Current management of an acute abdomen, risk scores, contraindications to intervention, benefits of intervention and postoperative care

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Learning Outcomes for Today

- Appreciate the impact of a laparotomy on a patient
- Changes in surgical management of the acute abdomen
- Understand the role of scoring systems to predict surgical outcome

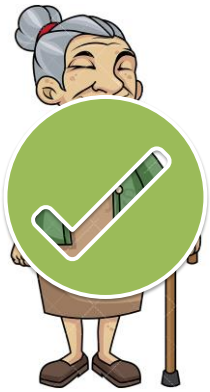
Overview

- The Stress of Surgery
- Current Situation in UK
- Experience in Oxford
- What are scoring systems and how do we use them
- Impact of Frailty
- Surgery and surgical conditions in patients with end-of-life conditions

The changing face of surgery

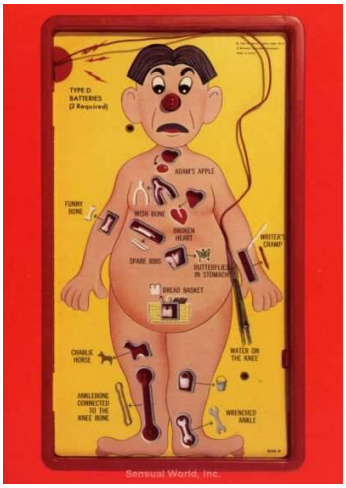
The changing face of surgery

- Improved anaesthetic techniques
- Improved medical care
- Ageing population
- Improved surgical techniques
- Patient Expectation



The Stress of Surgery

Stress response to surgery



Post-operative sequelae

Stress Response to Surgery / Sepsis / Trauma

- Stress response is an evolutionary protective mechanism in the response to trauma and to mobilize stored body fuels
- Local mediators trigger endocrine and acute phase responses and activate the sympathetic nervous system
- Cytokine production reflects degree of tissue trauma

Acute Phase Response

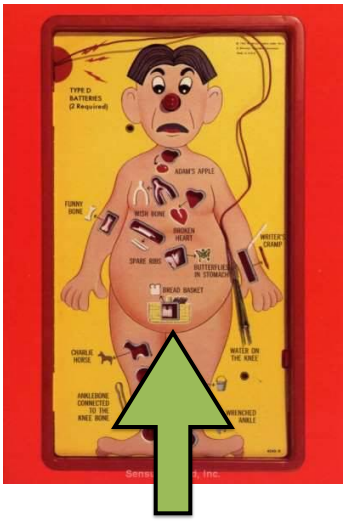
- Stimulated by cytokines
- Fever
- Granulocytosis
- Increased production of acute phase proteins
- Act as inflammatory mediators and are essential in tissue repair

Endocrine Response

- Increase glucose metabolism and production with central utilization
- Protein Breakdown in particular skeletal muscle
- Increase in water and salt reabsorption

