An Overview of Perioperative Mortality Reporting

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2. National Health & Medical Research Council Practitioner Fellow
Measuring and reporting mortality in hospital patients

David Ben-Tovim¹, Richard Woodman¹, James E Harrison², Sophie Pointer², Paul Hakendorf¹, Geoffrey Henley²

¹. Clinical Epidemiology Unit, Flinders Medical Centre and Flinders University
². AIHW National Injury Surveillance Unit, Flinders University

March 2009

Hospital Mortality Indicator (HMI) Review

DATE: 10 September 2013

PREPARED BY:
Melbourne EpiCentre in collaboration with Fiona Landgren and QUB
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STATISTICAL ISSUES IN ASSESSING HOSPITAL PERFORMANCE
Commissioned by the Committee of Presidents of Statistical Societies

The COPSS-CMS White Paper Committee:
Arlene S. Ash, PhD; Stephen E. Fienberg, PhD; Thomas A. Louis, PhD
Sharon-Lise T. Normand, PhD; Thérèse A. Stukel, PhD; Jessica Utts, PhD

Original report submitted to CMS on November 28, 2011
Revised on January 27, 2012
Mortality and volume of cases in paediatric cardiac surgery: retrospective study based on routinely collected data

Topic: 182;327;72;91;346;219

David J Spiegelhalter
Perioperative Mortality

*nominator & denominator?*

- Only GAs or any “anaesthesia” for all surgery?
- What is “surgery”?
- What about death before anaesthesia (or surgery)?

- **Time frame?**
  - for “safety and quality”, use 30 or 90 days
  - for appropriateness, consider 1 year outcomes
   - Australian national anaesthesia mortality data from 1985-2008 (8 consecutive triennial reports), covering ≈50 million anaesthetics
   - Comparing 1985-1987 to 2006-2008:
     - anaesthesia-related mortality in Australia fell from about 1:36,000 anaesthetics to 1:55,000
     - anaesthesia-related deaths fell from about 50% to about 15% of all reports

   - Anaesthesia is an uncommon (2·8%) cause of maternal death; higher if managed by non-physician anaesthetists

   - Include simple measures of risk adjustment: patient age, ASA status, patient condition, urgency, procedure being performed

   - POMR varies depending on the choice of denominator, and in-hospital deaths appear to underestimate 30-day mortality by up to one third
784 patients undergoing liver resection

1. 30-day mortality: 32 patients (4.0%) died
2. Inpatient mortality: 39 patients (5.0%) died
3. 90-day mortality: 55 patients (7.0%) died
Our Randomized Trials

**ATACAS** (cardiac surgery, n=4,631)
*New England Journal of Medicine 2016*
- In-hospital: 52 deaths (1.1%)
- At 30 days: 59 deaths (1.3%)

**ENIGMA-II** (non-cardiac surgery, n=7,112)
*The Lancet 2014*
- In-hospital: 96 deaths (1.37%)
- At 30 days: 99 deaths (1.4%)
- At 90 days: 169 deaths (2.6%)
Defining operative mortality: Impact on outcome reporting

Steven Maximus, MD, Jeffrey C. Milliken, MD, Beate Danielsen, PhD, Junaid Khan, MD, Richard Shemin, MD, and Joseph S. Carey, MD

ABSTRACT

Objective: Death is an important outcome of procedural interventions. The death rate, or mortality rate, is subject to variability by definition. The Society of Thoracic Surgeons Adult Cardiac Surgery Database definition of “operative” mortality originally included all in-hospital deaths and deaths occurring within 30 days of the procedure. In recent versions of the Society of Thoracic Surgeons Adult Cardiac Surgery Database, “in-hospital” has been modified to include “patients transferred to other acute care facilities,” and “deaths within 30 days unless clearly unrelated to the procedure” has been changed to “deaths within 30 days regardless of cause.” This study addresses the impact of these redefinitions on outcome reporting.
Can Patient Safety Incident Reports Be Used to Compare Hospital Safety? Results from a Quantitative Analysis of the English National Reporting and Learning System Data

Ann-Marie Howell, Elaine M. Burns, George Bouras, Liam J. Donaldson, Thanos Athanasiou, Ara Darzi

5,879,954 incident reports over 10 years (UK)

“hospitals where staff reported more incidents had reduced litigation claims ...

