



ANZICS

Outcomes Audit and Research

Graeme Hart

Chair

Core Management Committee

Australian and New Zealand Intensive Care Society

ANZICS CORE Management Committee

- Responsibility for the three components of the ANZICS CORE Databases:
 1. ANZICS Adult Patient Database (ANZICS APD)
 2. ANZICS Critical Care Resources Database
 3. Australian and New Zealand Paediatric Intensive Care (ANZPIC) Registry

Current funding via AHMAC 2001-2004, 2004 – 2007,
2009-2011 (\$AUD 2.3 Million)

Hong Kong signing on for 2 yrs

Resources and Funds

	Principles	Principle Met	Conformance
1	Registries should receive adequate ongoing funding to allow data collection, reporting and the institution of strong quality control procedures	Partially Yes	Jurisdictional funding by States and Territories and NZ

Triennial funding based on a priori agreed budget and work plan
Currently ~ \$800,000 pa

CORE Resources

- Manager / Epidemiologist
- Technical / SAS Programmer
- Access / SQL programmer
- Data Quality and Education
- Resources Project Officer
- ANZPIC Project Manager
- Secretarial / Admin
- PhD scholars x 2
- Committee
- Monash Uni Dept Epidemiology and Preventive Medicine (Registries / stats)



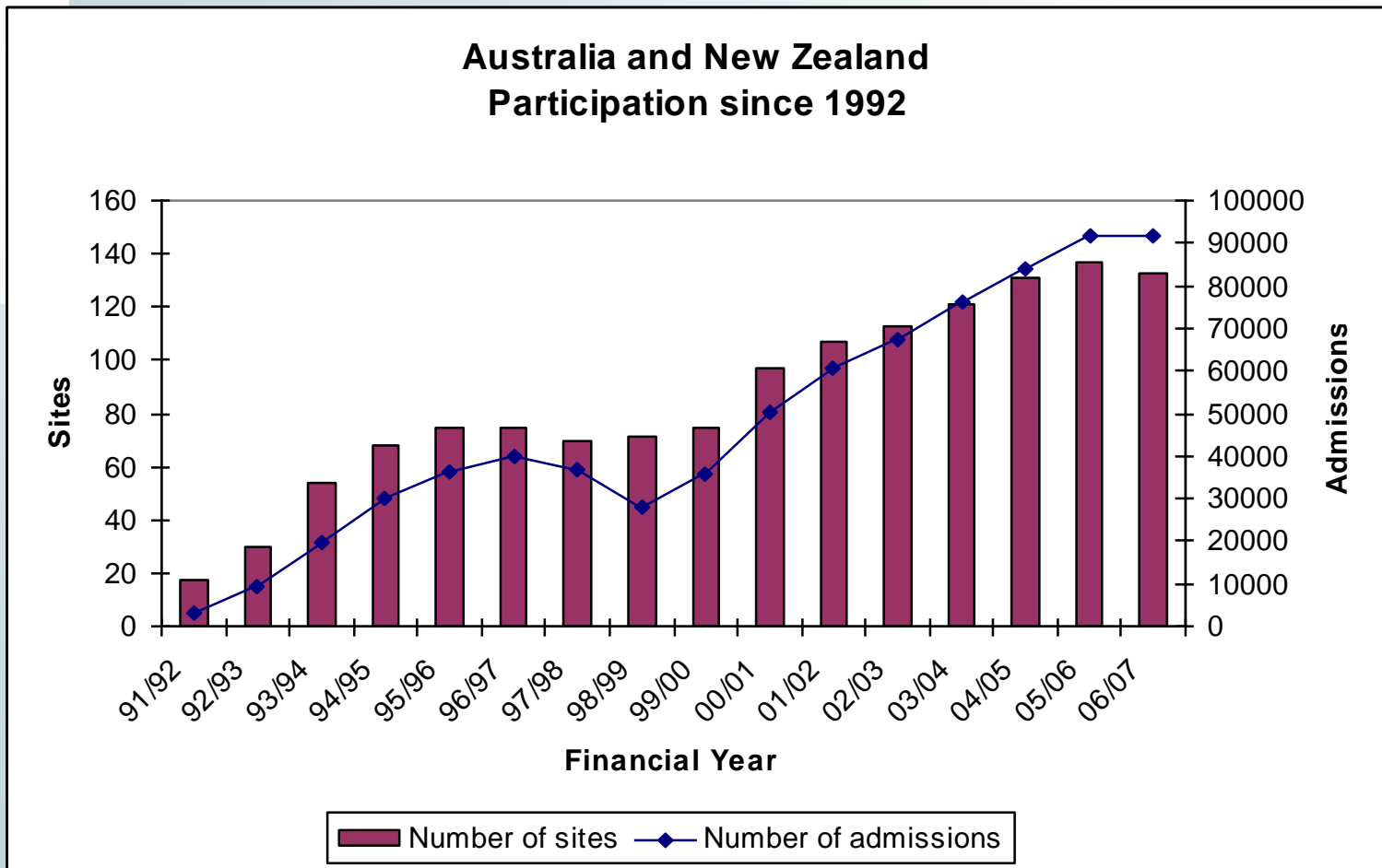
Registry Attributes

	Attributes	Standard Met	Conformance
1	Collect a core minimum data set	Yes	Minimum data set of 109 variables
2	Utilise systematic collection processes	Yes	APD data dictionary with range and data collection rules included
3	Epidemiologically sound data	Yes	Working group established to manage the ongoing development and integration of the APD data dictionary into the National Health Data Dictionary (NHDD) data set. In use and little changed since 1992
4	Simple outcome data	Yes	Hospital and ICU mortality
5	Collect sufficient clinical information to allow basic risk adjustment	Yes	SAPS II, APACHE II, APACHE III-J risk of death adjustment
6	Avoid selection bias	Require funding,	All ICU and HDU admissions under care of intensivist

ANZICS Database Management Committee (ADMC)

- ~180 ANZ ICUs
- Adult Patient Database 137 ICUs regularly contributing -Number increasing each year
 - 85% Australian Level 3 ICUs
 - 950,000 adult episodes
- 16 Units contributing to ANZPIC
- Governance – Internal and External

Participation since 1992



Adult Patient Database sites

June 2008

	All Adult ICUs (Public and Private)		
Region	Contributing Sites	All Sites	%
ACT	3	3	100.00%
	9	28	32.14%
NSW	40	54	74.07%
NT	2	2	100.00%
QLD	31	36	86.11%
SA	10	12	83.33%
TAS	3	4	75.00%
VIC	27	36	75.00%
WA	5	8	62.50%
Total	130	183	71.04%



Data Collection

	Principle	Principle Met	Conformance
1	Data capture close as possible to the point of care by appropriately trained data collectors	Partially met, external changes required	Data collected at clinical care level or one step removed but not all data collectors have equivalent training.
2	Standard definitions, terminology and specifications	Partially met, external changes required	APD data dictionary has been entered into METeOR.
3	Clinical registries methods should be systematic	Yes	Model data collection forms are provided. Data collection AORTIC software APD data dictionary
4	data dictionaries	Yes	Detailed data dictionary
5	utilising existing data, where they are of high quality	Yes	Modelling of Administrative data
6	linkage to other disease and procedure registries or other databases	No, external changes required	Research and current plans



Centre for
and Resource

Data Elements

	Principle	Principle Met / Agreed	Conformance
1	core minimum data set of information from individuals treated across multiple locations	Yes	Well defined APD data dictionary
2	individually identifiable information	No	
3	processes of care have a strong link to outcomes and measures are simple, reliable and reproducible,	Yes	Some measures reported , composite measures KPI
4	Data epidemiologically sound i.e. simple, objective and reproducible	Yes	Outcome measure of survived/died hospital and/or ICU stay a
5	burden and cost of data collection	Yes	Governance processes in place to ensure data collection retains relevance.

Risk Adjustment

	Principle	Principle Met	Conformance
	Objective, reliable covariates for risk adjustment to enable factors outside the control of clinicians to be taken into account by appropriate statistical adjustments	Yes	SAPS II, APACHE II and APACHE III-J algorithms utilised



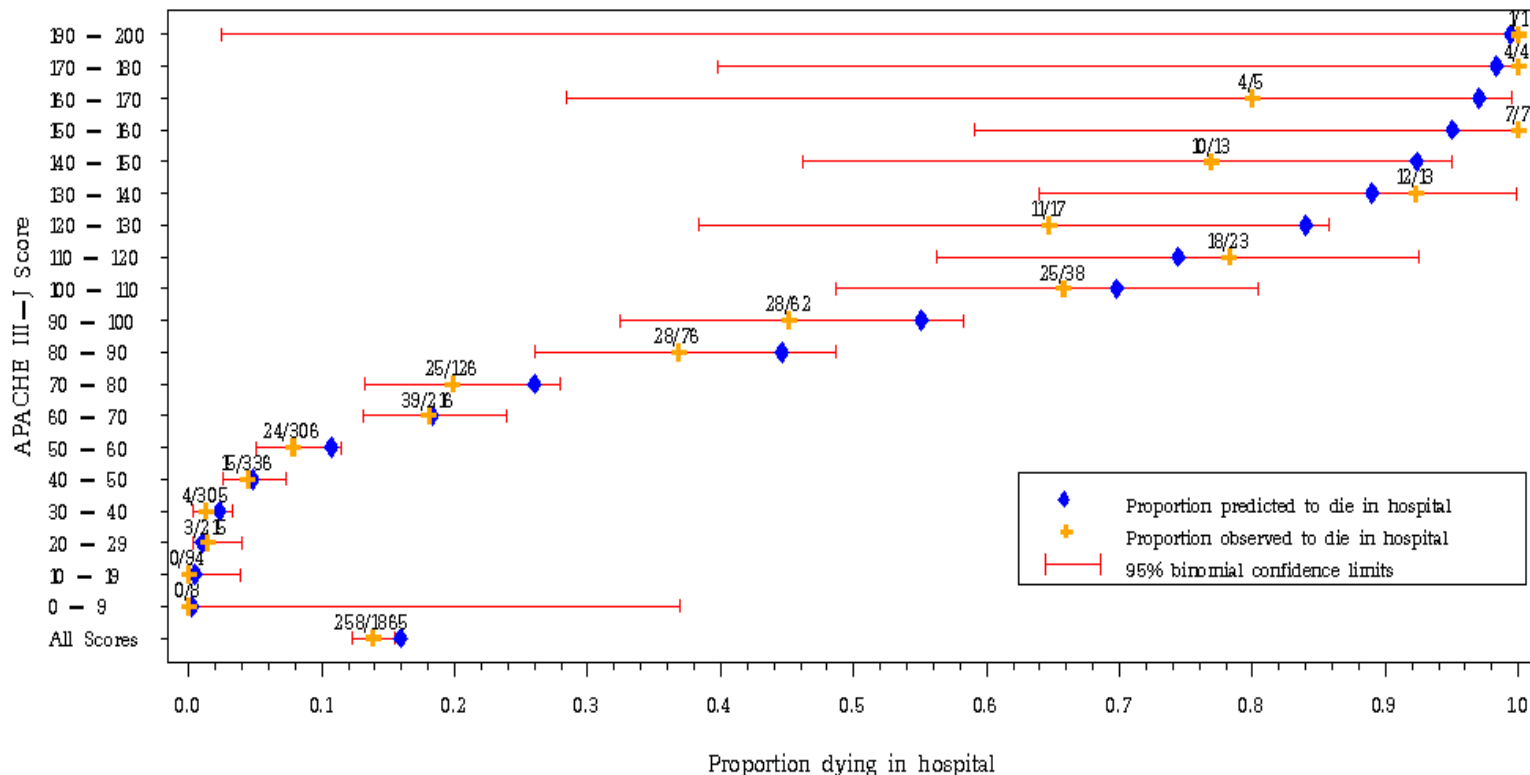
Austin ICU: Apache 3 SMR 2007/08

Observed & APACHE III-J (R) Predicted Hospital Outcome grouped by APACHE III-J (R) Score

Austin Hospital (ICU & CICU)

ICU admissions from Sunday, 1 July 2007 to Monday, 30 June 2008

Note: Patients aged < 16 yrs or with ICU stays < 4 hrs or with unknown outcome of their stay in hospital (including transfers out to another ICU) have been excluded.