The Stress of Surgery

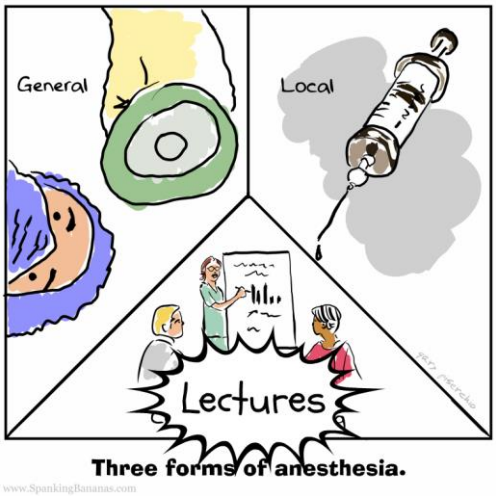
Stress response to surgery



Post-operative sequelae

Reducing the Stress Response to surgery

Opioid use can limited endocrine response



Regional Technique: Can prevent endocrine and metabolic response

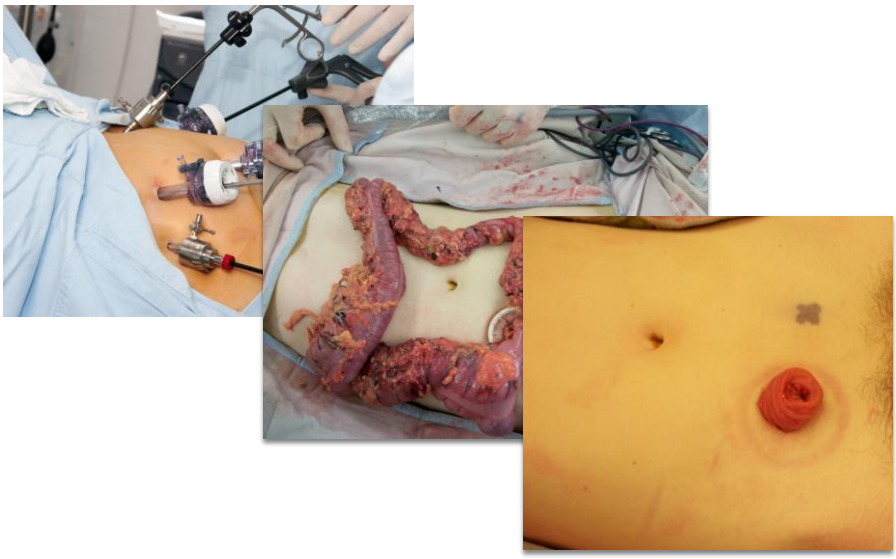
Reduce Thromboembolic complications

Improve pulmonary function

Possibly improve gut function

Reducing the Stress Response to surgery

Minimally invasive surgery



Minimally invasive surgery

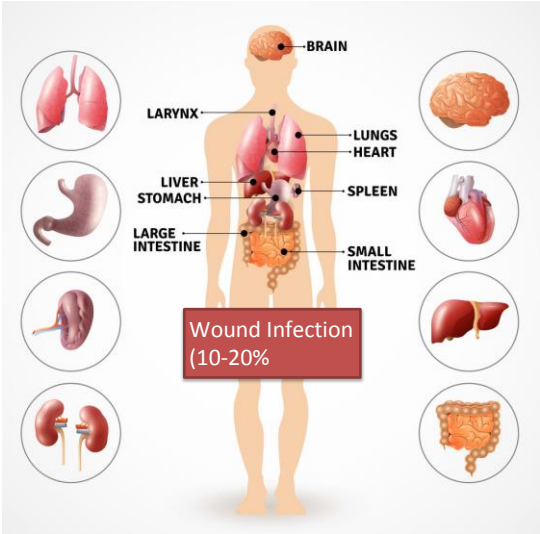
- Proven benefit in reducing
  - Post-operative pain
  - Length of stay
  - Morbidity and Mortality
- Faster return to normal function
- Role is limited in emergency setting

Post-operative sequelae

Basal Atelectasis
Chest Infection
Thrombo-embolic event
(20-50%)

Nausea and Vomiting
(50%)

Acute Kidney Injury
UTI
Urinary Retention
(10%)



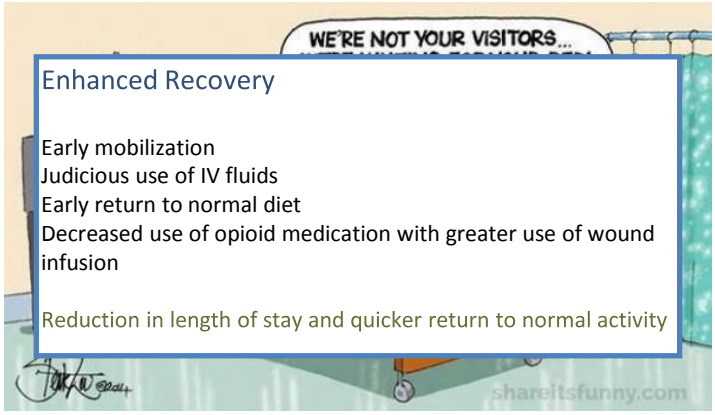
Wound Infection
(10-20%

Delirium
CVA
(15%)

Arrhythmia
MI
(7%)

Anastomotic leak
(2-10%)
Ileus (25%)

Post-operative sequelae



Enhanced Recovery

Early mobilization
Judicious use of IV fluids
Early return to normal diet
Decreased use of opioid medication with greater use of wound infusion

Reduction in length of stay and quicker return to normal activity

How does this impact on patient outcomes?