Staff survey results showed that open environments and reduced fear of punitive response increases incident reporting...

creating a responsive, confidential learning environment will increase staff engagement with error disclosure”
Alfred Hospital, Melbourne: what we do

- All in-hospital deaths are screened by the Clinical Governance Unit
- Special focus is placed on:
  - elective admissions
  - unplanned ICU admission or unexpected returns to ICU
  - deaths within a short period of transfer
- All deaths of patients admitted under surgical units (even if no surgery was performed) are reported to the Victorian Audit of Surgical Mortality (VASM)
- All known anaesthetic deaths (and major morbidity) are reported to the Victorian Consultative Council on Anaesthetic Mortality and Morbidity (VCAMM); also identified via State Coroner
- Monthly death data are presented to the hospital Clinical Outcomes Review Committee
  - total number of deaths, deaths referred to the coroner, number of autopsies performed, & number of cases reported to VASM
dr foster
Victorian Hospitals 2011-2016
### Relative Risk

**Outcome**
- Mortality (in-hospital)

**Basket**
- Diagnoses - All

**Chapter**
- All

**Group**
- All

**Rolling date range**
- From April 2011

**Fixed date range**
- To March 2016

**Primary Analysis By**
- Day of operation

**Admission type**
- All

**Sex**
- All

**Analyse by (standard)**
- Nested table

### Results 1 to 7 of 7

<table>
<thead>
<tr>
<th>Spells</th>
<th>Superspells</th>
<th>First / Last</th>
<th>Observed</th>
<th>Expected</th>
<th>Obs - Exp</th>
<th>Rate (%)</th>
<th>Exp (%)</th>
<th>Relative Risk</th>
<th>Benchmark</th>
<th>C-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>83,625</td>
<td>83,487</td>
<td>Apr-2011 / Mar-2016</td>
<td>1,223</td>
<td>1,568.80</td>
<td>-345.80</td>
<td>1.46 %</td>
<td>1.88 %</td>
<td>77.96 (73.65 - 82.45)</td>
<td>Annual: FY 13-14</td>
<td>0.84 (high)</td>
</tr>
</tbody>
</table>

**Drill down 1: Day of operation**

- Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday

<table>
<thead>
<tr>
<th>Day of operation</th>
<th>Spells</th>
<th>Superspells</th>
<th>(%) of all</th>
<th>Observed</th>
<th>Expected</th>
<th>Obs - Exp</th>
<th>Rate (%)</th>
<th>Exp (%)</th>
<th>Relative Risk</th>
<th>Benchmark</th>
<th>C-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL</td>
<td>83,625</td>
<td>83,487</td>
<td>100.00 %</td>
<td>1,223</td>
<td>1,568.80</td>
<td>-345.80</td>
<td>1.46 %</td>
<td>1.88 %</td>
<td>77.96 (73.65 - 82.45)</td>
<td>Annual: FY 13-14</td>
<td>0.84 (high)</td>
</tr>
<tr>
<td>Sunday</td>
<td>3,531</td>
<td>3,527</td>
<td>4.22 %</td>
<td>120</td>
<td>120.50</td>
<td>-0.49</td>
<td>3.40 %</td>
<td>3.42 %</td>
<td>99.59 (98.74 - 100.44)</td>
<td>82.57</td>
<td>119.09</td>
</tr>
<tr>
<td>Monday</td>
<td>13,512</td>
<td>13,592</td>
<td>16.16 %</td>
<td>178</td>
<td>243.47</td>
<td>-65.47</td>
<td>1.32 %</td>
<td>1.80 %</td>
<td>73.11 (70.63 - 75.59)</td>
<td>62.76</td>
<td>84.67</td>
</tr>
<tr>
<td>Tuesday</td>
<td>15,373</td>
<td>15,350</td>
<td>18.39 %</td>
<td>185</td>
<td>253.09</td>
<td>-68.09</td>
<td>1.21 %</td>
<td>1.65 %</td>
<td>73.10 (70.55 - 75.65)</td>
<td>62.94</td>
<td>84.42</td>
</tr>
<tr>
<td>Wednesday</td>
<td>15,688</td>
<td>15,666</td>
<td>18.76 %</td>
<td>190</td>
<td>266.68</td>
<td>-66.86</td>
<td>1.21 %</td>
<td>1.64 %</td>
<td>74.02 (71.56 - 76.48)</td>
<td>63.87</td>
<td>85.33</td>
</tr>
<tr>
<td>Thursday</td>
<td>15,393</td>
<td>15,367</td>
<td>18.41 %</td>
<td>221</td>
<td>285.49</td>
<td>-64.49</td>
<td>1.44 %</td>
<td>1.86 %</td>
<td>77.41 (74.85 - 80.02)</td>
<td>67.54</td>
<td>88.32</td>
</tr>
<tr>
<td>Friday</td>
<td>16,594</td>
<td>16,568</td>
<td>19.85 %</td>
<td>197</td>
<td>277.49</td>
<td>-80.49</td>
<td>1.19 %</td>
<td>1.67 %</td>
<td>76.99 (74.43 - 79.54)</td>
<td>61.42</td>
<td>81.63</td>
</tr>
<tr>
<td>Saturday</td>
<td>3,534</td>
<td>3,527</td>
<td>4.22 %</td>
<td>132</td>
<td>132.09</td>
<td>-0.09</td>
<td>3.74 %</td>
<td>3.74 %</td>
<td>99.93 (97.58 - 102.29)</td>
<td>83.61</td>
<td>118.51</td>
</tr>
</tbody>
</table>
ANALYSIS