Predicted mortality calculated from APACHE III scores using the APACHE III-J algorithm (<http://www.apache-web.com/public/hospmortality.xls>)

and diagnostic categories from the model published by Knaus WA, Wagner DP, Draper BA *et al. Chest* 1991, 100:119-36.

Code to enable calculation of APACHE III-J (R) mortality probabilities developed for ANZICS APD by Peter Bristow.

(R) APACHE is a registered trademark of Cerner Corporation, Kansas City, Missouri, USA

Apache 3: Comparative SMR

2007/08

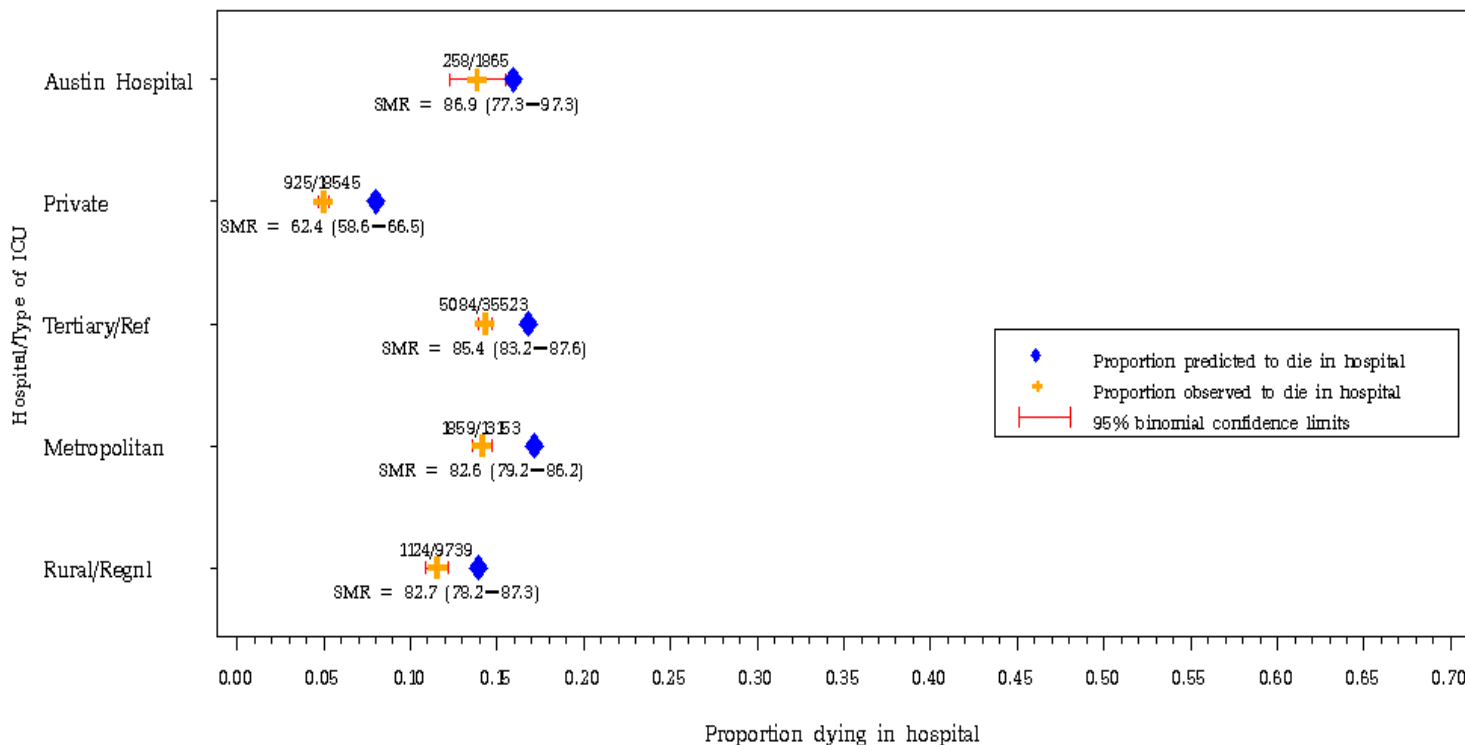


Observed vs APACHE III-J (R) Predicted Hospital Outcome for ICU patients

Austin Hospital (ICU & CICU) and pooled data

ICU admissions from 01/07/07 to 30/06/08

Note: Patients aged < 16 yrs or with ICU stays < 4 hrs or with unknown outcome of their stay in hospital (including transfers out to another ICU) have been excluded.



Predicted mortality calculated from APACHE III scores using the APACHE III-J algorithm (<http://www.apache-web.com/public/hospmortality.xls>) and diagnostic categories from the model published by Knaus WA, Wagner DP, Draper EA *et al.* *Chest* 1991; 100:1619-36.

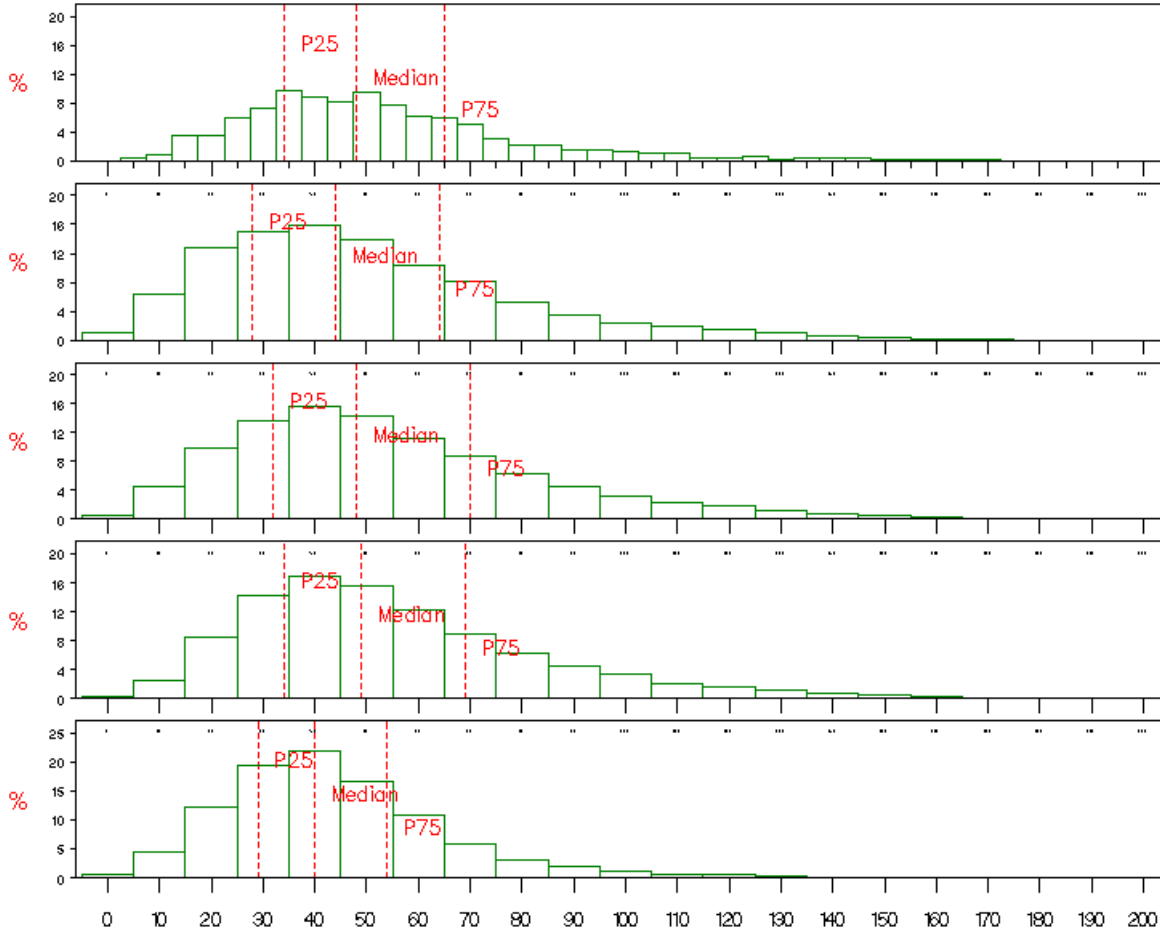
Code to enable calculation of APACHE III-J mortality probabilities developed by ANZICS OED by Peter Eastwood.