30 an
day
morta

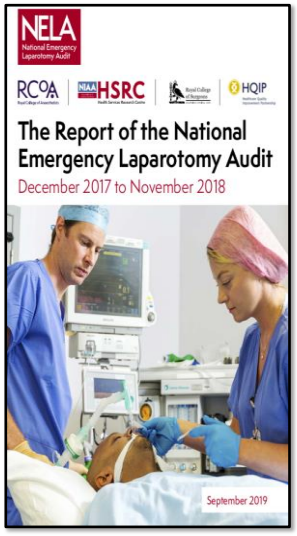
Functional outcome

th of

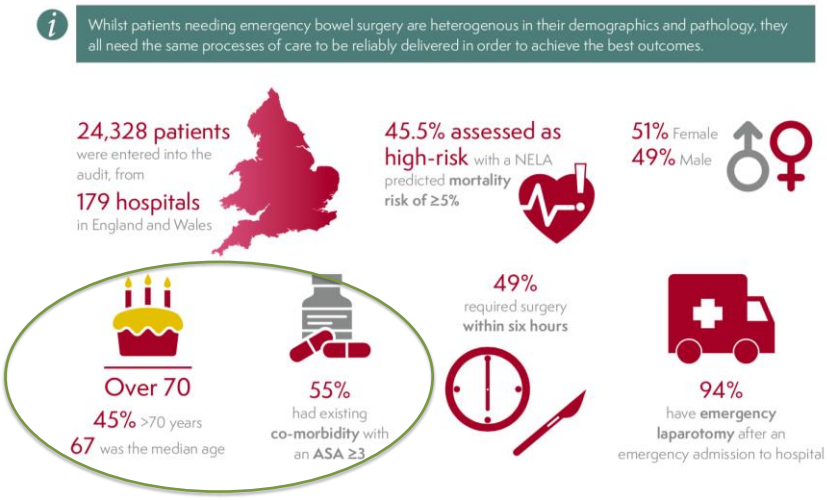
- The National Emergency Laparotomy Audit was started in 2013
- Studies showed this is one of the most risky types of emergency operation
- Lives could be saved and quality of life for survivors enhanced by measuring and improving the care delivered.

5th NELA report; 24,328 patients

- NELA Database now 160,000 patients in total
- 5th Report published December 2019



National Emergency Laparotomy Audit

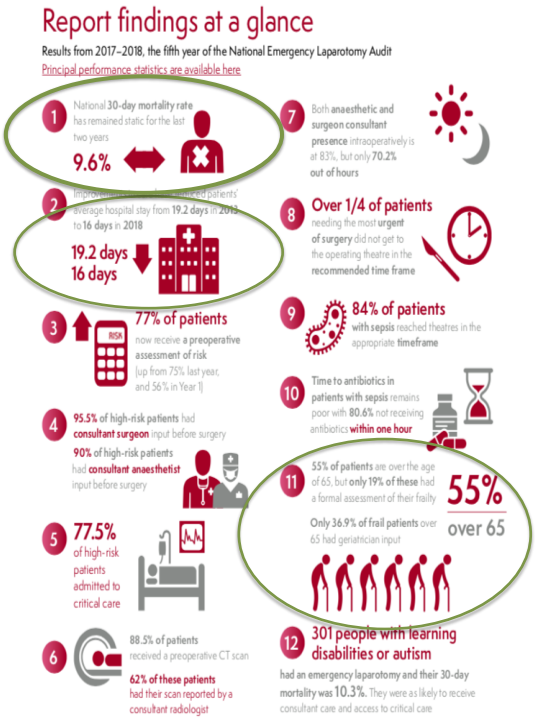


Experience in Oxford

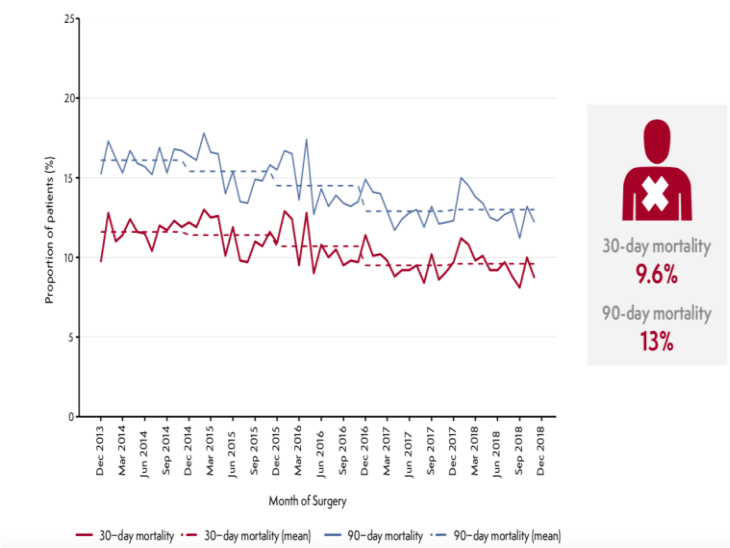
- SEU made up of 6 consultants with UGI/HPB and LGI special interests
- Supported by Elective colleagues
- Based at John Radcliffe
- Tertiary referral centre for the region
- Major trauma centre

