this report PIM2_ANZ11 represents a recalibrated version of PIM2 based on Australian and New Zealand 2010-2011 data.

Paediatric Index of Mortality 3 (PIM3)

PIM3 has been developed to provide an updated version of the PIM2 mortality prediction model and is still based on information collected within the first hour of ICU admission. The new model used a contemporary dataset (2010 & 2011 data) from both the ANZ and UK regions which was sourced from 60 ICUs, and comprised over 53,000 paediatric admission records. The availability of this more recent data, together with reclassification of diagnostic information, and modelling systolic blood pressure as a quadratic, provides better estimates of mortality risk among children admitted to intensive care. The development of the new PIM3 model represents an important collaboration between ANZPICR and PICANet in the UK.

Abbreviations

ACHS	Australian Council on Healthcare Standards
ACSQHC	Australian Commission for Safety and Quality in Health Care
AFP	Acute Flaccid Paralysis
AMI	Acute Myocardial Infarction
ANZICS	Australian and New Zealand Intensive Care Society
ANZIC-RC	Australian and New Zealand Intensive Care Research Centre
ANZPICR	Australian and New Zealand Paediatric Intensive Care Registry
ANZROD	Australian and New Zealand Risk of Death
APACHE	Acute Physiological, Age and Chronic Health Evaluation
APD	Adult Patient Database
CABG	Coronary Artery Bypass Graft
CCR	Critical Care Resources Registry
CERS	CORE Enterprise Reporting System
CICM	College of Intensive Care Medicine
CIDMU	Clinical Informatics and Data Management Centre
CMC	CORE Management Committee
CORE	Centre for Outcome and Resource Evaluation
CTG	Clinical Trials Group
FTE	Full Time Equivalent
GI	Gastrointestinal
ICU	Intensive Care Unit
IQR	Interquartile Range
NICU	Neonatal Intensive Care Unit
NICRSC	National Intensive Care Registry Steering Committee
OT	Operating Theatre
PICANet	Paediatric Intensive Care Audit Network
PICU	Paediatric Intensive Care Unit
PIM	Paediatric Index of Mortality
SMR	Standardised Mortality Ratio
VTE	Venous thrombo-embolus

Glossary

After Hours Discharge	Discharge of a patient from ICU between 18:00 and 06:00.
Available beds	A bed with advanced life support capability that is fully staffed and funded.
Chronic Care Facility	A facility that provides rehabilitative, restorative, and/or ongoing skilled nursing care to patients or residents in need of assistance with activities of daily living. Long-term care facilities include nursing homes, rehabilitation facilities, inpatient behavioural health facilities, and long-term chronic care hospitals.
Critical Care Nurse	A nurse who has completed a post-registration critical care qualification.
Delayed discharge	When discharge from ICU to the ward cannot proceed due to lack of resources including availability of staff or beds.
Emergency Admission	An unplanned admission to ICU. An admission of a patient to the ICU for urgent care or treatment.
Financial Year	A financial year begins July 1st and ends June 30th. When one year is quoted it is the year at the end of the financial year.
Full Time Equivalent	The number of paid hours which is expressed as a ratio of the agreed hours for a full time employee (> 35 hours per week of paid employment, worked at an individual site).
Hospital Mortality	Number of patients with an ICU admission that died in the same hospital admission.
ICU Mortality	Number of patients that died in ICU.
Intensivist	Medical practitioners who have completed the CICM certification and training program and attained a Fellowship of the College of Intensive Care Medicine of Australia and New Zealand.
Occupancy	The number of patient bed days divided by the number of available beds divided by the number of days in a year.
Readmission	Readmitted ICU patient is the patient who survived ICU and have had at least one readmission excluding direct transfers to or from ICU/HDU. Readmission includes all readmissions; it is not equivalent to the ACHS indicator ≤ 72 hours.
Registered Nurse	Australia: A nurse who is on the register maintained by the State of Territory nurses board or nursing council to practise nursing in that state or territory. New Zealand: A registered nurse is defined by the Nurses Act 1977 as a nurse whose name is recorded on one of the registers of Nurses.
Registrar	A medical practitioner appointed to a specialist training position.
Senior Medical Officer	A medical practitioner employed or working in a role as a specialist.
Standardised Mortality Ratio	The SMR presents the number of deaths that occur as a proportion of the number of deaths that might be expected based on a disease severity model such as APACHE III-J or PIM-3 which aims to take into account confounding factors such as disease severity and age. 'Expected deaths' therefore reflects outcomes that have been achieved internationally across hospitals seen to be delivering best practice treatment. An SMR below 1 represents a lower than expected mortality rate.
Ventilated	Patients who are provided with continuous support via oral/nasal intubation or tracheostomy by means of a mechanical device that augments or replaces respiratory effort.
VTE Prophylaxis	The administration of pharmacological or non-pharmacological treatment to prevent the formation of a venous thrombo-embolus.


2011-12-05
91
98