(R) APACHE is a registered trademark of Centex Corporation, Kansas City, Missouri, USA

Apache 3 Score Distribution 2007/08



Comparative APACHE III-J (R) Score Frequency Distributions - Austin Hospital (ICU & CICU) (01/07/07 - 30/06/08)



Austin Hospital
 n = 1983
 Mean = 52.92
 Std Dev = 27.28
 Median = 48.00
 P25 = 34.00
 P75 = 65.00

Rur/Regnl ICUs
 n = 11018
 Mean = 49.05
 Std Dev = 29.16
 Median = 44.00
 P25 = 28.00
 P75 = 64.00

Metrop. ICUs
 n = 14201
 Mean = 53.79
 Std Dev = 30.30
 Median = 48.00
 P25 = 32.00
 P75 = 70.00

Tert/Ref. ICUs
 n = 38429
 Mean = 54.84
 Std Dev = 29.00
 Median = 49.00
 P25 = 34.00
 P75 = 69.00

Private ICUs
 n = 20017
 Mean = 43.56
 Std Dev = 22.15
 Median = 40.00
 P25 = 29.00
 P75 = 54.00

APACHE III-J (R) Score

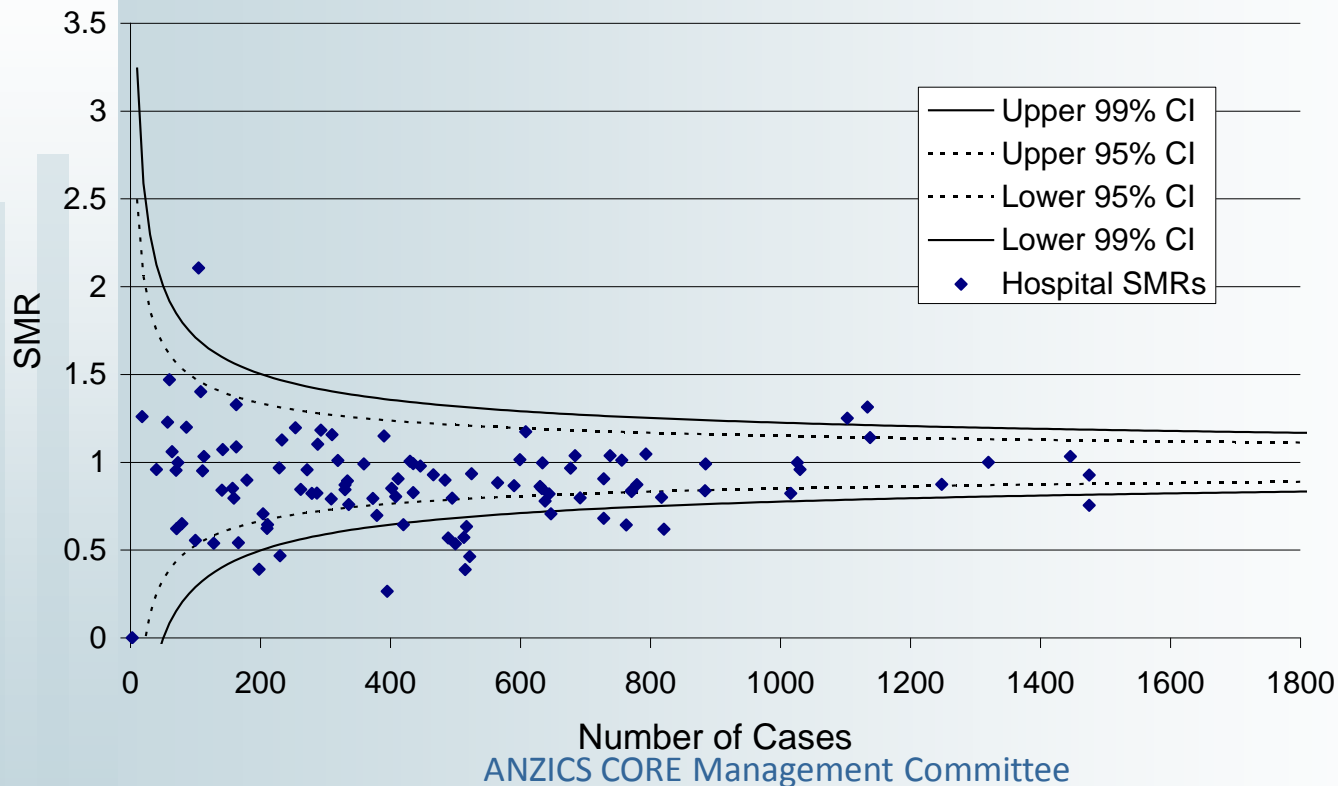
Source: Data submitted to the ANZICS Adult Patient Care Database as at Tuesday, 2 September 2008.

Code to enable calculation of APACHE III-J (R) mortality probabilities developed for ANZICS APD by Peter Bristow.

(R) APACHE is a registered trademark of Cerner Corporation, Kansas City, Missouri, USA

Funnel Plots

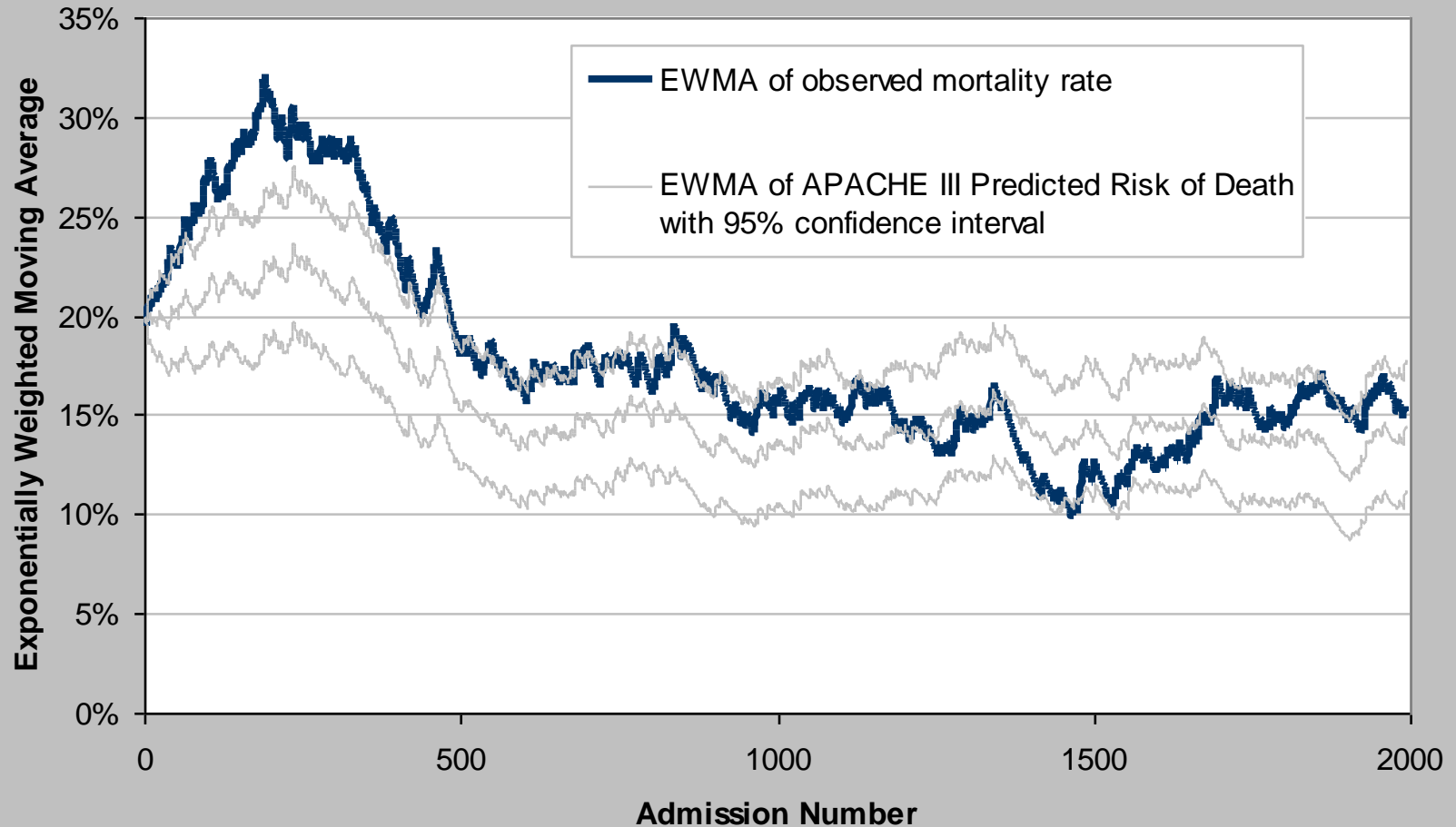
Funnel Plot of SMRs for Units by Number of Cases
2004, APACHE III J





Continuous Control Charts

RA EWMA





Data Security

	Principle	Principle met	Conformance
1	Secure access controls and secure messaging systems	Yes	Disaster recovery software, regular off site backups, firewall security, user names and password utilised. Individual patient identifiers are not currently held
2	The collection, storage and transmission of clinical registry data must be in line with institutional , state and national policies,	Partially Yes	

Data Quality

	Principle	Principle met	Conformance
1	Report as a quality measure the percentage of eligible patients recruited to the clinical registry	Yes	CCR vs Submitted
2	Quality control plan which allows ongoing monitoring of the completeness and accuracy of the data collected	Yes	Data check screening on receipt of data. Data quality reports provided back to units
3	Data checked against source records in a sample of cases.	Yes	Data audit program in place
4	Registries should incorporate data collection processes that are adequately supported by range and validity checks	Yes	AORTIC software provides range and validity checks at point of data entry
5	Registry reports should be produced according to a strict timeline and sufficient resources should be provided to facilitate this reporting	Yes	Quarterly data submission rounds with delivery of reports within four weeks of the submission deadline



Data Quality

Black N, Payne M, on behalf of the DoCDat Development Group: Directory of Clinical Databases: Improving and promoting their use.

Qual Saf Health Care 2003, 12:348-352

Data collection – 2006
cross validation study underway

		APD				DocDat Median (IQ)
		1	2	3	4	
A	Representativeness of country	Y	Y	Y		3 (2-4)
B	Completeness of recruitment	Y				3 (1-4)
C	Variables included	Y	Y	Y		3 (2-4)
D	Completeness of data	Y	Y	Y		2 (1-3)
E	Data collection format	Y	Y	Y	Y	4 (4-4)
F	Explicit definitions	Y	Y	Y	Y	2 (1-4)
G	Explicit rules	Y	Y	Y	Y	2.5 (1-4)
H	Reliability of coding	Y				1 (1-4)
I	Independence of observations	Y	Y	Y	Y	4 (2-4)
J	Data validation	Y	Y	Y		3 (3-4)

Organisation & Governance, Custodianship

	Principle	Principle met	Conformance
1	Formalise governance structures to ensure accountability, oversee resource application, provide focus and optimise output from the clinical registry	Yes	ANZICS CORE Management Committee NICRSC
2	Registries must establish policies to manage a range of potential findings from a clinical registry and include a plan to ensure that quality of care issues are effectively addressed	Yes	Outlier Management Plan in place
3	Custodianship of data needs to be made explicit in Contract and/or Funding Agreements. Data access and reporting policies should be accessible to all interested parties	Yes	Information request and publication policies are publicly available on SAS Web Portal