Experience in Oxford

- 9034 Attendances to SEU with 2934 admissions
- 1253 patients over 65 years
- In 2018 - 276 laparotomies with a mean LOS of 13 days



Mortality: National



Scoring systems

- Predict mortality and morbidity

- Categorise risk to tailor post-operative care
- Inform decision making with patient and family
- Guiding decision on surgery

- Don’t predict recovery and level of function

Scoring systems

- ASA

- APACHE II

- P-POSSUM

- NELA Risk Tool

ASA

1. Healthy Patient
2. Mild systemic disease
3. Severe systemic disease
4. Severe systemic disease that is a constant threat to life
5. Moribund

E - denotes emergency

APACHE II

	Physiologic variable[b]	Point score								
		+4	+3	+2	+1	0	+1	+2	+3	+4
1	Temperature	⩾41°	39–40.9°	–	38.5–38.9°	36–38.4°	34–35.9°	32–33.9°	30–31.9°	⩽29.9°
2	Mean arterial pressure (mm Hg)	⩾160	130–159	110–129	–	70–109	–	50–69	–	⩽49
3	Heart rate	⩾180	140–179	110–139	–	70–109	–	55–69	40–54	⩽39
4	Respiratory rate(non-ventilated or ventilated)	⩾50	35–49	–	25–34	12–24	10–11	6-9	–	⩽5
5	Oxygenation:									
	patient or emergency postperative patient with immunocompromise or severe organ insufficiency[c]									
13[d]	Serum HCO_3(venous-mMol/L) use only if no ABGs52	⩾52	41–51.9	–	32–40.9	22–31.9	–	18–21.9	15–17.9	<15

Good predictor of mortality

score of 0-21 mean of 5 in survivors Vs. 15-38, mean of 23 in patients who died

Adapted from Knaus WA. Draper EA. Wagner DP. Zimmermam JB: APACHE II: A severity of disease classification system. *Critial care medicine* 13: 818–829. 1985.
Interpretation of APACHE II scores (predicted mortality rate).
0–4 = ~4% death rate 10–14 = ~15% death rate 20–24 = ~40% death rate 30–34 = ~75% death rate.
5–9 = ~8% death rate 15–19 = ~25% death rate 25–29 = ~55% death rate Over 34 = ~85% death rate.

[a] APACHE II Score = acute physiology score + age points + chronic health points. Minimum score = 0; maximum score = 71. Increasing score is associated with increasing risk of hospital death.

[b] Choose worst value in the past 24 h.

[c] Chronic health status: Organ sufficiency (e.g. hepatic, cardiovascular, renal, pulmonary) or immuno-compromised state must have preceded current admission.

[d] Optional variable: use only if no ABGs.

Table 1 – APACHE II scoring for outcome in emergency general surgery or laparotomy.

