Quality Improvement for Emergency Laparotomy.

Nial Quiney
Royal Surrey County Hospital
Guildford

Scaling Up Improvement
Sources of funding/CI.

• Health Foundation ‘Shine Award’. 2012
• Health Foundation ‘Scaling Up’ award 2015
• LiDCO: provided cards/training for CO monitors
• Travel expenses/Honorarium paid by LiDCO
Emergency Admissions: A journey in the right direction?
Confidential Enquiry into Perioperative Death. NCEPOD.

Who: Often unsupervised junior doctors.
When: Late at night after long delays (diagnostics and operating theatre delays)
How: Poor resuscitation and risk assessment
Where: Patients received poor post operative care not in ICU.
Improving outcomes after emergency laparotomy.

Identify the problem

**Quantify the size of the problem**

Work out the solution

Implement solution and measure its effects

The future
Research

**Identification and characterisation of the high-risk surgical population in the United Kingdom**

Rupert M Pearse1, David A Harrison2, Philip James3, David Watson1, Charles Hinds1, Andrew Rhodes4, R Michael Grounds4 and E David Bennett4

- There were 4,117,727 surgical procedures; 2,893,432 were elective (12,704 deaths; 0.44%) and 1,224,295 were emergencies (65,674 deaths; 5.4%).
- A high-risk population of 513,924 patients was identified (63,340 deaths; 12.3%), which accounted for 83.8% of deaths but for only 12.5% of procedures.
- High risk population often elderly, comorbidities and emergency surgery
- Despite high mortality rates, fewer than 15% of these patients are admitted to the ICU.
Emergency Laparotomy Network Audit.

Data collection 3 months in 2011
37 hospitals submitted data. 1853 patients
Average 30 day mortality rate 14.9%
Mortality range 3.7-41%
Wide variation in:
   Consultant Anaesthetic /Surgeon involvement
   ICU admission
   Goal directed resuscitation

Emergency laparotomy in octogenarians: A 5-year study of morbidity and mortality.

Gemma Green, Irshad Shaikh, Roland Fernandes, Henk Wegstapel

100 pts >80 yrs old
70% had post operative complications
Overall mortality 45%
Leading causes of death:
  Sepsis 42%
  Underlying malignancy 29%
  Myocardial and intestinal ischaemia
  Dementia

*World J Gastrointest Surg* 2013 July 27; 5(7): 216-221
Incidence of emergency laparotomy 1:1000 per annum
Mortality rate UK 15%
(Elective surgical outcomes 1-2%)
UK 9000 deaths per annum (2000 deaths per annum RTA)
Modest improvement in outcomes save many lives
Evidence of ‘substandard’ care
Identify the problem
Quantify the size of the problem
**Work out the solution**
Implement solution and measure its effects
The future
The Higher Risk General Surgical Patient
Towards Improved Care for a Forgotten Group

The Royal College of Surgeons of England and Department of Health

24 ‘experts’
84 pages
268 ‘standards’ of care (11.17/expert!)
Variable evidence base
Further references were available
?user friendly
Emergency Laparotomy Pathway Quality Improvement Care Bundle

Small group developed ‘care bundle’ ELPQuiC

Five elements

Evidence based

Measurable
Emergency Laparotomy Quality Improvement Care Bundle

• All emergency admissions to surgical assessment area have an EWS completed. Outreach to review all patients with EWS of 4 or more.
• Broad spectrum antibiotics to be given to all patients with suspicion of peritoneal soiling or with septic shock.
• Once decision is made to carry out laparotomy patient takes next available slot on emergency list (or within 6 hours of decision made).
• Start resuscitation using goal directed techniques as soon as possible or within 6 hours of admission.
• Admit all patients after emergency laparotomy to ICU.
Emergency Laparotomy Pathway Quality Improvement Care Bundle

Four general hospitals in England
Baseline data for 299 patients
Eight month prospective data collection (427 patients)
Use of ‘statistical process control’ to identify changes
Meet every 4-6 weeks for results/learning
Results
Cases per trust

<table>
<thead>
<tr>
<th>Site 1</th>
<th>Site 2</th>
<th>Site 3</th>
<th>Site 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>144</td>
<td>44</td>
<td>60</td>
</tr>
<tr>
<td>109</td>
<td>144</td>
<td>97</td>
<td>77</td>
</tr>
</tbody>
</table>

Baseline (299)  ELPQuiC (427)
Underlying Pathology
(proportion of all patients %)

- Perforation: Pre (309), Post (427)
- Malignancy: Pre (299), Post (427)
- Large Bowel Obstruction: Pre (299), Post (427)
- Ischaemic bowel: Pre (299), Post (427)
- Collection: Pre (299), Post (427)
- Diverticular disease: Pre (299), Post (427)
- Anastomotic breakdown: Pre (299), Post (427)
- Haemorrhage: Pre (299), Post (427)
- Inflammatory bowel disease: Pre (299), Post (427)
- Unknown/not recorded: Pre (299), Post (427)
Crude 30-day mortality