Medical error—the third leading cause of death in the US

Medical error is not included on death certificates or in rankings of cause of death. Martin Makary and Michael Daniel assess its contribution to mortality and call for better reporting

Martin A Makary professor, Michael Daniel research fellow

Department of Surgery, Johns Hopkins University School of Medicine, Baltimore, MD 21287, USA
44,130 patients
201 unplanned ICU admission (0.45%)

1. Increased hospital length of stay
   - 16 days vs. 2 days, P<0.001
   - adjusted hazards ratio 1.5 (50% increase in LOS)

2. Intraoperative incidents
   - unadjusted OR 7.9 (6-11), P<0.001

3. Significantly increased 30-day mortality
   - unadjusted OR 10 (6-16), P<0.001
Measuring Mortality?

“Greater partnership in the design of trials among patients, their representatives, and researchers should help to identify outcomes that are important to patients, and reveal how information about these can be obtained without compromising the ability of trials to assess reliably those important outcomes, such as death, for which very large numbers of participants are required”

Chalmers I, Clarke M. Outcomes that matter to patients in tombstone trials. *Lancet* 2001
What about Disability-free Survival?
Measurement of Disability-free Survival after Surgery

Mark A. Shulman, M.B., B.S., M.P.H., F.A.N.Z.C.A.,
Sophie Wallace, M.P.H., Jennie Ponsford, B.A.(Hons), M.A.(Clin Neuropsych), Ph.D.
WHODAS 2.0 12-Item Questionnaire (Self-administered)

In the past 30 days, how much difficulty did you have in...

<table>
<thead>
<tr>
<th>Question</th>
<th>None</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Extreme/ Cannot Do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1. Standing for long periods such as 30 minutes?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Q2. Taking care of your household responsibilities?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Q3. Learning a new task, for example learning how to get to a new place?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Q4. How much of a problem did you have joining in community activities (for example, festivities, religious or other activities) in the same way as anyone else can?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Q5. How much have you been emotionally affected by your health problems?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Q6. Concentrating on doing something for ten minutes?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Q7. Walking a long distance such as a kilometer (or equivalent)?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Q8. Washing your whole body?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Q9. Getting dressed?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Q10. Dealing with people you do not know?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Q11. Maintaining a friendship?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Q12. Your day to day work?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

WHODAS Disability Score = Sum of the above

8
Measuring Disability-Free Survival

<table>
<thead>
<tr>
<th>ASA</th>
<th>n</th>
<th>Frequency</th>
<th>P for Trend</th>
<th>n</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>80</td>
<td>80 (100)</td>
<td></td>
<td>72</td>
<td>71 (99)</td>
</tr>
<tr>
<td>II</td>
<td>189</td>
<td>187 (99)</td>
<td>0.019</td>
<td>171</td>
<td>144 (84)</td>
</tr>
<tr>
<td>III</td>
<td>162</td>
<td>159 (98)</td>
<td></td>
<td>144</td>
<td>103 (72)</td>
</tr>
<tr>
<td>IV</td>
<td>24</td>
<td>22 (92)</td>
<td></td>
<td>24</td>
<td>14 (58)</td>
</tr>
</tbody>
</table>

Values are presented as number (%).
What about Days Alive and Out of Hospital?