Year	Patient Category	Outcome
1990	Perforated peptic ulcers	APACHE II scoring system accurately stratified patients according to risk [25]
1997	Peritonitis and intra abdominal sepsis	Combination of the APACHE II and the MPI provides the best scoring system [26]
2007	Peritonitis due to hollow viscus perforation	APACHE-II scoring system can be used to assess group outcomes in patients with peritonitis due to hollow viscus perforation [27]
2007	General surgical patients	M-POSSUM is more accurate than POSSUM and APACHE II in predicting postoperative morbidity and mortality [28]
2007	Perforated peptic ulcer	Compared to the APACHE II & III & the simplified acute physiology score II, the mortality probability models (MPM) II predicted mortality at admission better [29]
2010	Patients with peritonitis	APACHE II is accurate in predicting mortality has definitive advantages and is therefore more useful [30]
2010	Generalized secondary peritonitis	Independent mortality predictors were APACHE II > or = 16 [31]
2011	obstructing colon cancer	APACHE II score ≥11 was a prognostic factor for poor outcome [32]
2011	Perforation peritonitis	APACHE II is superior in prediction of the outcome as compared to SAPS I, Sepsis score, MOF, TISS-28 and MPI [33]
2011	Abdominal sepsis that have ongoing infection and would need relaparotomy	All evaluated scoring systems (APACHE-II score, SAPS-II, Mannheim Peritonitis Index (MPI), MODS, SOFA score, and the acute part of the APACHE-II score) were predictive of mortality, none predicted need for laparotomy [34]
2012	Secondary peritonitis of colorectal origin to predict relaparotomies	APACHE II score might be helpful in predicting the need for relaparotomies [35]
2013	Perforated peptic ulcer	APACHE II has been shown to predict outcome well also for PPU patients [36]
2014	Patients of intra-abdominal sepsis and treated with planned relaparotomy	APACHE II scoring system is reliable for prediction of mortality [37]
2015	Gall bladder perforation	Both POSSUM and APACHE II scores were superior to ASA score in risk prediction [38]

Nag D, Biomedicine. 2015: 5(4); 7-16

P-POSSUM

POSSUM score	1	2	4	8
Physiological parameters				
Age (years)	<60	61–70	≥71	
Cardiac signs	Normal	Cardiac drugs/Steroids	Edema/Warfarin	Raised JVP/cardiomegaly
CXR	Normal		Borderline cardiomegaly	Cardiomegaly
Respiratory signs	Normal	SOB exertion	SOB stairs	SOB rest
CXR	Normal	Mild COPD	Mod COPD	Any other signs
Systolic BP (mmHg)	110–130	131–170	≥171	≤89
		100–109	90–99	
Pulse rate	50–80	81–100	101–120	≥121
		40–49		
GCS	15	12–14	9–11	≤8
Hb (g/dl)	13–16	11.5–12.9	10–11.4	≤9.9
		16.1–17	17.1–18	≥18.1
WBC × 10^{12}/l	4–10	10.1–20	≥20.1	
		3.1–3.9	≤3	
Urea	≤7.5	7.6–10	10.1–15	≥15.1
Na^+	≥136	131–135	126–130	≤125
K^+	3.5–5	3.2–3.4	2.9–3.1	≤2.8
		5.1–5.3	5.4–5.9	≥6
ECG abnormality	Normal		AF (60–90)	Any other change
Operative parameters				
Operative magnitude	Minor	Intermediate	Major	Major+
No. of operations within 30 days	1		2	>2
Blood loss per operation (ml)	<100	101–500	501–999	>1000
Peritoneal contamination	No	Serous	Local pus	Free bowel contents, pus or blood
Presence of malignancy	No	Primary cancer only	Nodal metastases	Distant metastases
Timing of operation	Elective		Emergency resuscitation possible: operation <24 h	Emergency: immediate operation <2 h

Table 2 – Use of POSSUM or one of its variants in general surgery, laparotomy or high risk surgical patients.

Year	Patient Category	Outcome
2004	Patients needing damage control laparotomy	Lower mortality than that predicted by P-POSSUM and POSSUM with Damage Control Surgery [56]
2004	Patients undergoing emergency laparotomy	POSSUM is a good predictor of morbidity and mortality. P-POSSUM predicts mortality equally well. Both can be used for risk-adjusted surgical audit [57]
2005	High risk patients undergoing surgery	p-POSSUM predicted mortality well but POSSUM over-predicted mortality [58]
2006	elective and emergency laparotomy	It is a useful predictor of morbidity and mortality [59]
2007	General surgery	M-POSSUM correlates better with postoperative complications and mortality than POSSUM [60]
2008	cases of ileal perforations	Significant correlation between POSSUM score and postoperative complications and deaths [61]
2009	Patients undergoing emergency laparotomy	P-POSSUM predicts mortality better than POSSUM. Exponential method is better than linear regression analysis [62]
2009	Unresectable pancreatic cancer during exploratory laparotomy	POSSUM scoring system is an independent predictor of survival in multivariate analysis [63]
2009	oncologic gastric surgery	Mortality lower than that predicted by POSSUM and higher than that predicted by P-POSSUM [64]
2010	patients undergoing emergency surgery	ASA grade and POSSUM scores were the better predictors of mortality than EWS, APACHE II, and age [65].
2010	general surgical laparotomy	P-POSSUM is a better overall predictor of mortality than POSSUM [11].
2011	General surgical patients	Both POSSUM and P-POSSUM are valid indices for risk prediction of morbidity and mortality [66]
2012	secondary peritonitis of colorectal origin	CR-POSSUM had the highest sensitivity and specificity to predict mortality as compared to MPI & APACHE-II [35]
2014	Emergency laparotomy	POSSUM is an accurate predictor of mortality and morbidity and can be used for surgical audit [67]