- Site 1: Pre-ELPQuiC 20.4%, Post-ELPQuiC 13.5%
- Site 2: Pre-ELPQuiC 14.0%, Post-ELPQuiC 13.2%
- Site 3: Pre-ELPQuiC 13.6%, Post-ELPQuiC 8.2%
- Site 4: Pre-ELPQuiC 13.3%, Post-ELPQuiC 7.8%
- All: Pre-ELPQuiC 14.0%, Post-ELPQuiC 10.5%

25% reduction
ASA 3+ mortality

27.8% 22.7% 16.1% 23% 22.6%

17% 19.7% 16.1% 14% 15.8%

Site 1 Site 2 Site 3 Site 4 ALL

Baseline ELPQuiC

p = 0.08
30% reduction

0.0% 5.0% 10.0% 15.0% 20.0% 25.0% 30.0%

The Health Foundation
Shine

Inspiring Improvement
Summary

30 day outcomes
- Pooled data risk adjusted mortality 15.6 to 9.6% (38% reduction)
- 6.0 additional lives saved per 100 patients treated
- NNT 16.4

In hospital outcomes
- Pooled data risk adjusted mortality 17.4 to 10.1% (42%)
- 8.1 additional lives saved per 100 patients treated
- NNT 12.4
Results

Process compliance
EWS taken on presentation

- **Site 1**: 40.5% (Baseline), 65.1% (ELPQuiC)
- **Site 2**: 77.8% (Baseline), 99.0% (ELPQuiC)
- **Site 3**: 81.4% (Baseline), 100.0% (ELPQuiC)
- **Site 4**: 100.0% (Baseline), 98.7% (ELPQuiC)

No baseline data available.
Pre-op antibiotics

Site 1: Baseline 49.0% ELPQuiC 53.2%
Site 2: Baseline 47.9% ELPQuiC 69.4%
Site 3: Baseline 75.0% ELPQuiC 64.9%
Site 4: Baseline 48.6% ELPQuiC 85.7%
Decision to theatre less than 6 hours

Proportion of All Patients

Site 1: 77%
Site 2: 62%
Site 3: 66%
Site 4: 74%

Baseline
ELPQuiC
Intra-op GDFT (%)

- **Site 1**: 48% Pre-ELPQuiC, 92% Post-ELPQuiC
- **Site 2**: 16% Pre-ELPQuiC, 58% Post-ELPQuiC
- **Site 3**: 29% Pre-ELPQuiC, 82% Post-ELPQuiC
- **Site 4**: 5% Pre-ELPQuiC, 49% Post-ELPQuiC
Post-op ITU (%).

Site 1: 75% (Pre-ELPQuiC) vs. 88% (Post-ELPQuiC)
Site 2: 29% (Pre-ELPQuiC) vs. 51% (Post-ELPQuiC)
Site 3: 44% (Pre-ELPQuiC) vs. 75% (Post-ELPQuiC)
Site 4: 28% (Pre-ELPQuiC) vs. 62% (Post-ELPQuiC)
Consultant Anaesthetist in Theatre

Site 1: 48% Pre-ELPQuiC, 79% Post-ELPQuiC
Site 2: 56% Pre-ELPQuiC, 65% Post-ELPQuiC
Site 3: 56% Pre-ELPQuiC, 98% Post-ELPQuiC
Site 4: 49% Pre-ELPQuiC, 56% Post-ELPQuiC
Post CCT Surgeon in theatre (%)
Use of a pathway quality improvement care bundle to reduce mortality after emergency laparotomy

S. Huddart, C. J. Peden, M. Swart, B. McCormick, M. Dickinson, M. A. Mohammed and N. Quiney on behalf of the ELPQuiC Collaborator Group

Open Access. BJS Jan 2015.
# Multicentre trial of a perioperative protocol to reduce mortality in patients with peptic ulcer perforation

