Emergency Laparotomy

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Royal United Hospital, Bath.
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What am I going to discuss?

- The problem
- Focus on the elderly
- What can we do?
  - Postoperative
  - Intraoperative
  - Preoperative
- The role of measurement
- Quality Improvement and Research
- Challenges and the way forward
The “big five” for death
Mortality rates for selected HRG codes

<table>
<thead>
<tr>
<th>HRG</th>
<th>n</th>
<th>Urgency</th>
<th>Deaths (n)</th>
<th>Mortality (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency aorta</td>
<td>6598</td>
<td>Emergency</td>
<td>2721</td>
<td>41</td>
</tr>
<tr>
<td>Large intestine; major with complicating condition or over 69y</td>
<td>5765</td>
<td>Emergency</td>
<td>1290</td>
<td>22</td>
</tr>
<tr>
<td>General abdo; v. major over 69y</td>
<td>11648</td>
<td>Emergency</td>
<td>1843</td>
<td>15</td>
</tr>
<tr>
<td>Complex joint revision</td>
<td>1667</td>
<td>Elective</td>
<td>186</td>
<td>11</td>
</tr>
<tr>
<td>Fractured NOF; over 69</td>
<td>170804</td>
<td>Emergency</td>
<td>15780</td>
<td>9</td>
</tr>
</tbody>
</table>

Pearse et al. Critical Care 2006;10:R81
A Prospective Observational Study of Outcome of Emergency Laparotomy Submitted for publication 2010. Peden, Clarke, Murdoch, Cook, Thomas.

Proportion of patients having abdominal surgery; elective v. emergency Bath data

- Elective:
  - < 65: 49%
  - 65-69: 48%
  - 70-74: 43%
  - 75-79: 35%
  - > 80: 39%

- Emergency:
  - < 65: 51%
  - 65-69: 52%
  - 70-74: 57%
  - 75-79: 65%
  - > 80: 61%
> 85 fastest growing segment of the elderly population

- UK > 85 = 5.5%  (7.9% by 2031)
Outcome in critically ill octogenerians after surgery: an observational study. BJA 2007
Ford PNR, Thomas I, Cook TM, Whitley E, Peden CJ.

All patients after surgery (255, median age 83y)
Elective (102)
14.7% ICU mortality
20.6% hospital mortality
Emergency patients (153)
24.2% ICU mortality
41.8% hospital mortality
Type of Surgery

Emergency (60% of total cases)
- Laparotomy  53.7%
- AAA       21.2%
- Other vascular  3.2%
- Orthopaedic  9.8%
- Other        21.1%

*Ford PNR, Thomas I, Cook TM, Whitley E, Peden CJ.*
Significant covariates

- Urgency of surgery
  (OR 2.79, p=0.001)

- Use of vasoactive drugs day 1
  (OR 3.81, p <0.001)

- Use of vasoactive drugs day 2
  (OR 5.81, p <0.001)

- Use of ventilation day 2
  (OR 3.73, p<0.001)

*Ford PNR, Thomas I, Cook TM, Whitley E, Peden CJ.*
Bath data compared with National data (ICNARC) over 80’s ICU admissions

Hospital Mortality Rates for Patients Following Elective or Emergency Surgery
n=153

<table>
<thead>
<tr>
<th></th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elective Surgery</td>
<td>20.6, 23</td>
</tr>
<tr>
<td>Healthy</td>
<td>41.8</td>
</tr>
<tr>
<td>National</td>
<td>46.6</td>
</tr>
</tbody>
</table>

Elective Surgery p=0.65  Emergency Surgery p=0.28
Why do patients die?

- Operative urgency
- Preoperative status
- Operative severity
- Failings in care
- NCEPOD/NSQIP
- Post-operative complications!
Outcome following emergency versus elective major intestinal surgery > 80s

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Elective</th>
<th>Emergency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>1.7%</td>
<td>32.3%</td>
</tr>
<tr>
<td>Complication rate</td>
<td>39%</td>
<td>87.9%</td>
</tr>
<tr>
<td>LOS (d)</td>
<td>8.1</td>
<td>22.1</td>
</tr>
<tr>
<td>Discharge home</td>
<td>69.2%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Home with help</td>
<td>4.2%</td>
<td>12.9%</td>
</tr>
<tr>
<td>Nursing home</td>
<td>25%</td>
<td>48.4%</td>
</tr>
</tbody>
</table>

Surgical Outcomes for patients aged 80 and older: morbidity and mortality from major non-cardiac surgery. 

