What are my chances, Doc?

Dr Irwin Foo
Consultant Anaesthetist, Honorary Clinical Senior Lecturer
Western General Hospital
Edinburgh
Case History

- 80 yr old lady
- Admitted with intermittent abdominal pain and distension
- CT scan: abnormal segment of ileum
- DDx
  - ? Appendicitis
  - ? ischaemic bowel segment
- No improvement after 4 days of conservative management
- Asked to assess risk of laparotomy
Past Medical/Surgical History

- Ischaemic Heart Disease
  - 2 x Myocardial Infarctions
  - Angina 1-2 x per week and at rest
  - Episode of congestive cardiac failure (6/12 ago)
  - Atrial Fibrillation
- COPD
  - Exercise tolerance: SOB after 30 yards on the flat
- Chronic Kidney Disease Stage 4
  - eGFR 42 mls/min
- Sigmoid colectomy for perforated diverticular disease 2005
  - Complicated by fast AF and ischaemic changes intraoperatively
Risk Factors Determining Outcome in the Elderly

Irwin Foo - BGS Spring 2009
Presence of Co-existing Diseases

No preoperative problems (20%)

n = 288

% of patients

CVS

RS

CNS

NCEPOD 1999
(Patients > 90 yrs)

Cardiac: 57%
Respiratory: 28%
Neurological: 18%
Invasiveness of Surgery

Surgical Stress Response

tissue damage and pain

anxiety/starvation/hypothermia/hypoxia/haemorrhage/
acidosis/infection

Neurohormonal Effects

Inflammatory Responses

Catabolism
Autonomic activity
Immunosupression
Coagulopathy
Organ dysfunction

OXYGEN DEBT
### Extent of Surgical Stress
(patients > 90 yrs;  n = 301)

<table>
<thead>
<tr>
<th>Type of Surgery</th>
<th>Mortality after 30 days (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thoracotomy</td>
<td>38</td>
</tr>
<tr>
<td>Biliary, liver</td>
<td>27</td>
</tr>
<tr>
<td>Colorectal</td>
<td>24</td>
</tr>
<tr>
<td>Major Vascular</td>
<td>20</td>
</tr>
<tr>
<td>Hip</td>
<td>8</td>
</tr>
<tr>
<td>TURP, eye</td>
<td>0</td>
</tr>
</tbody>
</table>

Physiological Ageing

% organ function

Age (Years)

'young', 'average', 'old'

Irwin Foo - BGS Spring 2009
Assessment of Functional Reserve

% Maximal Organ Function

Maximal

Functional Reserve

Basal

Age (Years)
Perioperative Oxygen Debt and Outcome


Irwin Foo - BGS Spring 2009
Functional Reserve Assessment

Co-morbidities ⇔ Physiological Ageing

\[ \text{Functional Reserve} + \text{Extent of surgical stress} \]
(alter if necessary)

Postoperative Placement

Patient Outcome
Tools Commonly Used For Risk Assessment

- **Ward Assessment**
  - ASA classification
  - Lee Cardiac Risk Index
  - Metabolic equivalence
  - POSSUM (P-POSSUM)

- **Laboratory Assessment** (elective patients only)
  - CPEX (cardiopulmonary exercise testing)
  - Others (stress echocardiography, dipyridamole thallium scintigraphy etc)
ASA Physical Status Categories

- **Class 1**: a normally healthy patient
- **Class 2**: patient with mild systemic disease
- **Class 3**: patient with moderate to severe disease that is not incapacitating
- **Class 4**: patient with incapacitating disease that is a constant threat to life
- **Class 5**: moribund patient- not expected to survive 24 hrs with or without an operation
Mortality and ASA grading

% of deaths

ASA grading

NCEPOD 2002
Lee Cardiac Risk Index

- One point for each of the following:
  - High risk surgery
  - History of IHD
  - History of CCF
  - History of cerebrovascular disease
  - Insulin-dependent diabetes mellitus
  - Chronic renal failure (creatinine > 177mmol.l⁻¹)

- Risk of major cardiac complications:
  - 0 point = 0.4%
  - 1 point = 0.9%
  - 2 points = 7%
  - 3 or more points = 11%

