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
National Confidential Enquiry into Perioperative Death. NCEPOD.

First report 1987
‘Who operates when?’ 1996
‘Changing the way we operate.’ 2001
‘Who operates when.’ 2003
‘Emergency admissions. A journey in the right direction?’ 2007
‘Elective and emergency surgery in the elderly’ 2010
‘Perioperative care. Knowing the risk’ 2011
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
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

When is death inevitable after emergency laparotomy? 
Analysis of the American College of Surgeons National QIP database.

Retrospective data 2005-9
37,553 patients/similar criteria as UK ELN
Overall crude mortality rate at 30 days was 14.1%
Identified highest risk patients over 90 years with significant pre-morbid state and shock. 90% mortality rate

High mortality following emergency gastrointestinal surgery: a cohort study.

Use of Danish national database
4920 patients over 1 year
All cause 30 day mortality 19% (CI 16.9-19.1)
Almost 50% had severe coexisting disease
Only 16% went to ICU

Vester-Andersen et al. eBJA 2014
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

Scaling Up Improvement
The scale of the problem.

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
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

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

Royal Surrey County Hospital
NHS Foundation Trust

Site 1 Site 2 Site 3 Site 4

Cases per trust:

- **Baseline (299)**
- **ELPQuiC (427)**

<table>
<thead>
<tr>
<th>Site</th>
<th>Baseline</th>
<th>ELPQuiC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1</td>
<td>51</td>
<td>109</td>
</tr>
<tr>
<td>Site 2</td>
<td>44</td>
<td>144</td>
</tr>
<tr>
<td>Site 3</td>
<td>60</td>
<td>97</td>
</tr>
<tr>
<td>Site 4</td>
<td></td>
<td>77</td>
</tr>
</tbody>
</table>
Underlying Pathology
(proportion of all patients %)

- Perforation
- Small Bowel Obstruction
- Malignancy
- Large Bowel Obstruction
- Ischaemic bowel
- Collection
- Diverticular disease
- Anastomotic breakdown
- Haemorrhage
- Inflammatory bowel disease
- Unknown/not recorded

Pre (299) vs Post (427)
Crude 30-day mortality

<table>
<thead>
<tr>
<th>Site</th>
<th>Pre-ELPQuiC</th>
<th>Post-ELPQuiC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1</td>
<td>20.4%</td>
<td>13.5%</td>
</tr>
<tr>
<td>Site 2</td>
<td>14.0%</td>
<td>13.2%</td>
</tr>
<tr>
<td>Site 3</td>
<td>13.6%</td>
<td>8.2%</td>
</tr>
<tr>
<td>Site 4</td>
<td>13.3%</td>
<td>7.8%</td>
</tr>
<tr>
<td>All</td>
<td>14.0%</td>
<td>10.5%</td>
</tr>
</tbody>
</table>

25% reduction
ASA 3+ mortality

- Site 1: Baseline 27.8%, ELPQuiC 17%
- Site 2: Baseline 22.7%, ELPQuiC 19.7%
- Site 3: Baseline 16.1%, ELPQuiC 10.5%
- Site 4: Baseline 23%, ELPQuiC 14.0%
- ALL: Baseline 22.6%, ELPQuiC 15.8%

*p = 0.08
30% reduction
### P-POSSUM Adjusted 30 day mortality

#### Lives saved per 100 patients

<table>
<thead>
<tr>
<th>Site</th>
<th>Before ELPQuiC</th>
<th>After ELPQuiC</th>
<th>Difference</th>
<th>P*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.48 (4.64, 8.32)</td>
<td>11.96 (11.37, 12.55)</td>
<td>5.48 (3.55, 7.42)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>2</td>
<td>6.76 (6.37, 7.14)</td>
<td>15.68 (15.29, 16.06)</td>
<td>8.92 (8.37, 9.47)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>3</td>
<td>7.95 (5.66, 10.25)</td>
<td>9.96 (9.26, 10.67)</td>
<td>2.01 (0.40, 4.42)</td>
<td>0.101</td>
</tr>
<tr>
<td>4</td>
<td>4.34 (2.90, 5.78)</td>
<td>8.77 (7.78, 9.76)</td>
<td>4.43 (2.68, 6.19)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>All</td>
<td>6.47 (5.79, 7.15)</td>
<td>12.44 (12.14, 12.75)</td>
<td>5.97 (5.23, 6.72)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Site</th>
<th>No baseline data available</th>
<th>ELPQuiC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1</td>
<td>40.5%</td>
<td>65.1%</td>
</tr>
<tr>
<td>Site 2</td>
<td>77.8%</td>
<td>99.0%</td>
</tr>
<tr>
<td>Site 3</td>
<td>81.4%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Site 4</td>
<td>100.0%</td>
<td>98.7%</td>
</tr>
</tbody>
</table>

- Blue bars represent Baseline data.
- Red bars represent ELPQuiC data.

