Using data to drive change and improve patient outcomes

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Intensive Care Specialist, Box Hill Hospital, Eastern Health
1. Problem?

2. Goal?

3. Audience?

4. Data?

5. Methodology?
Data

powerful ammunition

ambiguous, amoral, agnostic

take care!
Case Example 1

Victorian Road Toll and Road Safety Enforcement Initiatives


1976: Random breath testing introduced.

1985: Small number of mobile speed cameras introduced on a trial basis.


1989/90: Covert operation of mobile cameras commenced. Thirteen RBT ‘boozes buses’ and penalties introduced for BAC exceeding 0.05.

2001/02: Default urban speed limit lowered to 50km/h and new 40km/h limit introduced for school and strip shopping zones. 50% increase in mobile camera hours and speeding tolerance reduction.

2000: First fixed digital safety cameras began operation on CityLink.

2006: Random drug testing and vehicle impoundments introduced.
Case Example 1

- Problem? Preventable trauma deaths in-hosp.
- Audience? Ambulance, Clinicians, DoHV, etc.
- Data? High quality, large quantity.
- Methodology? Detailed peer review deaths.
Case Example 1

TRAUMA AUDIT METHODOLOGY

Francis T. McDermott, Stephen M. Cordner, Ann B. Tremayne and the Consultative Committee on Road Traffic Fatalities in Victoria*


In-depth review
250 consecutive road trauma deaths
30+ personnel over 5-years
high rate of errors of care and potentially preventable deaths.
Although the combined preventable/potentially preventable death rate reduced significantly from 1997/1998 as compared with 2002/2003 this significant reduction has not been mirrored in the time period of this project (2003-2005) (Figure). However, lower death rates have been maintained. This lack of significant reduction in preventable/potentially preventable deaths is due at least in part to inadequate compliance with accepted recommendations/guidelines/protocols.

The present situation requires improvement. The key factors required for improvement include audit of compliance with guidelines/protocols (including the development of statewide protocols and minimal standards), the development and use of prompting systems, the appointment of a Director for each trauma service receiving major trauma patients and better education. The appointment of such Directors with responsibility for education, compliance with guidelines and protocols, audit and educational feedback is essential. This is essential for effective accountability and successful implementation of progressive improvements in process and outcomes. All these factors are covered in the summary of recommendations and in the sections detailing the recommendations, comments and implementation status. These sections are included within this report.

At the final meeting between the CCRTF and MTS to discuss all relevant findings it was agreed that the responsibility for implementation and compliance with the consensus recommendations lies with the Directors of Trauma Services for their individual hospitals and with the State Trauma Committee for Victoria wide compliance. It was also recommended that the resource requirements for the MTS...
Case Example 2

- **Problem?** Quality of medical care @ TNH?
- **Goal?** Maximal clinical ‘bang’ for the audit ‘$’
- **Audience?** Medical staff
- **Data?** Comprehensive, high quality
- **Methodology?** Directed effective peer review
Validation of the hospital outcome prediction equation (HOPE) model for monitoring clinical performance

G. J. Duke,¹ M. Graco,² J. Santamaria³ and F. Shann⁴

¹Critical Care Department, The Northern Hospital and ²Northern Clinical Research Centre, Northern Health, Epping, and ³Intensive Care Department, St Vincent's Hospital and ⁴Intensive Care Unit, Royal Children's Hospital, Melbourne, Victoria, Australia


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¹Northern Health, ²Centre of Research Excellence in Patient Safety, Monash University, ³St Vincent's Hospital, Melbourne; The University of Melbourne and ⁴Northern Clinical Research Centre, Melbourne, Victoria, Australia

Key words
hospital, mortality, temporal trend, epidemiology.

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Abstract

Background: The background of the study is a comparison of risk-adjusted mortality across hospitals from different jurisdictions is now common worldwide.

Aim: To examine temporal trends in risk-adjusted mortality in Victoria over the last decade.