OUTLIER MANAGEMENT POLICY

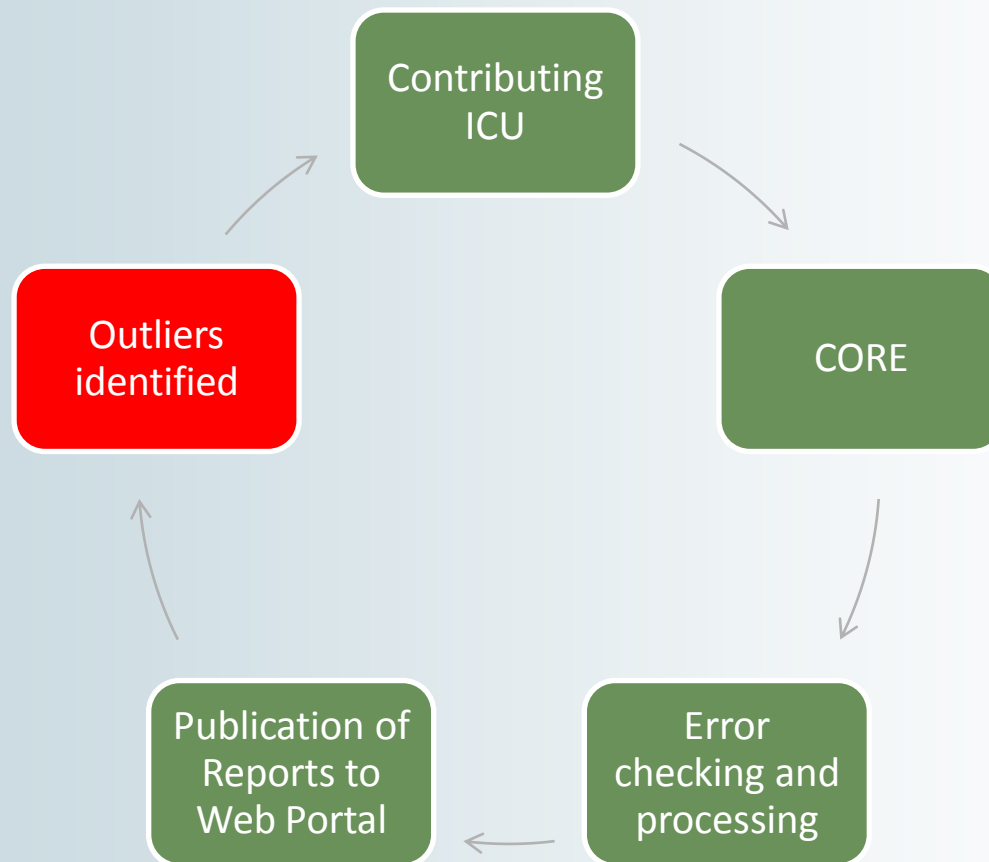
- National Intensive Care Registry Steering Committee
- Jurisdictions – Chaired CEO ACSQHC
- Promotes ongoing relationships and “peer pressure “ regarding responses to outliers
- Positive and Negative outliers

Outlier Definition

A contributing Intensive Care Unit identified by analysis of data submitted to the ANZICS CORE Adult Patient Database (APD) or Paediatric Database, as having results which lie outside of a predetermined range.

This pre determined range is defined to indicate a high likelihood of being within the boundaries of standard or acceptable practice and may vary over time.

Information Flow

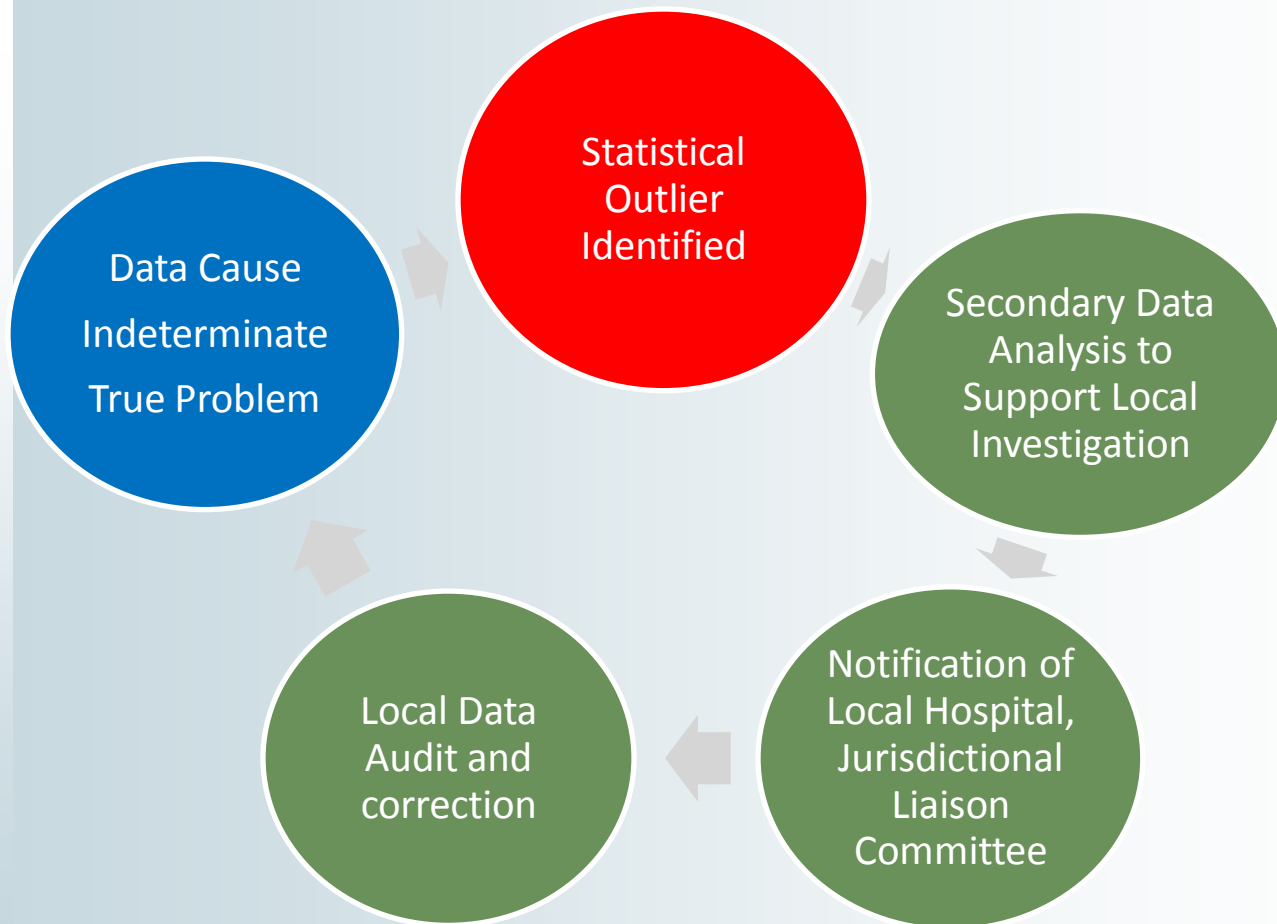


The action plan

- *balance governance and community safety imperatives for early identification of poor performance*
 - *Against*
- *ensuring that identified units are able to address data related issues that may cause erroneous identification of poor performance.*



Action Plan



DATA ANALYSIS, REPORTING AND FOLLOW-UP ACTION PLAN

- **Process phases:**
 - **Phase 1:** Data Upload, clean, initial report
 - **Phase 2:** Notification & investigation of the findings to ICU / state committee
 - **Phase 3:** Detailed analysis of data quality, case mix, other confounders
 - **Phase 4:** Local Intervention
- **Repeat Cycle:**

Jurisdictional Responsibility

- It is the responsibility of the regional jurisdictional authority to liaise with the hospital management and the ICU Director and assume responsibility for correcting factors leading to outlier performance.

Ethics and Privacy

	Principle	Principle met	Conformance
1	Institutional Ethics Committee approval must be obtained to establish the clinical registry	No	
2	Consent must be obtained from participants or their next of kin prior to the collection of registry data	No	



Information Output

	Principle	Principle Met	Conformance
1	ad hoc analysis of data to enable monitoring of clinical care	Yes	Web based reporting tools Published reports ad hoc analyses
2	capacity to verify data in a timely manner and produce risk-adjusted reports as close to real time as possible for local users	Yes	submit data on a quarterly basis.
3	Registries must produce a publicly accessible aggregated annual report detailing clinical and corporate findings	Partially Yes	CCR Report annual CORE annual report. ANZPIC Annual Report Peer reviewed publications Jurisdiction reports
4	Data from clinical registries should be used to evaluate quality of care by identifying gaps in best practice and benchmarking performance	Yes	APD provides benchmark reporting to units on quarterly basis.

2007 -08 : 96% return

Influenza Pandemic

June – September 2009

Interim Update

Isolation resources ,

Staff Impact and shortages,

Surge capability and sustainability

Intensive Care Resources & Activity: Australia and New Zealand 2006/2007

Authors: Kelly Drennan, Graeme K Hart & Peter Hicks



ANZPIC Report

Annual report

**Australian and New Zealand
Paediatric Intensive Care Registry
2006**

Jan Alexander, Shelley Tregear
& Anthony Slater

The BIG Picture Australia

- ~ \$AUD 750 million spent pa#.
- 140,000 patients receive ICU / HDU care
- 4.76 % all non same day acute admissions
- 167 Australian public and private sector ICUs.
- ~ 25% episodes in Private sector

based on NSW cost model 2003-4 of \$2900 – \$3200 per day – Does not include private medical fees, PBS funded drugs.

The BIG Picture Australia

- 1881 ICU / HDU Beds
 - Available :1695 Ventilator: 1318
- 5500 patients (4.9 %) require readmission to ICU during a hospital admission .
- 7% ICU mortality 14-15% hospital mortality.
- APACHE 3j SMR 0.85 (tertiary sector)
- 18 % Discharged “out of hours”
 - Impact on mortality – OR 1.4

