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### Intensive Care Registries in Australia & New Zealand

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This year there will be over 160,000 patients admitted to Intensive Care Units (ICUs) in Australia and New Zealand. More than 90% will leave hospital alive. Two out of every five patients will be cared for in large university affiliated tertiary referral hospitals. The most common patient will be a 68 year old man, weighing 85 kg who will be admitted after coronary artery bypass surgery and will survive to return home. Not only do we know this but we also know how much his chances of survival will vary depending on which hospital he is admitted to!

Our ability to make projections like this is due to comprehensive data collected by The Australian and New Zealand Intensive Care Society (ANZICS) Centre for Outcome and Resource Evaluation (CORE), which runs the

Intensive Care registries in Australia and New Zealand.

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## Why Have an Intensive Care Registry?

In all fields of medicine it is important to monitor the care given to patients. Without adequate monitoring and appropriate feedback, 'dysfunctional' systems may arise and put lives at risk through provision of unsafe or sub-standard healthcare. Numerous publications have highlighted the adverse consequences of failure to monitor outcomes or appropriately feedback and act on findings (Spiegelhalter et al. 2003; Pilcher et al. 2010; Mid Staffordshire NHS Foundation Trust Public Inquiry 2013).

In recognition of this, clinical registries have become more common in recent years. Many countries already have well established organisations collecting clinical information from ICUs and providing comparative reports to submitting sites. Registry organisations in the United Kingdom, the Netherlands and Scandinavia have a long history of collecting clinical information, using severity of illness scores to risk adjust mortality outcomes and providing benchmarking reports to submitting ICUs. Within Australia and New Zealand these activities are run by ANZICS CORE.

## A Little Bit of History

The publication of severity of illness scoring systems in the 1980s paved the way for appropriate comparison of mortality outcomes between ICUs. In the early nineties, Australia and New Zealand ICUs began collecting information on patient outcomes and severity of illness using software developed by a small band of highly driven clinician enthusiasts (Stow et al. 2006). From the outset a bi-national approach was undertaken with intention to benchmark outcomes across both Australia and New Zealand. Participation rapidly grew over the 1990s. Over the 2000s with further support from the clinical community, improved infrastructure and more secure funding, individual Intensive Care databases were consolidated under a single organisational banner, which is now ANZICS CORE.

CORE presently houses a dataset of over 1.5 million patient records with a further 130,000 added each year and sees international contributions from Hong Kong, India and hopefully soon Fiji. Submission of data within Australia remains voluntary, but high levels of support from the clinical community have led to over 90% of ICUs in Australia and approximately 50% in New Zealand contributing data. Non-contributing ICUs are predominantly private ICUs, which require individual contractual agreements, or small rural units where resources for data collection are limited.

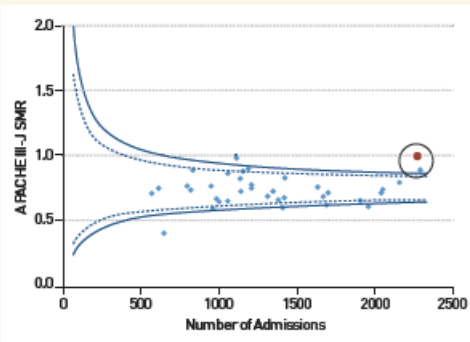
## What Does ANZICS CORE Actually Do?

ANZICS CORE collects de-identified data on diagnoses, severity of illness and outcomes from adult and paediatric ICUs. CORE also surveys ICUs annually to determine bed numbers, staffing and resources. In addition to data collected directly from units, information from jurisdictional infection control bodies on rates of central line associated bloodstream infections are collected. Online reports are created quarterly and made available to submitting ICUs and to regional health departments. These reports benchmark ICU mortality outcomes against similar hospital types using internationally validated scoring systems (Acute Physiology and Chronic Health Evaluation (APACHE) III for adults, Paediatric Index of Mortality (PIM) 2 for children). Additional information is also provided on factors such as patient demographics, length of stay, readmission rates, after-hours discharges, provision of venous thrombo-embolism prophylaxis and exit block.

If an ICU appears to have worse mortality outcomes than its peer group, then a structured "Outlier Analysis" is undertaken and fed back to the hospital and to the regional department of health who determine any action required. In about half the cases, data quality and case mix issues appear to be the strongest factors contributing to the ICU's outlier status.....but not always! An example is given below:

### Case Study from 2011 – An Outlier ICU?

This ICU had a higher standardised mortality ratio [observed deaths / predicted deaths derived from the APACHE III scoring system] than other similar units. The ICU Director, hospital administration and local jurisdictional committee were informed and further analyses were confidentially undertaken.



Initial analysis showed:

- An on-site audit had demonstrated accurate data collection
- The data was of high quality with a high level of completeness
- Case mix was similar to other peer group hospitals

Further analysis indicated that this ICU (compared to its peer group) had:

- Higher levels of after-hours discharge from the ICU
- Higher occupancy
- Higher nursing vacancy
- Lower medical and nursing staffing levels.