Methods: Retrospective cohort study of 6.89 million adult (>14 years) patient episodes from 23 major Victorian public hospitals between 1999 and 2009. The primary outcome was in-hospital death. Three measures were calculated: the crude mortality rate, risk-adjusted mortality rate and standardised mortality ratio (SMR). The Hospital Outcome Prediction Equation (HOPE) was applied to generate estimates of predicted mortality that were used to compute the SMR and risk-adjusted mortality rates. The HOPE model includes 26 exogenous risk factors for which providers have no influence. The model was calibrated using the 2004–2005 data. Temporal mortality trends from 1999–2009...
Validation of the hospital outcome prediction equation (HOPE) model for monitoring clinical performance

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1 Critical Care Department, The Northern Hospital and 2 Northern Clinical Research Centre, Northern Health, Epping, and 3 Intensive Care Department, St Vincent’s Hospital and 4 Intensive Care Unit, Royal Children’s Hospital, Melbourne, Victoria, Australia

2. High-mortality:
   * Pneumonia
   Cardiac failure
   Myocardial infarction
   Stroke
   Intensive care

3. Compare hospital with State benchmark
Case Example 2

4. Audit case records: simple audit criteria

5. Repeat audit before and after eduction of staff

Pneumonia

Appropriate antibiotics treatment (typical & atypical cover) 2010-11

IVAB given <= 4hrs for moderate to severe pneumonia 2009-11

Thursday, 6 December 12
Case Example 2

4. Audit case records: simple audit criteria

5. Repeat audit before and after eduction of staff

Pneumonia

**Appropriate antibiotics treatment (typical & atypical cover) 2010-11**

Cardiac failure

**CHF discharged on Beta Blockers 2009-12**

**IVAB given <= 4hrs for moderate to severe pneumonia 2009-11**

**CHF discharged on ACEI + / or ARBs 2009-12**
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Pneumonia

Cardiac failure

Appropriate antibiotics treatment (typical & atypical cover) 2010-11

CHF discharged on Beta Blockers 2009-12

CHF discharged on ACEI +/- or ARBs 2009-12
Case Example 3

- Casemix funding of ICU patients

Funding for pneumonia DRG

- ICU: 4%
- Non-ICU: 96%
Case Example 3

- Problem? **Casemix funding of ICU patient**

Cost of same pneumonia DRG in ICU patient

**Funding for pneumonia DRG**

- ICU: 4%
- Non-ICU: 96%

- ICU: 60%
- Non-ICU: 40%
Case Example 3

- **Problem?** Casemix funding of ICU patients
- **Goal?** Remove disincentive, improve resources
- **Audience?** DoHV & Health Service Exec
- **Data?** ICU throughput, access block, etc.
- **Methodology?** Simple but honest.
Planning for Intensive Care Services in Victoria

PROJECT REPORT

MA International Pty Ltd June 2001

Figure 26: Open Vs Available Beds 1996-2000 (Source: OCECCS)

5.2 MANAGING BEDSTOCK

As discussed above the availability of ICU beds is not simply just a function of how many beds are open for use. Staffing, other hospital activities, admission and discharge strategies interact to determine bed availability within the ICU. Issues and strategies of relevance to Victorian ICUs are discussed in further detail below.

5.2.1 MANAGING ADMISSIONS

An obvious strategy to ensuring the availability and appropriate use of ICU resources is to regulate the number and type of patients admitted to such units. All units surveyed within this project had policy and procedure manuals, most had policies specific to admission procedures and criteria. Discussion by stakeholders indicated that admission policies provided a framework of principles, primarily that admission is based on clinical need in cases where ICU intervention will promote recovery and quality of life. Although indicators and criteria may be listed within policies to reinforce the factors considered in evaluating a potential admission, there is no specific test or measure which can define the need for admission, ultimately it is a clinicians judgement, often the unit director or senior intensivist on shift, who will approve admissions and prioritise admission status if there are multiple admission requests for a limited number of places.
Funding for intensive care in Victorian public hospitals

*mechanical ventilation co-payment*

acknowledge complexity, fixed costs, and encourage throughput..