The BIG Picture

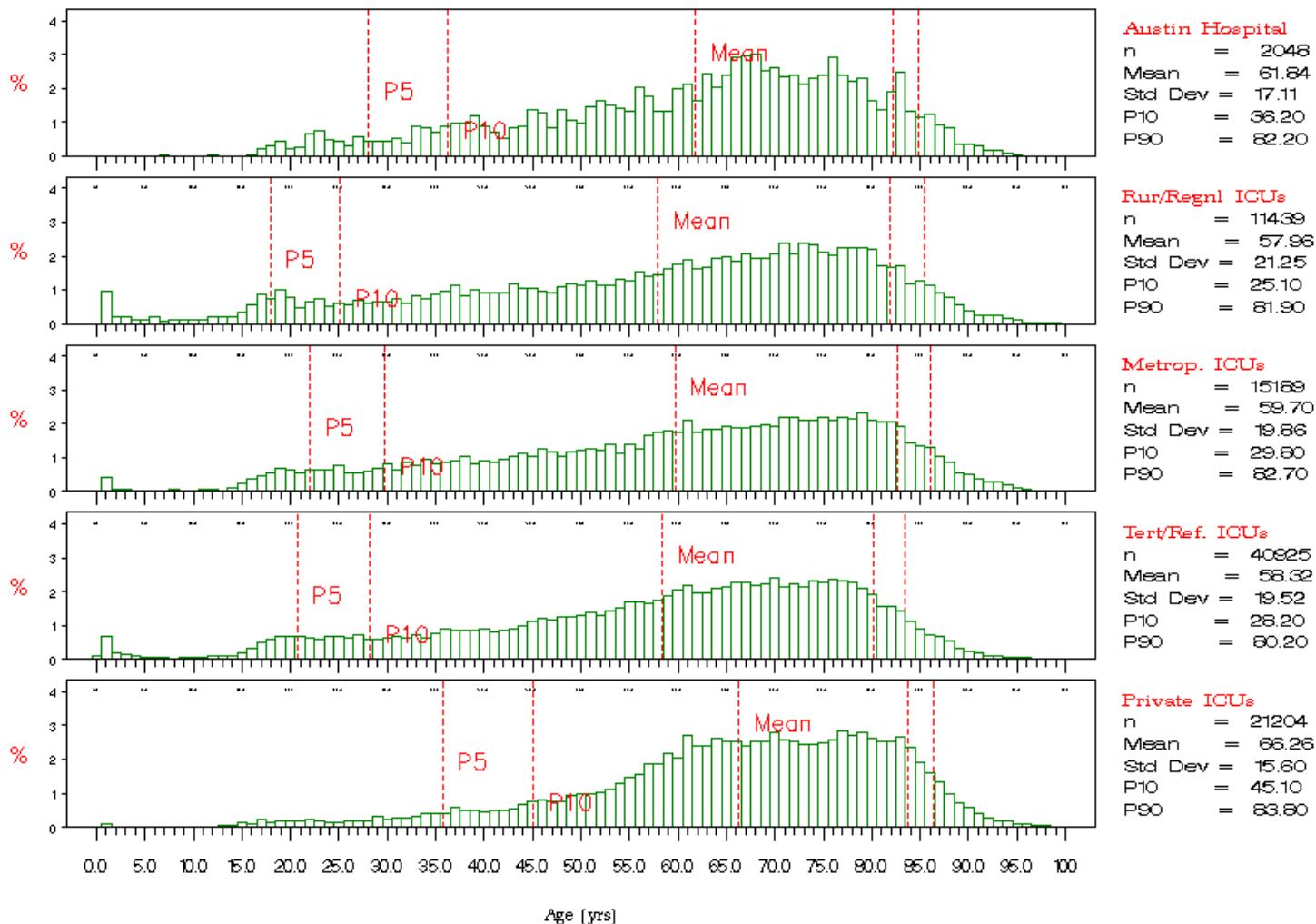
- 10,000 patients may not receive appropriate ICU care because of resource constraints.
- This exceptional care is provided by 4,122 RN FTE, 280 ICU or other specialists.
- shortfall of RNs: 7% to 20 % depending on staff type and locality.



Patient Age Distribution 2007/08



Comparative ICU Patient Age Distributions — Austin Hospital (ICU & CICU) (01/07/07 — 30/06/08)



ANZICS CORE Management Committee

Source: Data submitted to the ANZICS Outcomes Database changed as at Tuesday, 2 September 2008.

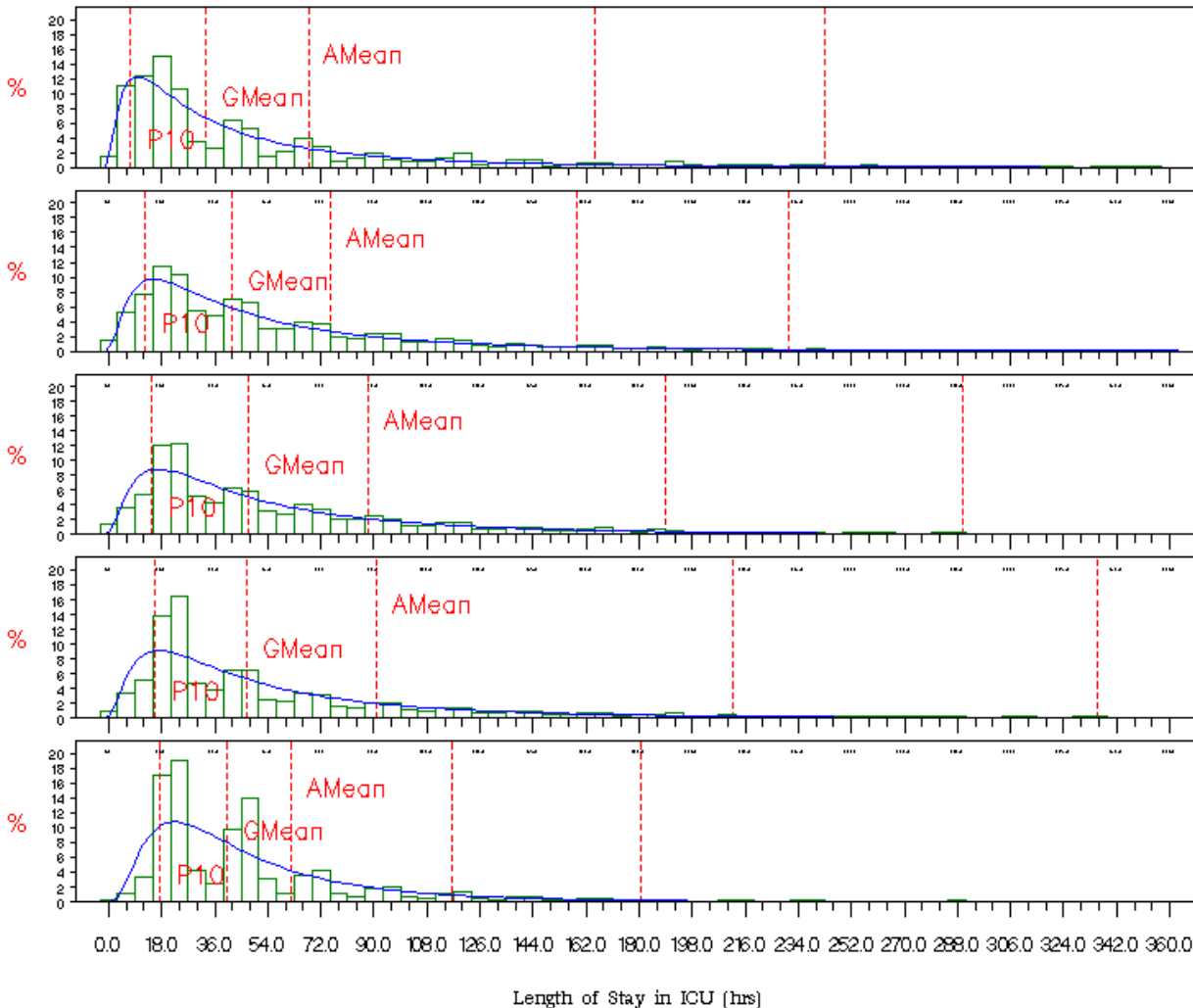


ICU Length of Stay

2007/08



Distribution of ICU Lengths of Stay — Austin Hospital (ICU & CICU) (01/07/07 — 30/06/08)



Austin Hospital
 n = 2047
 GeomMean = 33.17
 ArithMean = 67.60
 P95 = 242.97
 P99 = 546.73

Run/Regnl ICUs
 n = 11420
 GeomMean = 41.72
 ArithMean = 75.50
 P95 = 230.54
 P99 = 589.50

Metrop. ICUs
 n = 15169
 GeomMean = 47.44
 ArithMean = 88.36
 P95 = 290.00
 P99 = 697.27

Tert/Ref. ICUs
 n = 40692
 GeomMean = 46.61
 ArithMean = 91.15
 P95 = 335.50
 P99 = 742.43

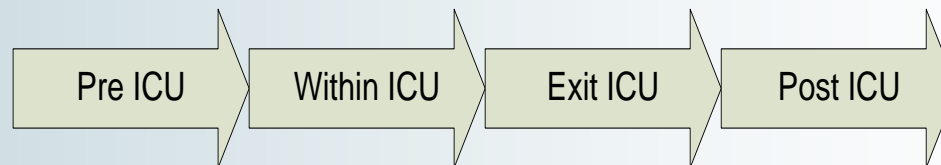
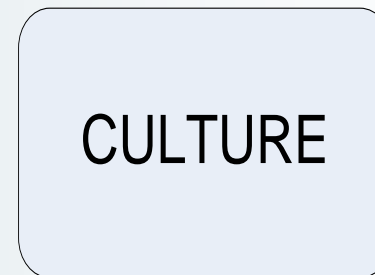
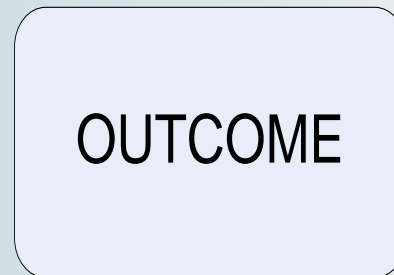
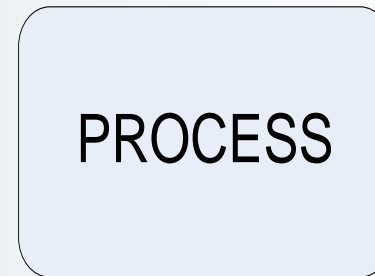
Private ICUs
 n = 21197
 GeomMean = 40.16
 ArithMean = 61.99
 P95 = 180.63
 P99 = 491.42

Note: Statistics calculated all admissions but stays > 360 hrs not shown.
 Source: Data submitted to the ANZICS Outcomes Database as at Tuesday, 2 September 2008.

Mortality is Not Enough!

- Adult Patient Database
- ANZPIC
- Critical Care Resource Survey
 - Annual
 - Resources
 - Physical, Human, Process, ?Culture
 - Access