Understanding changing patterns of survival and hospitalization for heart failure over two decades in New Zealand: utility of ‘days alive and out of hospital’ from epidemiological data

Cara A. Wasywich\textsuperscript{1*}, Greg D. Gamble\textsuperscript{2}, Gillian A. Whalley\textsuperscript{2}, and Robert N. Doughty\textsuperscript{1,2}

\textsuperscript{1}Green Lane Cardiovascular Service, Auckland City Hospital, Private Bag 92024, Auckland 1031, New Zealand; and \textsuperscript{2}Department of Medicine, The University of Auckland, Private Bag 92019, Auckland 1142, New Zealand

Received 9 December 2009; revised 9 January 2010; accepted 11 January 2010; online publish-ahead-of-print 1 March 2010

Aims
To describe changes in heart failure (HF) epidemiology in New Zealand between 1988 and 2008 using the number of days alive and out of hospital after a first hospitalization for HF, and to use these data to evaluate the overall impact of changing patterns of hospitalization and survival.

Methods and results
We performed a population analysis of all HF hospitalization and mortality data from 1 January 1988 to 31 December 2008 in New Zealand. The main outcome measures were ‘days alive and out of hospital’. Age standardized hospitalization rates, and mortality after an index hospitalization for HF. The number of days alive and out of hospital at 2 years increased by 2 months over the two decades of the study (from 448.8 to 511.3 days). Age standardized index HF hospitalization rates increased from 1988 to 1999, and declined thereafter, current rates are 106.9/100 000 for women and 174.3/100 000 for men. Patient age at index admission progressively increased, and hospital length of stay decreased. Mortality rates progressively decreased until 2000, but there has been no further decrease since then. Total hospital days have decreased up to 2008.

Conclusion
There have been major changes in the epidemiology of HF in New Zealand between 1988 and 2008, during which time there have been important changes in HF management. Despite increasing age, hospitalization rates are now declining and patients with HF are surviving longer out of hospital and with fewer hospital days. These results support the need for continued emphasis on delivery of effective community-based care for patients with this long-term condition.
Real world effectiveness of warfarin among ischemic stroke patients with atrial fibrillation: observational analysis from Patient-Centered Research into Outcomes Stroke Patients Prefer and Effectiveness Research (PROSPER) study

Ying Xian, Jingjing Wu, Emily C O'Brien, Gregg C Fonarow, DaiWai M Olson, Lee H Schwamm, Deepak L Bhatt, Eric E Smith, Robert E Suter, Deidre Hannah, Brianna Lindholm, Lesley Maisch, Melissa A Greiner, Barbara L Lytle, Michael J Pencina, Eric D Peterson, Adrian F Hernandez

ABSTRACT
OBJECTIVE
To examine the association between warfarin treatment and longitudinal outcomes after ischemic stroke in patients with atrial fibrillation in community practice.

DESIGN
Observational study.

SETTING
Hospitals (n=1487) participating in the Get With The Guidelines (GWGT)-Stroke program in the United States, from 2009 to 2011.

PARTICIPANTS
12,552 warfarin naïve atrial fibrillation patients admitted to hospital for ischemic stroke and treated with warfarin compared with no oral anticoagulant at discharge, linked to Medicare claims for longitudinal outcomes.

MAIN OUTCOME MEASURES
Major adverse cardiovascular events (MACE) and home time, a patient centered outcomes measure defined as the total number of days free from institutional care after discharge.

Institutes of Health Stroke Scale. Relative to those not treated, patients treated with warfarin had more days at home (as opposed to institutional care) during the two years after discharge (adjusted home time difference 47.6 days, 99% confidence interval 26.9 to 68.2). Patients discharged on warfarin treatment also had a reduced risk of MACE (adjusted hazard ratio 0.87, 99% confidence interval 0.78 to 0.98), all cause mortality (0.72, 0.63 to 0.84), and recurrent ischemic stroke (0.63, 0.48 to 0.83). These differences were consistent among clinically relevant subgroups by age, sex, stroke severity, and history of previous coronary artery disease and stroke.

CONCLUSIONS
Among ischemic stroke patients with atrial fibrillation, warfarin treatment was associated with improved long term clinical outcomes and more days at home.

CLINICAL TRIAL REGISTRATION
Clinical trials NCT02146274.

Introduction
Approximately 15 million people worldwide have a stroke each year.1 Atrial fibrillation is an important risk factor, accounting for approximately 15% of all strokes, and the highest incidence is in older patients.2
“days alive and out of hospital”
Conclusions

• PoM: value in measuring quality of care
  – 30 days vs. 90 days?

• What is the purpose
  – quality/safety, appropriateness, preventability?
  – PoM, DFS, DAOH ...

• **Engage** clinicians (and patients/community)
  – multidisciplinary leadership
  – agreed definitions
  – provide regular feedback
  – ask for solutions