Hamel MB, Henderson WG, Khuri WG, Daley J. 
JAGS 2005:53:424-429

A prospective cohort study of 26,648 patients > 80y

- 20% of > 80s had a complication
- 30d mortality 26% for those who suffered a complication; 4% for those with no complications
- OR for mortality from 80y onwards 1.05 per year
- Emergency surgery OR 1.8
- For certain complications mortality very high
  - Cardiac arrest 88%, Acute renal failure 52%, MI 48%
Factors predicting morbidity and mortality in emergency colorectal procedures in elderly patients
McGillicuddy et al Arch Surg 2009; (Dec)144:1157-1162

Figure. Morbidity and mortality among 292 patients undergoing emergent colorectal procedures. CVA indicates cerebrovascular accident; DVT, deep venous thrombosis; MI, myocardial infarction; and PE, pulmonary embolism.
Factors predicting morbidity and mortality in multivariate analysis McGillicuddy et al

- Morbidity
  - Shock
  - Chronic renal insufficiency
  - Time in theatre
  - Contamination

- Mortality
  - Septic shock
  - Age
  - EBL >1000 ml
Determinants of outcome

- Emergency surgery
- High ASA score
- Co-morbid illness
- Post operative complication
- Age is a risk factor >70y/80.
- >80’s length of surgery


What can we do?

• Identify key areas for achievable change
• Critical care beds – Outreach!
• Understand what goes wrong (NCEPOD)
• Learn from best practice
• How do we raise profile of this problem?
• Implementation gap
Postoperative Care

What can we do better?

Prevent complications!

- “The occurrence of a 30 day postoperative complication is more important than preoperative patient risk and intraoperative factors in determining the survival after major surgery in the VA. Quality and process improvement in surgery should be directed toward the prevention of postoperative complications”.
- A Prospective Multicenter Study
Variation in Hospital Mortality Associated with Inpatient Surgery

Amir A. Ghaferi, M.D., John D. Birkmeyer, M.D., and Justin B. Dimick, M.D., M.P.H.
Hospital Mortality (quintiles)

- Very low
- Low
- Medium
- High
- Very high

<table>
<thead>
<tr>
<th></th>
<th>All Complications</th>
<th>Major Complications</th>
<th>Death after Major Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low</td>
<td>24.6</td>
<td>16.2</td>
<td>12.5</td>
</tr>
<tr>
<td>Low</td>
<td>27.6</td>
<td>18.4</td>
<td>14.7</td>
</tr>
<tr>
<td>Medium</td>
<td>26.9</td>
<td>14.9</td>
<td>17.5</td>
</tr>
<tr>
<td>High</td>
<td>26.9</td>
<td>18.0</td>
<td>19.3</td>
</tr>
<tr>
<td>Very high</td>
<td>23.5</td>
<td>18.2</td>
<td>21.4</td>
</tr>
</tbody>
</table>

Patients (%)
Clinical or physiological deterioration not acted upon

1. Failure to do basic observations
2. Lack of recognition of importance
3. Delay in response to deterioration

Evidence from Portsmouth group; NCEPOD An Acute Problem, MET studies
Scottish Audit of Surgical Mortality
Summary Report
2008 data
Western Australian Audit of Surgical Mortality

- Highest mortality emergency general surgical patients
- Median age 79 years
- Concerns over care in no. of deaths decreasing each year
- “Patients having an elective AA repair, which has an overall 2% postoperative mortality, are routinely admitted to ICU or HDU. Yet patients over 80 years having a colonic resection, which carries an overall 10% mortality, cannot routinely access an HDU bed.” 2009 report [http://www.surgeons.org/Content/NavigationMenu/Research/Audit/WAASM/WAASM_Annual_Report_2009_2.pdf](http://www.surgeons.org/Content/NavigationMenu/Research/Audit/WAASM/WAASM_Annual_Report_2009_2.pdf)
Identification and characterization of the high-risk surgical population in the United Kingdom.