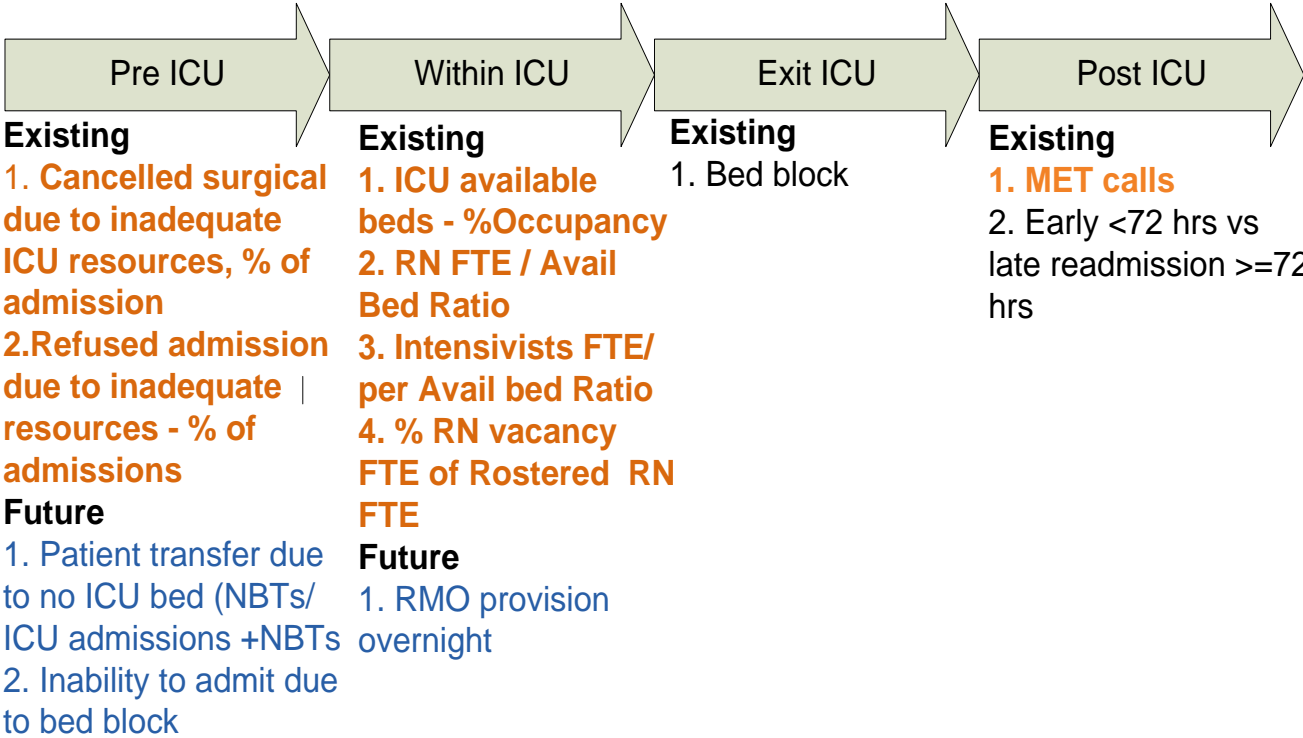
PROPOSED STRATEGY MAP FOR ANZICS CORE STRATEGIC PERFORMANCE MANAGEMENT PORTAL Draft Version 1





ACCESS

- Data Sources
- 1. **Critical Care Resource Survey**
Unit structure / resource data
 - 2. Adult Patient Database
Individual patient episode data



Scorecard - ANZICS

Diagram: ANZICS Strategy Maps Date: 05/31/2008 Zoom: 100% Go

Access

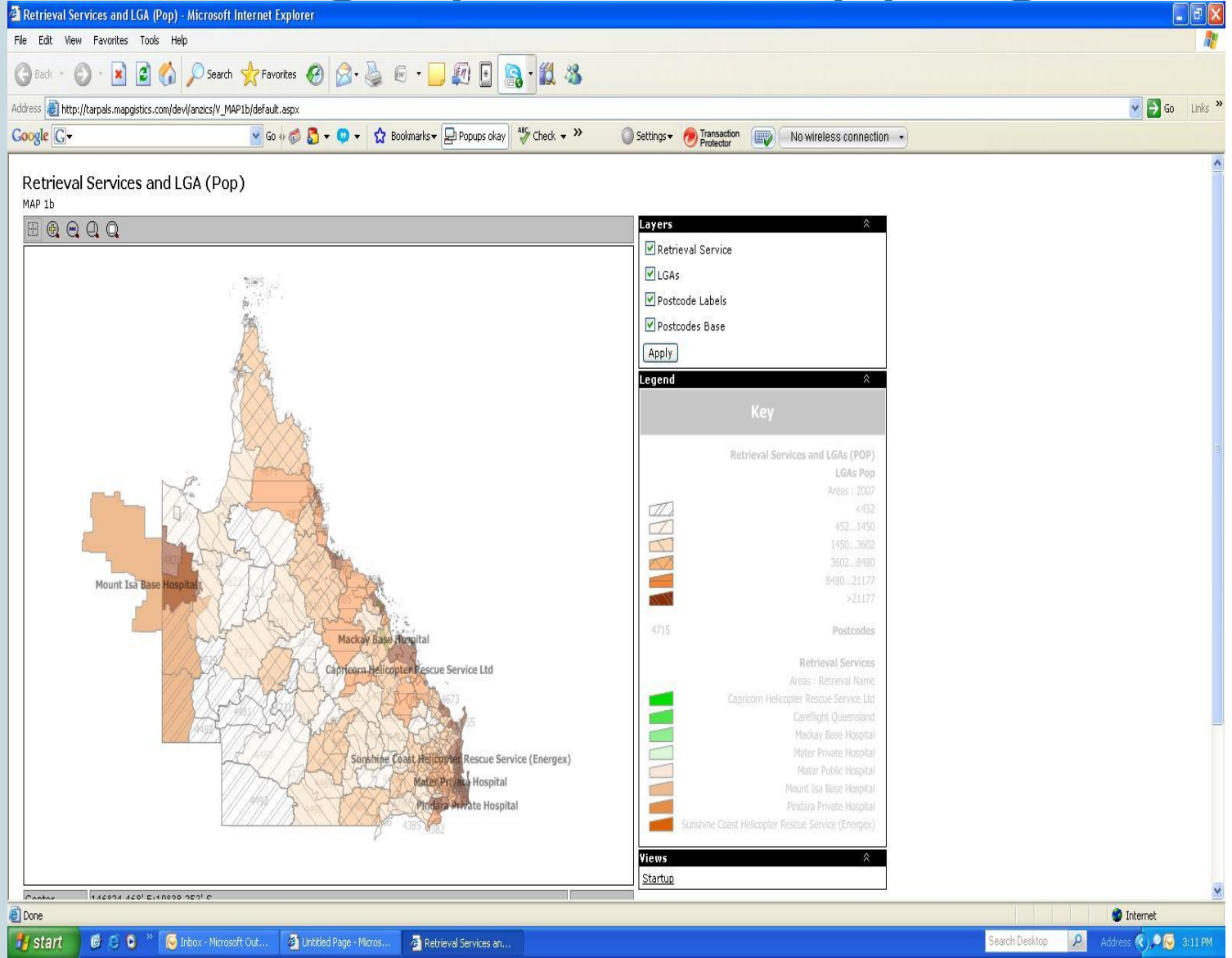
Pre ICU	Within ICU	Exit ICU	Post ICU
Cancelled Surgical Status 12 ●	ICU Availability Beds Status 10 ●	Bed Block Status 12 ●	MET Calls Status 2 ●
Refused Admission Status 12 ●	RN FTE/Avail Bed Ratio Status 9 ●	Early <72 hrs vs late readmission Status 1 ●	
	% RN Vacancy FTE of Rostered RN FTE Status 1 ●		

Process

Pre ICU	Within ICU	Exit ICU	Post ICU
Pre Hospital Length of Stay Status 1 ●	Number of Admissions/Number of Beds Status 12 ●	Nocturnal Discharge From ICU % Status 12 ●	Readmission Rate Status 12 ●
	Mean Hours Invasive Ventilation Hrs for Invasively Ventilated Patients Status 1 ●	Destination - Other ICU Status 12 ●	Unplanned Readmission Hours Status 12 ●
	Length of Stay (Survivors vs Non Survivors) Status 1 ●	Delayed Discharge Status 12 ●	



Geographical Mapping



Research

- Private Sector
- Balanced Scorecard – validation with ICNARC
- Administrative Database use
- Data Linkage – National Long Term Outcomes and Specific links to other Registries – Trauma Cardiac Surgery
- Increased Overseas collaboration UK, HK.
- Increase Non jurisdictional Funding

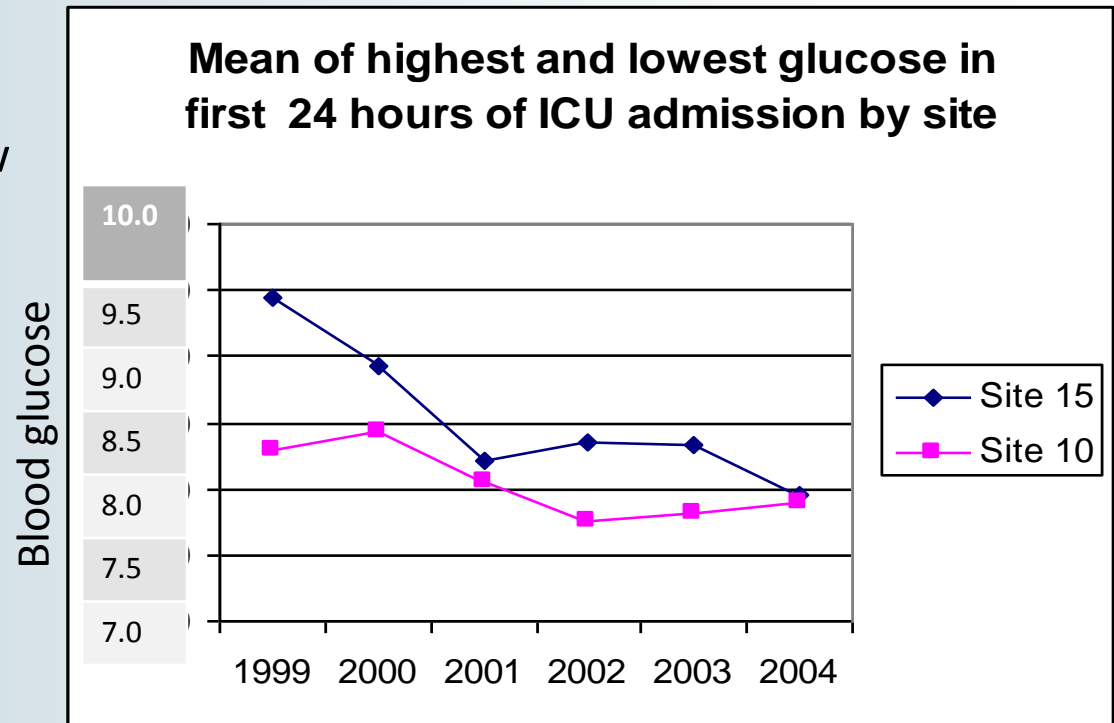
Research

- 10 plus papers pa
 - Committee, ANZIC RC, CTG, others
- Annual Reports – ANZPIC , CCR Survey
- KPI development program
 - ICCMU, and ICNARC
- Geographical Mapping
- Registry Linkage