0.6980 WIES per episode – *support for throughput/availability*...

0.7729 WIES per day while ventilated – *recognition of ICU complexity*
Case 3 result

Basic funding for DRG + co-payment if ICU care required

Non-ICU $ + Ventilator copayment $
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5.2.1 Managing Admissions
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Case Example 4

- Problem? ‘Sideway’ inter-hospital CC transfer
- Facilities at the sending hospital are ‘fully occupied’, restricted, or rationed.
- Nil therapeutic benefit
- Cost-effective!
- Commonplace
- No evidence of mortality, morbidity risk
Case Example 4

- **Problem?** Critical care ‘sideway’ transfers
- **Goal?** Reduce rate of crit care transfers
- **Audience?** Clinicians, Health Service Exec
- **Data?** Clinical & scientific validity. None avail.
- **Methodology?** RCT? Or prospective case-control
Outcome of critically ill patients undergoing interhospital transfer.


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Case Example 4

Outcomes Comparison

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Transfers</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU Delay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICU LOS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hos LOS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Predicted mortality*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual mortality</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

p-value
0.001 0.04 0.02 0.63 0.41
Annual cost of critical care transfers:

- 1100 hospital bed-days
- 500 ICU bed-days
- 1 full-time Ambulance crew for 15 weeks.
- Family/social dislocation

Outcome of critically ill patients undergoing interhospital transfer.

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Case 4 result  Less transfers. More access/exit block!
Case Example 5

- **Problem?** Prolonged ED length of stay
- **Goal?** Improve ICU access, reduce ED LOS
- **Audience?** Clinicians, HealthService Exec
- **Data?** Clinical & scientific validity. None avail.
- **Methodology?** RCT unethical! Prospective observational single-centre cohort
Survival of Critically Ill Medical Patients is Time-Critical

G. DUKE, *J. GREEN, *J. BRIEDIS†

Table 6. Variables in the final logistic regression model

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>RR</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>APACHE II score&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.14</td>
<td>1.10-1.18</td>
<td>0.001</td>
</tr>
<tr>
<td>Age (per year)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.03</td>
<td>1.02-1.05</td>
<td>0.001</td>
</tr>
<tr>
<td>Lead-time (per hour)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.06</td>
<td>1.01-1.1</td>
<td>0.015</td>
</tr>
<tr>
<td>Cardiac arrest&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.1</td>
<td>2.7-9.7</td>
<td>0.001</td>
</tr>
<tr>
<td>Cardiogenic shock&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.5</td>
<td>1.4-9.0</td>
<td>0.01</td>
</tr>
<tr>
<td>COPD&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.37</td>
<td>0.38-0.95</td>
<td>0.04</td>
</tr>
<tr>
<td>Chronic health status</td>
<td>2.2</td>
<td>1.3-3.7</td>
<td>0.002</td>
</tr>
</tbody>
</table>

<sup>a</sup>- continuous variable, <sup>b</sup>- primary diagnosis.
Case 5 result

More access/exit block!

No change!
Problem? Management agnosticism or inertia?

Goal? Increase awareness, reduce block.

Audience? DoHV, Health Service Exec

Data? Simple but honest.

Methodology? Phone friends: “Access block?”
Case 6: first audit 1999, 3mths

Metropolitan Audit of Appropriate Referrals Refused Admission to Intensive Care

G. J. DUKE

Australian and New Zealand Intensive Care Society (Victorian Region), Carlton, Victoria

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Reason for RAATI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reason</td>
<td>Number</td>
</tr>
<tr>
<td>No bed*</td>
<td>131</td>
</tr>
<tr>
<td>Bed closed*</td>
<td>147</td>
</tr>
<tr>
<td>Not classified</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>282</td>
</tr>
</tbody>
</table>

*See Table 1 for definitions.