M. H. Møller, S. Adamsen, R. W. Thomsen and A. M. Møller

## Table 2  Compliance with the trial protocol

<table>
<thead>
<tr>
<th>Compliance Item</th>
<th>No. of patients (n = 117)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Before surgery</strong></td>
<td></td>
</tr>
<tr>
<td>Evaluation by a consultant anaesthetist and a consultant surgeon with discussion of therapeutic options</td>
<td>104 (88·9)</td>
</tr>
<tr>
<td>Surgery within 6 h of admission</td>
<td>74 (63·2)</td>
</tr>
<tr>
<td>APACHE II scoring(^5^)</td>
<td>97 (82·9)</td>
</tr>
<tr>
<td>Sepsis screening(^6^)</td>
<td>105 (89·7)</td>
</tr>
<tr>
<td>Standard blood samples and electrocardiogram</td>
<td>110 (94·0)</td>
</tr>
<tr>
<td>Packed red blood cells if patient anaemic</td>
<td>23 (19·7)</td>
</tr>
<tr>
<td>Broad-spectrum empirical antibiotics</td>
<td>113 (96·6)</td>
</tr>
<tr>
<td>Measurement of bodyweight</td>
<td>108 (92·3)</td>
</tr>
<tr>
<td>Respiratory and circulatory stabilization in the high-dependency unit (89·7)</td>
<td>105</td>
</tr>
<tr>
<td>(89·7) Oxygen treatment leading to arterial oxygen saturation ≥ 94%</td>
<td></td>
</tr>
</tbody>
</table>
| Insertion of central venous catheter, arterial line, NGT and indwelling bladder catheter Early goal-directed fluid therapy\(^2^\)
|                                                                                  |                           |
| **During surgery**                                                              |                           |
| Fluid balance chart                                                             | 106 (90·6)                |
| Early goal-directed fluid therapy\(^2^\)                                        | 99 (84·6)                 |
| Maintenance of normothermia using convective air warming system                 | 112 (95·7)                |
| Insertion of double-barrelled NGT                                               | 89 (76·1)                 |
| **After surgery**                                                               |                           |
| Evaluation by a consultant anaesthetist and a consultant surgeon; postop. treatment planned | 94 (80·3)                |
| Early goal-directed fluid therapy\(^2^\) in recovery room                       | 106 (90·6)                |
| Oxygen treatment leading to arterial oxygen saturation ≥ 94% on postop. days 1–2 | 111 (94·9)                |
| Sepsis screening\(^6^\) daily on postop. days 1–3                               | 83 (70·9)                 |
| Standard systemic analgesia with opioids + paracetamol (acetaminophen), + continuous epidural analgesia, if indicated | 117                        |
| (100) Chest physiotherapy on postop. days 1–3                                   | 99 (84·6)                 |
| (84·6)                                                                         |                           |
| Standard blood samples and electrocardiogram on postop. days 1–3                | 105 (89·7)                |
| Proton pump inhibitor treatment                                                | 115 (98·3)                |
| Evaluation by anaesthesiologist if postop. condition deteriorates in recovery room | 117 (100)                |
| Postop. plan of nutrition within 12 h of admission                              | 103 (88·0)                |
| ≥ 12 h in recovery room                                                         | 110 (94·0)                |
| Removal of central venous catheter, arterial line and indwelling bladder catheter when no longer indicated | 117                        |
| (100) Written plan of treatment and monitoring in first 24 h in regular surgical ward after discharge from recovery room | 97 (82·9)                |
| Monitoring of blood pressure, heart rate, respiratory rate, oxygen saturation and level of consciousness 3 times daily on postop. (53·8) days 1–3 | 63                        |
| Fluid balance chart on postop. days 1–3                                         | 101 (86·3)                |
| Bodyweight measurement daily on postop. days 1–3                                | 62 (53·0)                 |
| Early mobilization                                                             | 115 (98·3)                |
| Use of medical emergency team-calling criteria in regular surgical department\(^5^\) | 12 (10·4)                 |
Conclusion: The 30-day mortality rate in patients with PPU was reduced by more than one-third after the implementation of a multimodal and multidisciplinary perioperative care protocol, compared with conventional treatment.
Why did it work?
Emergency Laparotomy Quality Improvement Care Bundle

- All emergency admissions to surgical assessment area have a MEWS completed. Outreach to review all patients with MEWs of 4 or more.
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- Start resuscitation using goal directed techniques as soon as possible or within 6 hours of admission.
- Admit all patients after emergency laparotomy to ICU.
When is death inevitable after emergency laparotomy? Analysis of the American College of Surgeons National QIP database.

Best discriminators to predict post operative mortality:

- Age >70 yrs
- Functional status
- Presence of sepsis/septic shock

Emergency laparotomy in octogenarians: A 5-year study of morbidity and mortality.
Gemma Green, Irshad Shaikh, Roland Fernandes, Henk Wegstapel

100 pts >80 yrs old
70% had post operative complications
Overall mortality 45%
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  Sepsis 42%
  Underlying malignancy 29%
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  Dementia

*World J Gastrointest Surg* 2013 July 27; 5(7): 216-221

Scaling Up Improvement
Resuscitation bundle (6 hours)

- Measure lactate
- Resuscitate (fluids and inotropes)
- Blood cultures
- Antibiotics
- Control source of infection (2004)
Mortality Risk with Increasing Delays in Implementation of Source Control in Septic Shock