Glucose control

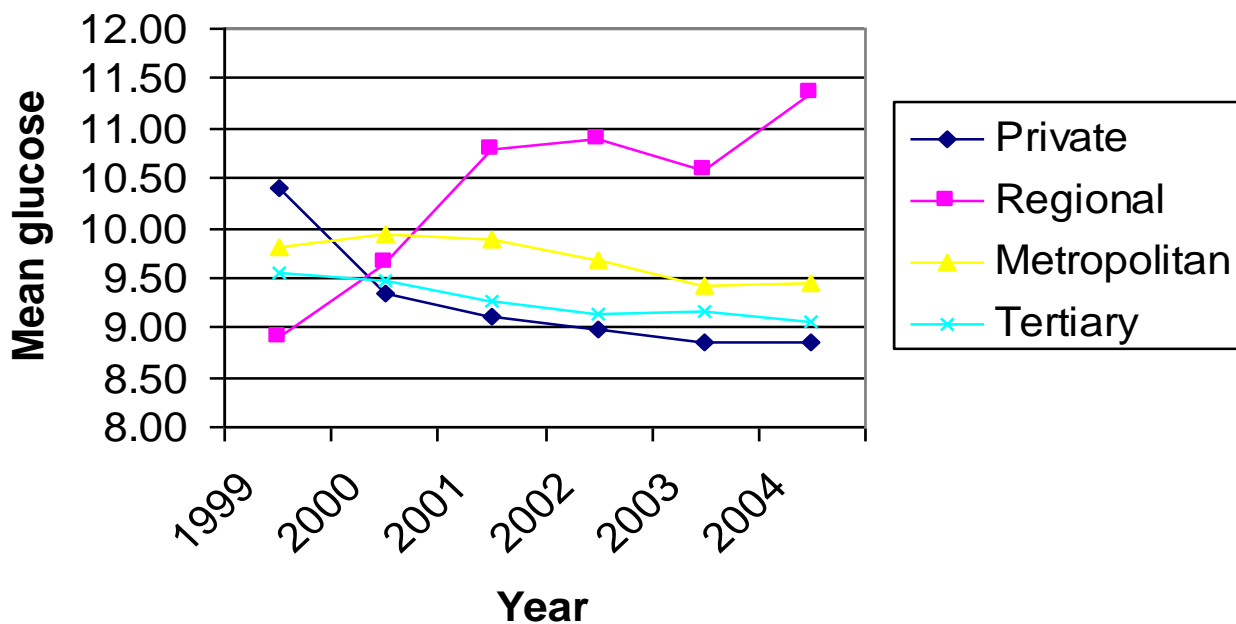
- Glucose
 - Addition of High & Low Glucose values to export file
- Assessment of glucose control for baseline comparison of van den Berghe study





Glucose control by Sector

APD submitted glucose Worst in first 24 hours





Effect of After Hours ICU Discharge

ICU discharge shift	D: 0700-1400	E: 1400-2200	N: 2200-0700	p-value
n (% ICU-survivors)	4671 (41%)	5579 (49%)	1077 (10%)	<0.01*
Crude mortality (%)	192 (4.1%)	377 (6.8%)	67 (6.2%)	<0.0001#
APACHE III-J SMR Median (95% CI)	0.80 (0.64-1.16)	0.84 (0.63-1.08)	1.38 (0.89-1.96)	<0.001*

*N compared to D and E. # D compared to E and N

References.

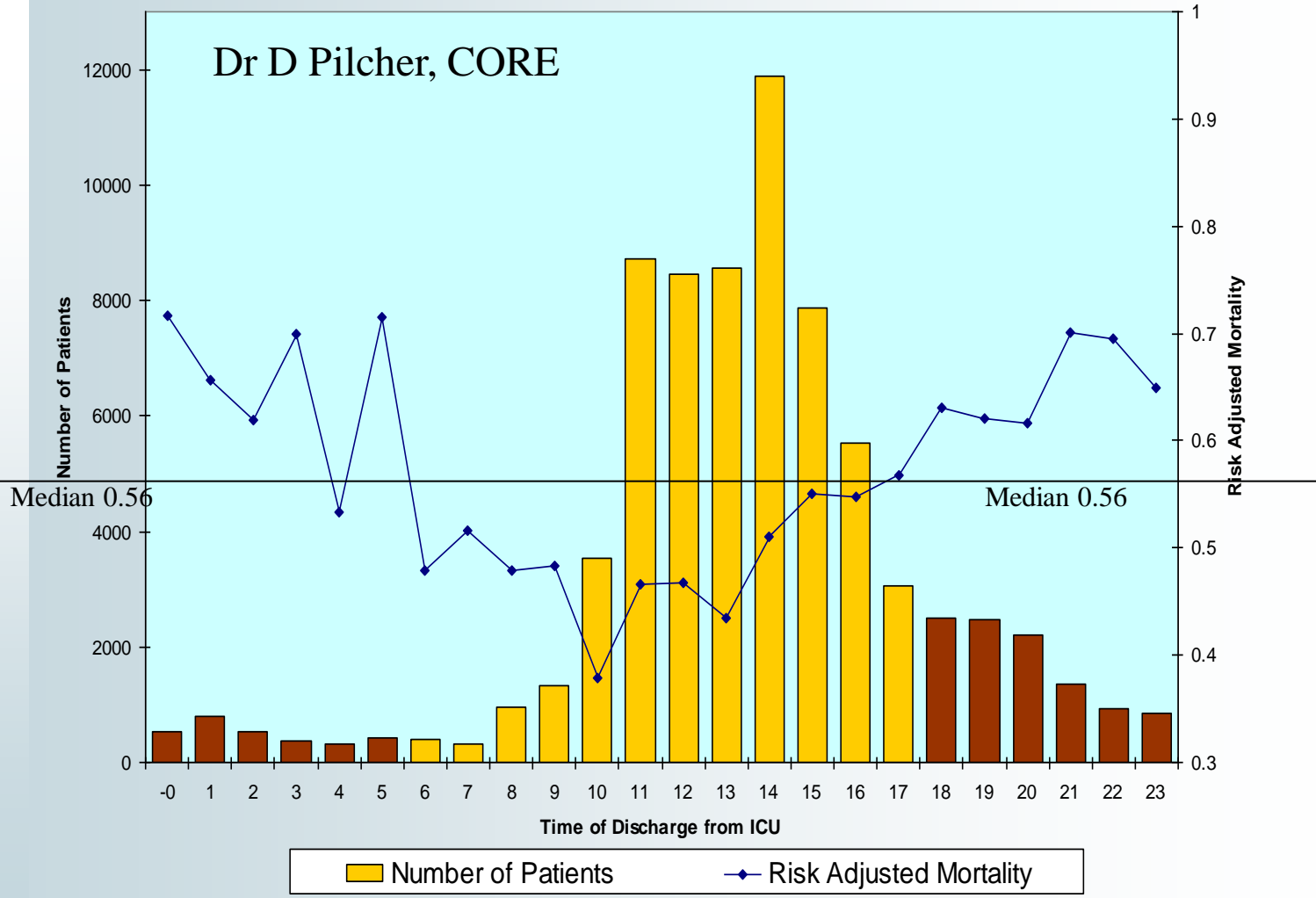
1. Duke GJ, Green JV, Briedis JH. Night-shift ICU discharge is an independent predictor of ICU outcome. *Anaesth Intensive Care* 2004; 32:697-701

2. Goldfrad C, Rowan K. Consequences of discharge from intensive care at night. *Lancet* 2000; 355:1138-42.



Risk Adjusted Mortality

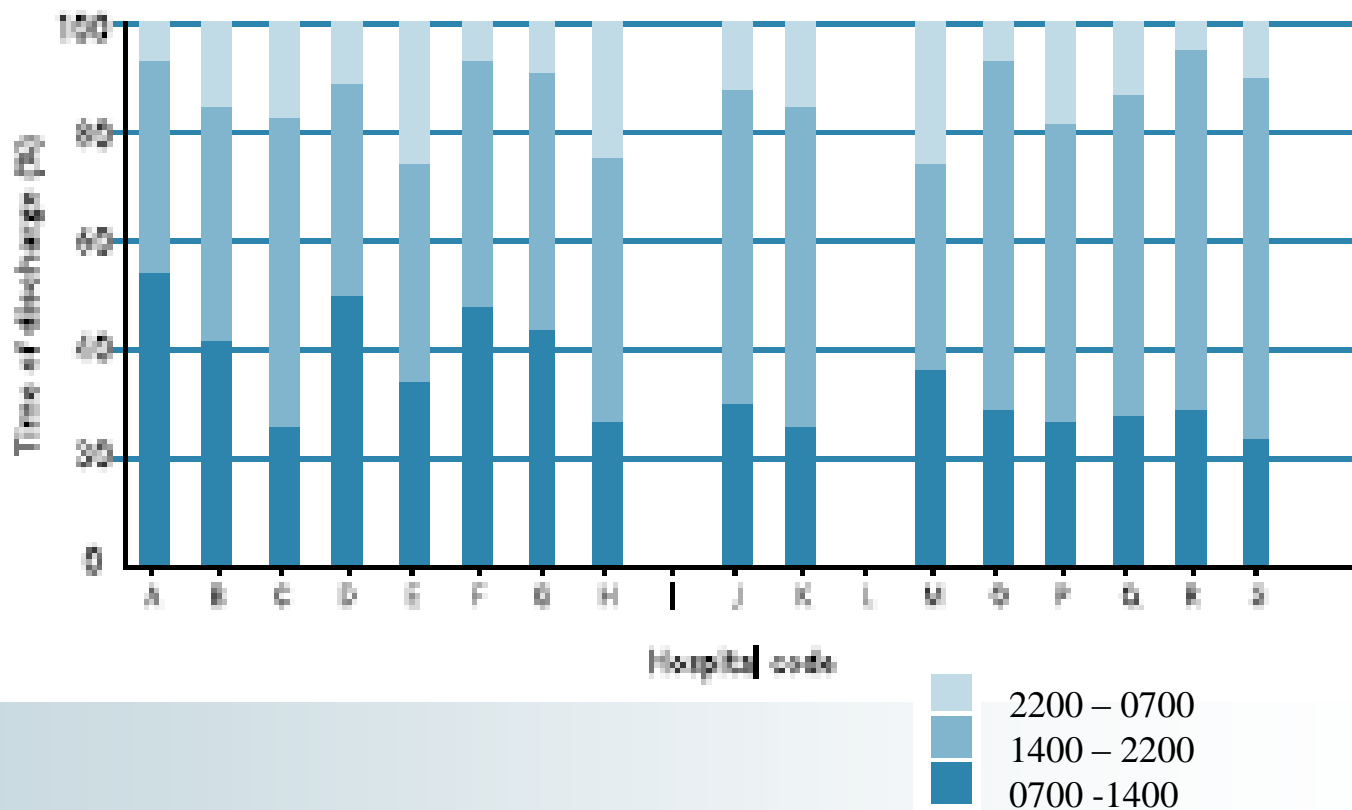
Number of Patients and Risk Adjusted Mortality





ICU Hour of Discharge

Figure 15: Time of discharge from ICU for each public hospital



Victorian Data Review Committee

ANZICS CORE Management Committee

Readmission to ICU

- 3.3% to 19.5%, depending on the case mix and location of the intensive care unit.
- increase in mortality associated with readmission.
 - two to almost ten-fold.
 - Hospital and ICU length of stays are also longer and associated with higher in-hospital cost.
- Higher readmission rate in patients initially admitted from general wards.
- Non-operative patients have also been shown to have higher readmission rates than operative patients



Victorian ICU Patient Age Distribution

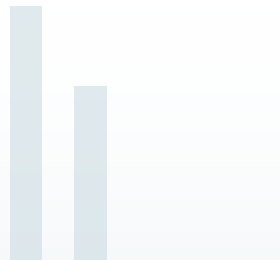


Figure 3: Percentage of admissions in each different age group for all Victorian public hospital admissions to ICU during 2002-03