Lee et al. Circulation 1999;100: 1043
Metabolic Equivalence

- Attempt to quantify metabolic ($O_2$ delivery) capacity of the patient
- Predicts the likelihood of postoperative complications/outcome

Score Activity

1. Eat and dress, walk indoors around the house
2. Walk a block on the level, do light work around the house
4. Climb a flight of stairs or walk uphill, heavy domestic work, run a short distance
6. Moderate recreational activities e.g. dancing, golf, doubles tennis
10. Strenuous sports e.g. swimming

Unable to achieve 4 METS = HIGH RISK

complications/outcome
Limitations with METS

• METS-dependent on patient history

• McGlade et al. Anaesth Intensive Care 2001; 29:520-6
  – compared reliability of patients as historians
  – used a questionnaire and a simple exercise test
  – 14% of patients who claimed they could climb a flight of stairs declined to do so

• watching them climb a flight of stairs more reliable
**POSSUM:** Physiological and Operative Severity Scoring for the enumeration of Mortality and Morbidity

- Surgical audit tool allowing comparison of different units performance

12 physiological and 6 operative parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Hb</td>
</tr>
<tr>
<td>Cardiac status</td>
<td>WCC</td>
</tr>
<tr>
<td>Respiratory status</td>
<td>Urea</td>
</tr>
<tr>
<td>ECG</td>
<td>Sodium</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>Potassium</td>
</tr>
<tr>
<td>Pulse Rate</td>
<td>GCS</td>
</tr>
<tr>
<td>Operation type</td>
<td>Number of procedures</td>
</tr>
<tr>
<td></td>
<td>Operative blood loss</td>
</tr>
<tr>
<td></td>
<td>Peritoneal contamination</td>
</tr>
<tr>
<td></td>
<td>Malignancy status</td>
</tr>
<tr>
<td></td>
<td>Elective vs emergency</td>
</tr>
</tbody>
</table>

Physiological score: 30
Operative severity score: 13
Morbidity 80% and Mortality 12%

www.riskprediction.org.uk
Cardiopulmonary Exercise Testing:

- Bicycle ergometer/metabolic cart
- Computerised analysis of gas exchange data/12 lead ECG data
- Anaerobic Threshold (AT)
- AT < 11 ml/kg/min equivalent to less than 4 METs
- = HIGH RISK
Patients Undergoing Major Surgery

Older P et al. Chest 1993 104:701-4
CPX: a test for perioperative management

Major surgery

(i) Age > 60 yrs. (n = 476)
(ii) Age < 60 yrs. known ischemic heart disease or cardiac failure (n = 72)

C.P.X.

AT < 11 ml/min/kg
or aortic or oesophageal surgery

AT > 11 ml/min/kg
with myocardial ischemia
or Ve/VO2 > 35 on CPX

AT > 11 ml/min/kg.
no myocardial ischemia and
Ve/VO2 < 35 on CPX

ICU
28% (n = 153)
CVS mortality 4.6% (n = 7)

HDU
21% (n = 115)
CVS mortality 1.7% (n = 2)

Ward
51% (n = 280)
CVS mortality 0%

Case History

- ASA 4
- Lee CRI = 11% risk
- Metabolic Equivalence
  - < 4 METS: high risk category
- P-POSSUM
  - Morbidity 80%
  - Mortality 12%
- What did I tell the patient/surgeon?
  - HIGH RISK
  - Risk of major event:
    - 10% risk if surgery minimal
    - 20% risk if surgery extensive
What Happened?

• Laparotomy requiring small bowel resection
• Operation time = 1 hour with minimal blood loss
• Admitted to ITU for 24 hours
• Complication: basal consolidation treated with intense physiotherapy/antibiotics
• Discharged from hospital after 22 days
Summary

• Risk prediction in the elderly surgical patient determined by:
  • Patient co-morbidities
  • Extent of surgery/surgical stress
  • Physiological ageing (functional reserve status)

• As yet, no reliable tool to give precise risk value
  • Bands of risk: low, intermediate and high (surgery specific)
  • Allows postoperative placement

• Cardiopulmonary exercise testing – promising tool
Thank You