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

<table>
<thead>
<tr>
<th>Site</th>
<th>Baseline</th>
<th>ELPQuiC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1</td>
<td>47%</td>
<td>77%</td>
</tr>
<tr>
<td>Site 2</td>
<td>46%</td>
<td>62%</td>
</tr>
<tr>
<td>Site 3</td>
<td>50%</td>
<td>66%</td>
</tr>
<tr>
<td>Site 4</td>
<td>43%</td>
<td>74%</td>
</tr>
</tbody>
</table>

Baseline

ELPQuiC
Surgery within 6 hours of decision to operate (Time to OT)
Intra-op GDFT (%)

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

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

- Site 1: Pre-ELPQuiC 48%, Post-ELPQuiC 79%
- Site 2: Pre-ELPQuiC 56%, Post-ELPQuiC 65%
- Site 3: Pre-ELPQuiC 87%, Post-ELPQuiC 98%
- Site 4: Pre-ELPQuiC 49%, Post-ELPQuiC 56%

The Health Foundation
Shine
Consultant delivered Anaesthesia

Consultant Anaesthetist

Consultant Anaesthetist MeAN
Post CCT Surgeon in theatre (%)

<table>
<thead>
<tr>
<th>Site</th>
<th>Pre-ELPQuiC</th>
<th>Post-ELPQuiC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1</td>
<td>44%</td>
<td>94%</td>
</tr>
<tr>
<td>Site 2</td>
<td>43%</td>
<td>54%</td>
</tr>
<tr>
<td>Site 3</td>
<td>82%</td>
<td>93%</td>
</tr>
<tr>
<td>Site 4</td>
<td>76%</td>
<td>99%</td>
</tr>
</tbody>
</table>
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
What other evidence is out there?
Multicentre trial of a perioperative protocol to reduce mortality in patients with peptic ulcer perforation

<table>
<thead>
<tr>
<th></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</td>
<td>97 (83·9)</td>
</tr>
<tr>
<td>Septis screening</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</td>
<td>105</td>
</tr>
<tr>
<td>Oxygen treatment leading to arterial oxygen saturation ≥ 94%</td>
<td>33 (28·4)</td>
</tr>
<tr>
<td>Insertion of central venous catheter, arterial line, NGT and indwelling bladder catheter</td>
<td>91 (78·0)</td>
</tr>
<tr>
<td>Early goal-directed fluid therapy</td>
<td>99 (84·6)</td>
</tr>
<tr>
<td><strong>During surgery</strong></td>
<td></td>
</tr>
<tr>
<td>Fluid balance chart</td>
<td>106 (90·6)</td>
</tr>
<tr>
<td>Early goal-directed fluid therapy</td>
<td>99 (84·6)</td>
</tr>
<tr>
<td>Maintenance of normothermia using convective air warming system</td>
<td>112 (95·7)</td>
</tr>
<tr>
<td>Insertion of double-barrelled NGT</td>
<td>89 (76·1)</td>
</tr>
<tr>
<td><strong>After surgery</strong></td>
<td></td>
</tr>
<tr>
<td>Evaluation by a consultant anaesthetist and a consultant surgeon; postop. treatment planned</td>
<td>94 (80·3)</td>
</tr>
<tr>
<td>Early goal-directed fluid therapy in recovery room</td>
<td>106 (90·6)</td>
</tr>
<tr>
<td>Oxygen treatment leading to arterial oxygen saturation ≥ 94% on postop. days 1–2</td>
<td>111 (94·9)</td>
</tr>
<tr>
<td>Septis screening daily on postop. days 1–3</td>
<td>83 (70·9)</td>
</tr>
<tr>
<td>Standard systemic analgesia with opioids + paracetamol (acetaminophen), + continuous epidural analgesia, if indicated</td>
<td>117</td>
</tr>
<tr>
<td>Chest physiotherapy on postop. days 1–3</td>
<td>99 (84·6)</td>
</tr>
<tr>
<td>Standard blood samples and electrocardiogram on postop. days 1–3</td>
<td>105 (89·7)</td>
</tr>
<tr>
<td>Proton pump inhibitor treatment</td>
<td>115 (98·3)</td>
</tr>
<tr>
<td>Evaluation by anaesthesiologist if postop. condition deteriorates in recovery room</td>
<td>117 (100)</td>
</tr>
<tr>
<td>Postop. plan of nutrition within 12 h of admission</td>
<td>103 (88·0)</td>
</tr>
<tr>
<td>≥ 12 h in recovery room</td>
<td>110 (94·0)</td>
</tr>
<tr>
<td>Removal of central venous catheter, arterial line and indwelling bladder catheter when no longer indicated</td>
<td>117</td>
</tr>
<tr>
<td>Written plan of treatment and monitoring in first 24 h in regular surgical ward after discharge from recovery room</td>
<td>97</td>
</tr>
<tr>
<td>Monitoring of blood pressure, heart rate, respiratory rate, oxygen saturation and level of consciousness 3 times daily on postop. days 1–3</td>
<td>63</td>
</tr>
<tr>
<td>Fluid balance chart on postop. days 1–3</td>
<td>101 (86·3)</td>
</tr>
<tr>
<td>Bodyweight measurement daily on postop. days 1–3</td>
<td>62 (53·0)</td>
</tr>
<tr>
<td>Early mobilisation</td>
<td>115 (98·3)</td>
</tr>
<tr>
<td>Use of medical emergency team-calling criteria in regular surgical department</td>
<td>12 (10·4)</td>
</tr>
</tbody>
</table>
Multicentre trial of a perioperative protocol to reduce mortality in patients with peptic ulcer perforation