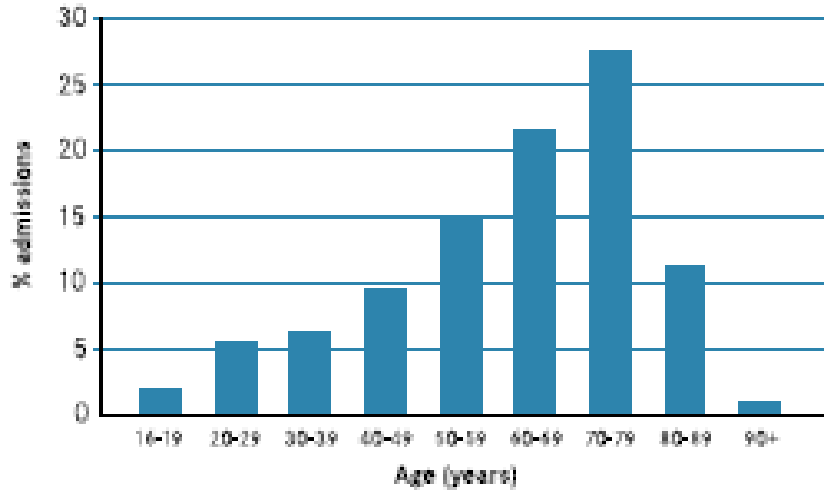
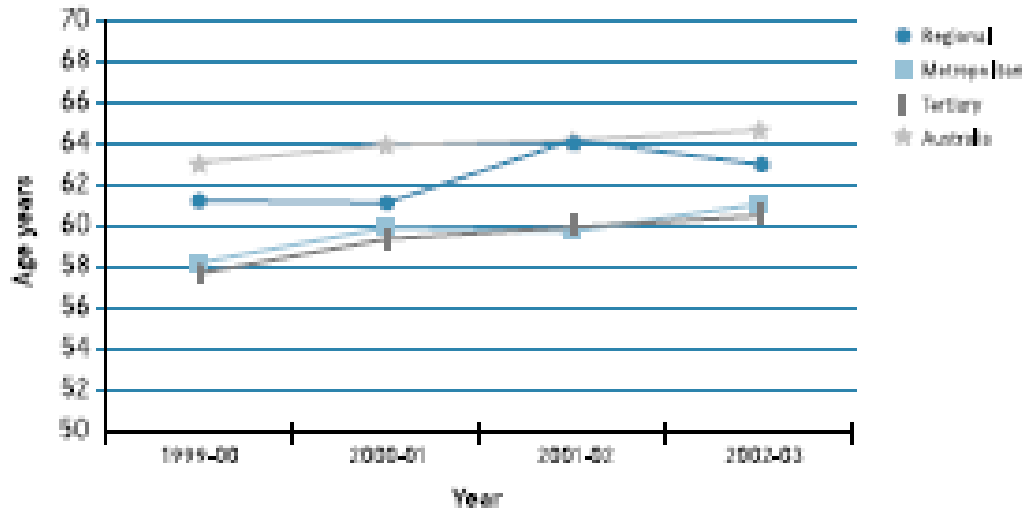


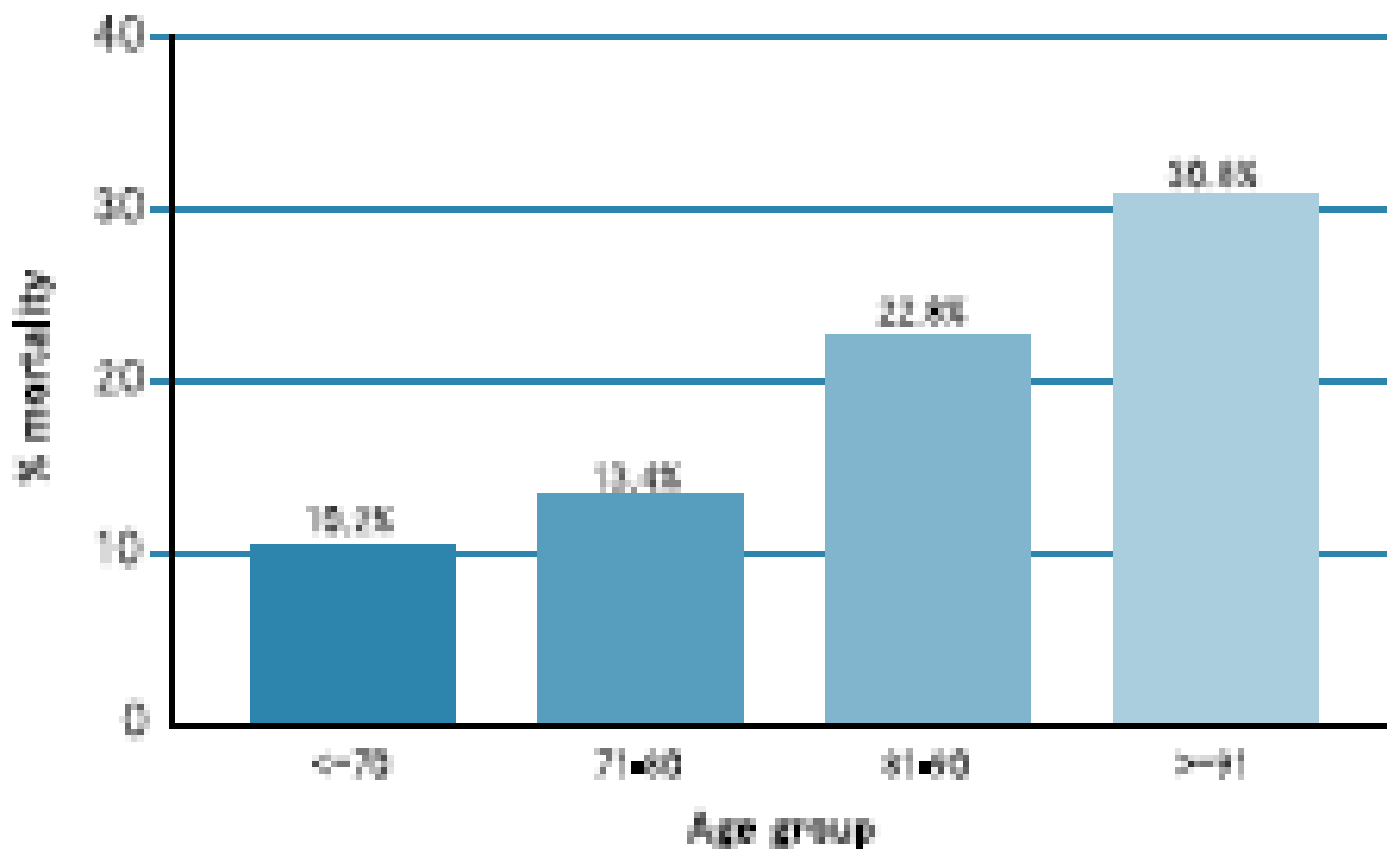
Figure 2: Mean age of patients at time of ICU admission by financial year





Hospital Mortality After ICU vs Age (Vic)

Figure 9: Mortality rate by age group

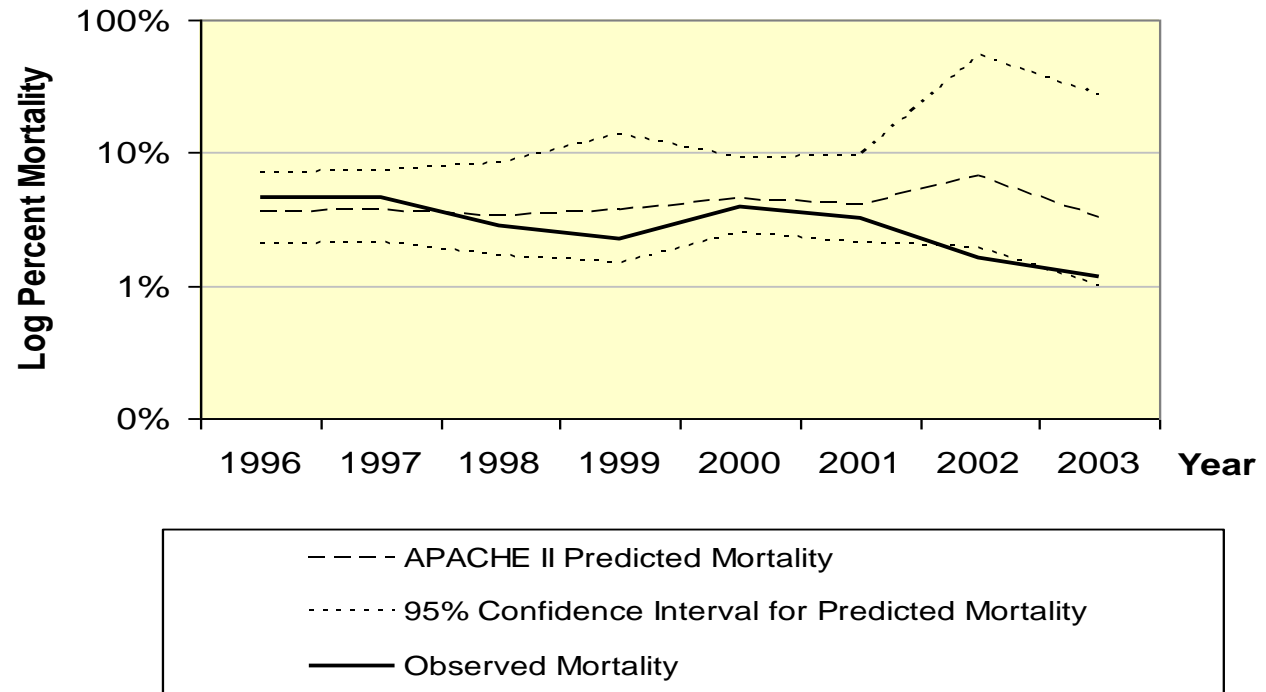




Asthma Outcomes over 8 years



Observed Mortality Compared to Predicted Mortality (using APACHE II score)



Peter J Stow¹, David Pilcher², Carol George³, Michael Bailey⁴, Tracey Higlett⁵, Rinaldo Bellomo⁶ and Graeme K Hart⁷
(for the ANZICS Database Management Committee) – submitted Chest 2006



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AUSTRALIAN AND NEW ZEALAND INTENSIVE CARE SOCIETY



ANZICS

3rd International Conference on Safety, Quality, Audit & Outcomes Research in Intensive Care 2009



3rd International Conference on Safety Quality Audit & Outcomes Research in Intensive Care

Millennium Hotel Queenstown New Zealand
6th-7th August 2009

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3rd International Conference on Safety Quality Audit & Outcomes Research in Intensive Care

Millennium Hotel Queenstown New Zealand
6th-7th August 2009