*Pearse R. M. et al. Critical Care 2006*

**High risk group**
- 12.5% of procedures
- 84% of deaths

<15% to ICU
- ICU median stay 1.6d
- 41% of deaths after ICU discharge
- 1% discharged for palliative care

Patients admitted to ICU from ward 40% mortality
High risk surgical patients that die often not admitted to critical care

“Critical care gap”

*Preventing Surgical deaths: critical care and intensive care outreach in the postoperative period.*  

DOH Census data for England July 2007

<table>
<thead>
<tr>
<th>Critical Care</th>
<th>Total</th>
<th>Level 3 ICU</th>
<th>Level 2 HDU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>2566</td>
<td>1486</td>
<td>1080</td>
</tr>
<tr>
<td></td>
<td>(0.5/10,000)</td>
<td>(0.3/10,000)</td>
<td>(0.2/10,000)</td>
</tr>
</tbody>
</table>
Comparison of P-Possum risk adjusted mortality rates after surgery between patients in USA and UK.


➢ Similar major surgery in UK v US four times more likely to die in UK!
A Prospective Observational Study of Outcome of Emergency Laparotomy
Submitted for publication
Peden, Clarke, Murdoch, Thomas, Cook.

- 125 patients
- 137 days
- P-POSSUM scored
- Followed to hospital discharge, 30 days or death
- Outcome
- Intra-operative variables collected
### SMR data

#### Observed/expected mortality and location

<table>
<thead>
<tr>
<th></th>
<th>Patients (n)</th>
<th>Deaths</th>
<th>Observed mortality</th>
<th>Mean P-POSSUM PDR</th>
<th>SMR (O/E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ward</td>
<td>88</td>
<td>11</td>
<td>14.2%</td>
<td>19.6%</td>
<td>0.8</td>
</tr>
<tr>
<td>Critical Care</td>
<td>36</td>
<td>12</td>
<td>33.3%</td>
<td>34.2%</td>
<td>0.6</td>
</tr>
<tr>
<td>Ward (&gt; 20, &lt; 80)</td>
<td>14</td>
<td>5</td>
<td>35.7%</td>
<td>40.7%</td>
<td>0.9</td>
</tr>
<tr>
<td>Critical Care (&gt;20, &lt; 80)</td>
<td>17</td>
<td>3</td>
<td>30%</td>
<td>50.3%</td>
<td>0.4</td>
</tr>
</tbody>
</table>

*Submitted for publication. Peden, Clarke, Murdoch, Thomas, Cook.*
Some findings

- Lactate >2.0 mmol/l significant
- Should all laparotomy patients have ABG performed?
- Decision making process for referral to critical care not standardized
- Clear end of life care pathways needed and documentation to be improved
Could greater investment in post-operative care be cost effective?
INTRA-OPERATIVE CARE

What could we do better?
Over 80s outcome impact of surgical duration


- 7696 patients (single institution): >70 age significantly associated with morbidity and mortality

- A 30 minute increment of operative duration increased odds of mortality by 17% in patients older than 80 years
Avoid debt

How can we keep the patient out of trouble?


Best intra-operative management. Goal directed therapy?
The Issues

- Emergency intra-abdominal surgery patients have a high mortality
- Intra-operative management and postoperative care are important in preventing surgical deaths
- More critical care input required
- Study of the whole pathway and process is needed to identify areas for improvement
- Numbers are large so small changes in mortality could have a big impact

- Largest surgical group (1000 FCE’s /100,000 p.a.)
- “Significant under-investment for many years”
- Fundamentally different patients
- “Unanimity that standards of care often unsatisfactory”
Emergency laparotomy network

- Your help is needed!
- Forthcoming article in Anaesthesia news
- Dave Murray and Adam Pichel
- Baseline data/large database
- Set standards against which to measure and improve
Developing Quality Indicators for Elderly Surgical Patients.


- RAND corporation work
- To develop process driven indicators
- Evidence based
- E.g delirium assessment for 5 days post op.
What can be done to improve outcome in the emergency laparotomy patient?

- Less emergency surgery!
- Fast surgery by experienced surgeons
- Accurate risk assessment
- Increase critical care admission
- Examine all parts of the process for improvement
- The next NCEPOD report
Can we do better?
Bringing it all together....

- Raise awareness and generate discussion: Anaesthesia, Surgery and Critical Care
- Use cost-effectiveness argument
- Measurement: local and national
- Improvement – Randomized controlled trial and improvement science (SQUIRE guidelines http://www.squire-statement.org/)
- New ideas and ways of thinking about improving outcomes for the patient having emergency abdominal surgery!