<table>
<thead>
<tr>
<th>Table 4</th>
<th>Immediate outcome of internal RAATI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome of internal RAATI</td>
<td>Number</td>
</tr>
<tr>
<td>Inter-hospital transfer*</td>
<td>135</td>
</tr>
<tr>
<td>Surgery deferred</td>
<td>26</td>
</tr>
<tr>
<td>Prolonged ED stay &gt;4 h†</td>
<td>11</td>
</tr>
<tr>
<td>Prolonged OR/Recovery stay†</td>
<td>3</td>
</tr>
<tr>
<td>Admit to Ward</td>
<td>41</td>
</tr>
<tr>
<td>Not specified</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>228</td>
</tr>
</tbody>
</table>

*To a public or private hospital with ICU facilities.
†i.e. delayed admission to first-choice ICU.
Case 6 result

Persistent access/exit block!

No change!

Understanding variations in demand for ICU services on a shorter time frame may be important to Case 6 result.
Interventions to circumvent intensive care access block: a retrospective 2-year study across metropolitan Melbourne


3 **Reported frequency of interventions and associated mortality rate used to estimate attributable fatalities**

<table>
<thead>
<tr>
<th>Access block intervention</th>
<th>2004–05</th>
<th>2005–06</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. (%)*</td>
<td>Mortality rate†</td>
</tr>
<tr>
<td>Interhospital transfer</td>
<td>283 (2.6%)</td>
<td>19.5%</td>
</tr>
<tr>
<td>Access delay from ED &gt; 8 hours</td>
<td>549 (5.1%)</td>
<td>17.5%</td>
</tr>
<tr>
<td>Premature ICU exit</td>
<td>75 (0.7%)</td>
<td>5.9%</td>
</tr>
<tr>
<td>After-hours ICU exit</td>
<td>1973 (18.4%)</td>
<td>8.3%</td>
</tr>
<tr>
<td>Postponed major surgery</td>
<td>318 (3.0%)</td>
<td>na</td>
</tr>
<tr>
<td>Total</td>
<td>3198 (29.9%)</td>
<td>na</td>
</tr>
</tbody>
</table>

ED = emergency department. ICU = intensive care unit. na = not applicable.* Per cent of total admissions. † Reported mortality rate used in calculations, as demonstrated in Box 2. ‡ Comparison of frequency for 2004–05 with 2005–06.

5 **Average annual attributable effects of intensive care access block interventions**

<table>
<thead>
<tr>
<th>Access block intervention</th>
<th>Attributable fatalities, mean (95% CI)*</th>
<th>Attributable bed-days, median (IQR)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interhospital transfer</td>
<td>12.6 (0–40.0)</td>
<td>838 (210–2096)</td>
</tr>
<tr>
<td>Access delay from ED &gt; 8 hours</td>
<td>34.3 (0–53.3)</td>
<td>775 (456–1549)</td>
</tr>
<tr>
<td>Premature ICU exit</td>
<td>4.0 (2.3–5.3)</td>
<td>0</td>
</tr>
<tr>
<td>After-hours ICU exit</td>
<td>40.5 (32.4–48.6)</td>
<td>1860 (0–3720)</td>
</tr>
<tr>
<td>Postponed major surgery</td>
<td>0</td>
<td>975 (0–2685)</td>
</tr>
<tr>
<td>Total/year</td>
<td><strong>91.1 (34.7–147.2)</strong></td>
<td><strong>4368 (333–10 050)</strong></td>
</tr>
<tr>
<td>Prevalence per day</td>
<td>0.25</td>
<td>12</td>
</tr>
</tbody>
</table>

IQR = interquartile range. ED = emergency department. ICU = intensive care unit.
* Figures calculated using data in Box 4 and formulae in Box 2.
Lives lost in intensive care shortfall
Julia Medew
April 6, 2009
ONE person dies every four days because of a lack of intensive care beds in Melbourne's public hospitals, a study has found.
A group of intensive care doctors analysed the records of more than 21,000 critically ill patients to assess their care when insufficient intensive care beds were available.