• 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.
Reduced mortality following the introduction of a multimodal multidisciplinary perioperative protocol in high risk emergency gastrointestinal surgery patients. A single center intervention study of a consecutive cohort

Tengberg LT, Bay-Nielsen M, Bisgaard T, Cihoric M, Lauritsen ML, Foss NB

600 pts vs control

**Bundle:**  Early resuscitation  
Antibiotics  
GDT  
Risk stratification and ICU  
Consultant input  
Feeding, analgesia, ambulation

**Results:**

- 30 day mortality: 21.8 vs 15.5% (29%)
- 180 day mortality: 29.5 vs 22.2 (24%)
- Total LOS: 10872 vs 9902d (8%)
- ICU stay: 1622 vs 1242d (23%)
Common goals of all published data to date

- Identify sick patients (lactate/PPOSSUM/EWS)
- Aggressive antibiotics
- Early surgery
- Senior involvement
- GDT
- ICU usage
Scaling Up Collaborative.

Saving 1000 lives together.

www.emergencylaparotomy.org.uk

@ELCSavingLives
To visit the website of a AHSN region choose from the list below or choose a region on the map.

- North East and North Cumbria
- North West Coast
- Greater Manchester
- Yorkshire & Humber
- East Midlands
- West Midlands
- Eastern
- West of England
- Imperial
- UCL Partners
- South London
- Oxford
- Kent, Surrey and Sussex
- Wessex
- South West Peninsula

Map produced by East Midlands AHSN and automated by Yorkshire and Humber AHSN
Scaling up ELPQuiC

Three AHSN’s (30 hospitals)
2 year program
Similar care bundle approach
Launched Sept 2015
Understand NELA data
QI education
Scaling up ELPQuiC

Plenary meetings:
  Care bundles, sepsis, care of elderly

Local AHSN QI meetings:
  Driver diagrams, variation, driver diagrams, CUSSUM.

Webex/webinar meetings:
  ‘Show and tell’

QI macro run chart maker
Posters and pamphlets, educational videos and publications
Video presentations from our meetings
Quality improvement and performance

‘Every system is perfectly designed to get the results it gets. The only way to get real change is to change the system. To do this you need ‘will, ideas and execution’.

- You must have the **Will** to make the system better- this may be because you have identified poor performance or outcome through audit or patient experience
- You must have **Ideas** about how you could change things for the better
- You must have skills to make it happen: **Execution**.

Paul Batalden IHI 1984
Thank you.

Dr Sam Huddart
Prof Carol Peden
Dr Bruce McCormick
Dr Mike Swart
Dr Geeta Aggarwal
And many others

nialquiney@nhs.net