It was likely that these factors contributed to the poor mortality outcomes at this hospital.

A formal report was put together jointly by staff at ANZ-ICS CORE and experienced clinicians who form the Outlier Working Group. This was provided to the unit Director and to the local jurisdictional governance body.

### What Does ANZICS CORE Actually Do?

ANZICS CORE comprises ten staff located in Melbourne and Brisbane (exclusively funded by the State Health Departments) who work with three intensive care physicians, to manage education, audit, data submission, software support, data-bases and provision of online reports for all contributing units. Data quality is ensured through automated validation rules, regular training workshops and on-site audits. ANZICS CORE provides free data collection software to all contributing units. This is essentially the same software built by the “founding” clinicians in the 1990s but with several renovations. Most ICUs do not have to pay to contribute data or receive reports, but the costs of data collection are born by the ICUs themselves.

### What Else Can Registry Data Tell Us About Intensive Care Medicine in Australia?

Although the primary purpose of the registry is to monitor mortality outcomes of ICUs, the data finds many other uses. It allows us to paint a picture of resources available and outcomes achieved in ICUs throughout Australia and New Zealand (Figure 1). It can also be used for research. However it is worth noting that financial support from health departments comes with the expectation that ‘their money’ is spent on monitoring the healthcare system, not funding the growth of someone’s personal publication list! Thus, when research with data is undertaken, it is self-funded by interested clinicians. This requires careful data governance and oversight of publication processes to ensure the appropriate use of data. This is achieved through close collaboration with organisations such as the Australian and New Zealand Intensive Care Research Centre at Monash University and The George Institute in Sydney.

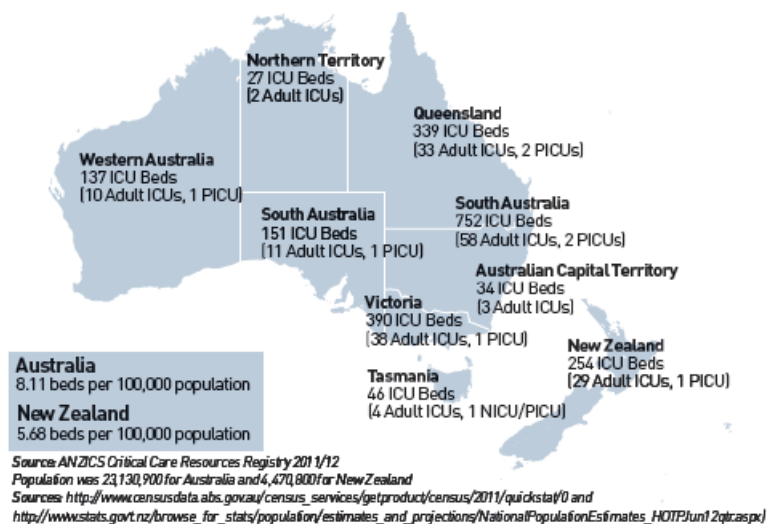


Figure 1. A profile of All ICUs Across Australia and New Zealand

ANZICS CORE data has facilitated development of performance indicators such as 'after-hours discharge from ICU' (Pilcher et al. 2007) and 'provision of venous-thromboembolism prophylaxis in the first 24 hours ICU admission' (Ho et al. 2011); has led to development of statistical methods for monitoring outcomes, identifying variation and describing trends (Pilcher et al. 2010; Kasza et al. 2013); has provided physiological rationale for randomised trials (e.g. following the finding that high body temperatures are associated with improved survival in patients with infections (Young et al. 2012)) and has resulted in the development of new severity of illness models (Paul et al. 2013; Straney et al. 2013) tailored to Australian and New Zealand practice.

#### The Future for Intensive Care in Australia and the ANZICS CORE Registries

Future aims include ensuring coverage of all ICUs, increasing linkages with other registry groups locally and internationally, matching our services to the developing needs of the speciality, integration with clinical information systems and developing registry methodologies to perform large, cost effective and well powered clinical studies. In addition, as mortality outcomes continue to improve, it will become increasingly important to determine functional outcomes and long-term survival (Figure 2).

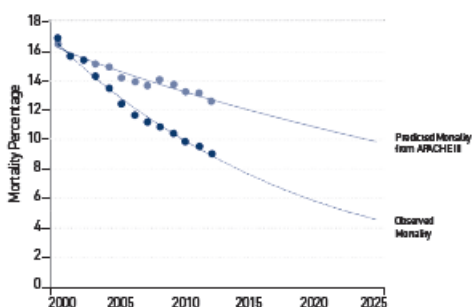


Figure 2. Observed and Predicted Mortality (Derived from APACHE III) 2000-2012 with Extrapolated Trend until 2025

Although we may know whether the 68 year old 85 kg man admitted after cardiac surgery in 2014 survives to leave hospital alive, to truly understand if we are providing effective care to critically ill we will need to know how well he can walk, talk and care for himself and what his chances are of being alive are five, ten or more years later. These are the future challenges for the ANZICS CORE registries and Intensive Care medicine in Australia and New Zealand.

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