Victoria’s intensive care services
Future directions
February 2009
## 2011–12
### Statement of Priorities

Agreement between Minister for Health and Eastern Health

#### Service performance

<table>
<thead>
<tr>
<th>Key performance indicator</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WIES (1) activity performance</strong></td>
<td></td>
</tr>
<tr>
<td>Percentage of WIES (public &amp; private) performance to target</td>
<td>98 to 102</td>
</tr>
<tr>
<td><strong>Elective surgery (2)</strong></td>
<td></td>
</tr>
<tr>
<td>Number of patients admitted from the elective surgery waiting list – quarter 1</td>
<td>3,516</td>
</tr>
<tr>
<td>Number of patients admitted from the elective surgery waiting list – quarter 2</td>
<td>3,390</td>
</tr>
<tr>
<td>Number of patients admitted from the elective surgery waiting list – quarter 3</td>
<td>2,377</td>
</tr>
<tr>
<td>Number of patients admitted from the elective surgery waiting list – quarter 4</td>
<td>3,401</td>
</tr>
<tr>
<td><strong>Critical care</strong></td>
<td></td>
</tr>
<tr>
<td>ICU minimum operating capacity - Box Hill</td>
<td>9</td>
</tr>
<tr>
<td>ICU minimum operating capacity - Maroondah</td>
<td>5</td>
</tr>
</tbody>
</table>

*(1) WIES is a Weighted Inlier Equivalent Separation.*

*(2) Established benchmark targets for patient access to public health services. It is expected that health services show demonstrable improvement towards achievement of benchmark targets.*

*(3) SAB is Staphylococcus aureus bacteraemia.*

*(4) The target for the Victorian Patient Monitor is the Overall Care Index (OCI) which comprises six categories.*

*(5) The Consumer Participation Indicator is a category of the Victorian Patient Monitor.*

*(6) Applicable to child and adolescent, adult and aged services.*
Health services without an ICU should have local policies and processes in place to care for critically ill patients, including provisions for managing all patients while resources are diverted from normal operations to care for critically ill patients.

**CASE STUDY 3: Use of telemedicine to reduce transfers and improve care of patients in rural locations**

The Virtual Trauma and Critical Care Unit (ViTCCU) project supports clinicians in the Loddon Mallee region by linking them via video conferencing and broadband equipment, with trauma and critical care specialists at the Alfred, Austin, St Vincent's and Royal Children's hospitals. This allows for quicker decisions to be made on the appropriate treatment for the patient and determines if the patient can stay at their local hospital or needs to be transferred to a larger regional or metropolitan hospital.

**CASE STUDY 4: Statewide high occupancy as reported in Victorian Critical Care Access (VCCA) website**

- **Situation:**
  - VCCA website indicates tertiary unit occupancy at 100%, metropolitan units at 98%.
  - Electronic alerts sent to health executives advising high occupancy levels.
  - VCCA website requests units implement 'appropriate strategies'.

- **Risk:**
  - Lack of ICU beds puts critically unwell patients at risk
  - Defined Patient Transfer likely (ie. health service advised they will receive a patient regardless of capacity).
  - Overcrowding in ICUs, other critical care units and recovery areas increases the risk of an adverse incident and poor patient outcomes.

- **Possible health service response:**
  - Elective surgery cases requiring ICU bed postponed by health executives.
  - General wards expedite discharges to allow ICU discharges.
  - Increase ICU and/or ward staffing to open additional beds.

**Case 6: result**

[Image of the Victorian Critical Care Access website dashboard showing high ICU occupancy across various hospitals and regions.]
Case 6: result

ICU & MV beds going up

Mortality going down
1. Problem?

2. Goal?

3. Audience?

4. Data?

5. Methodology?
USE WATER WISELY
TURN OFF TAPS PROPERLY
REPORT ANY LEAKS