## Source Control/Antimicrobial Interaction and Survival in Septic Shock

<table>
<thead>
<tr>
<th>Source Control Initiation Post-Shock</th>
<th>Antimicrobial Initiation Post-Shock</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 3 h</td>
</tr>
<tr>
<td>&lt; 6 h</td>
<td>92%</td>
</tr>
<tr>
<td>(n=75)</td>
<td></td>
</tr>
<tr>
<td>6-24 h</td>
<td>80.0%</td>
</tr>
<tr>
<td>(n=60)</td>
<td></td>
</tr>
<tr>
<td>&gt; 24 h</td>
<td>69.0%</td>
</tr>
<tr>
<td>(n=29)</td>
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Emergency Laparotomy Quality Improvement Care Bundle

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• Admit all patients after emergency laparotomy to ICU.
Effect of a Perioperative, Cardiac Output-Guided Hemodynamic Therapy Algorithm on Outcomes Following Major Gastrointestinal Surgery
A Randomized Clinical Trial and Systematic Review

Rupert M. Pearse, MD, David A. Harrison, PhD; Neil MacDonald, FRCA; Michael A. Gillies, FRCA; Mark Blunt, FRCA; Gareth Ackland, PhD; Michael P.W. Grocott, MD; Aoife Ahern, BSc; Kathryn Griggs, MSc; Rachael Scott, PhD; Charles Hinds, FRCA; Kathryn Rowan, PhD; for the OPTIMISE Study Group

CONCLUSIONS AND RELEVANCE In a randomized trial of high-risk patients undergoing major gastrointestinal surgery, use of a cardiac output-guided hemodynamic therapy algorithm compared with usual care did not reduce a composite outcome of complications and 30-day mortality. However, inclusion of these data in an updated meta-analysis indicates that the intervention was associated with a reduction in complication rates.
Cumulative Incidence of Mortality Up to 180 Days After Surgery Using a Cardiac Output–Guided Hemodynamic Therapy Algorithm Intervention vs Usual Care

Figure Legend:
**Figure Legend:**

Meta-analysis of Number of Patients Developing Complications After Surgery

Size of data markers corresponds to weighting for each component trial.

*New trials identified in updated literature search.*
Determinants of Long-Term Survival After Major Surgery and the Adverse Effect of Postoperative Complications

Shukri F. Khuri, MD,*†‡ William G. Henderson, PhD,§ Ralph G. DePalma, MD,Cecilia Mosca, MSPH,§ Nancy A. Healey, BS,* Dharam J. Kumbhani, MD, SM,* and the Participants in the VA National Surgical Quality Improvement Program

• National Surgical Quality Improvement Program
• >105,000 patients
• 9 years
• 8 surgical procedures

Determinants of Long-Term Survival After Major Surgery and the Adverse Effect of Postoperative Complications

‘Independent of preoperative patient risk, the occurrence of a 30-day complication in the total patient group reduced median patient survival by 69%’.

‘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’.

Individualised oxygen delivery targeted haemodynamic therapy in high-risk surgical patients: a multicentre, randomised, double-blind, controlled, mechanistic trial

Gareth L. Ackland, Sadaf Iqbal, Laura Gallego Paredes, Andrew Toner, Craig Lyness, Nicholas Jenkins, Phoebe Bodger, Shamir Kormali, John Whittle, Anna Reyes, Mervyn Singer, Mark Hamilton, Maurizio Cecconi, Rupert M Pears, Susan V Mallett, Rumana Z Omar, for the POM-O (PostOperative Morbidity-Oxygen delivery) study group*

• 204 prospective patients
• Major elective surgery
• Individualised DO2 targets (preoperative DO2)
• Fluids/dobutamine/blood
• Morbidity day 2: 46% vs 53% (NS)
• 68% of pts in GDT achieved IDO2 vs 38% pts in control group
• Pts who achieved IDO2 target (66%) had lower morbidity (ARR 19%, p=0.016)
Thank you.

Dr Sam Huddart
Prof Carol Peden
Dr Bruce McCormick
Dr Mike Swart
Dr Matt Dickinson
Prof Mohammed A Mohammed

Collaborators

Mr Ajay Belguamkar, Dr Tim Cook, Alison Cornwell, Dr Louise Cossey, Louise Corrigan, Mr Stephen Dalton, Mr Ian Daniels, Dr Freddy Frost, Dr Jennifer Goddard, Miss Shelly Griffiths, Victoria Hemmings, Dr Tim Howes, Mr Richard Kryztopik, Ms Sarah Richards, Dr Ailie Pigott, Dr James Pittman, Ms Angela Riga, Mr Neil Smart, Mr Daniel White, Dr Mehrun Zuleika