Limitation to the P-Possum

- Patient with a strangulated hernia
- P-Possum mortality of 3.6%

- However he had alcoholic liver disease
- Child-Pugh C
  - **Surgical mortality of 81%**
  - **1-3 year life expectancy**

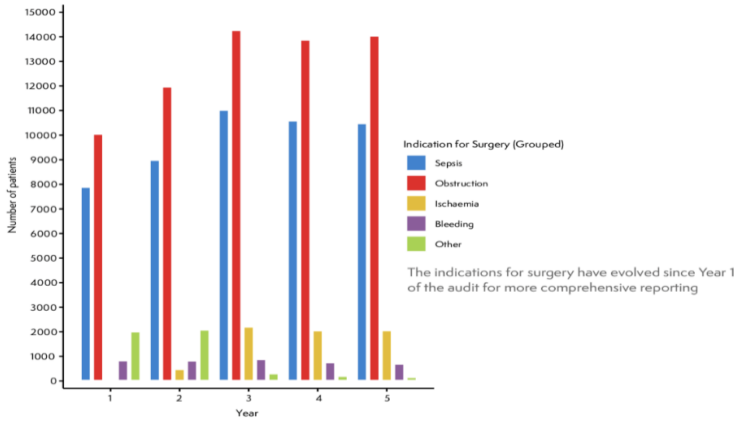
Ideal scoring system

- Easy to calculate
- Accurate in its prediction
- Reproducible across geographical locations
- Allow surgical audit and assess change of quality improvement

Indications for Emergency Laparotomy

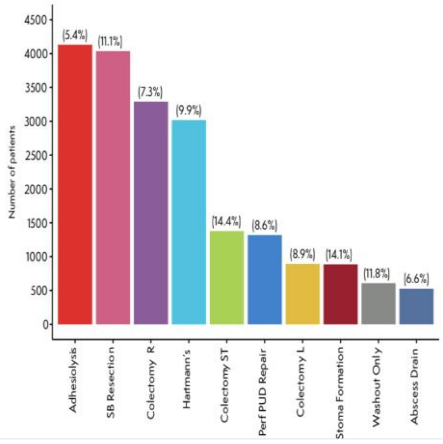
NELA National Emergency Laparotomy Audit

Figure 6.1 Indications for emergency laparotomy, by NELA year



Indications for Emergency Laparotomy

Figure 6.4 Top ten most commonly performed surgical procedures and associated 30 day in-patient mortality (NB hospital teams can see this data contemporaneously on their own database and the NELA webtool). Figure: mortality for the procedure performed



Antibiotics in Suspected Sepsis

- 10,947 (45%) of patients undergoing emergency laparotomy had signs of sepsis; approximately half of which had generalised peritonitis.
- 31% of patients with sepsis are not cared for in a critical care environment following surgery.

Only 19% of patients with suspected sepsis received antibiotics in the internationally recommended first hour.[10] This has not improved over time, and is a key area of improvement that must be addressed.

Median time to antibiotics = 3.5 hours in patients with suspected sepsis on admission

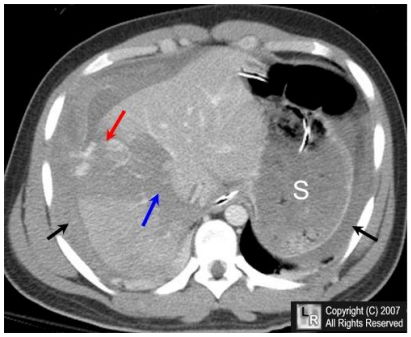
80% patients with sepsis required immediate or urgent surgery; 84% of these arrived in theatres in appropriate time frame

Damage Control Surgery

Strategy
Originally described in the context of exsanguinating abdominal trauma

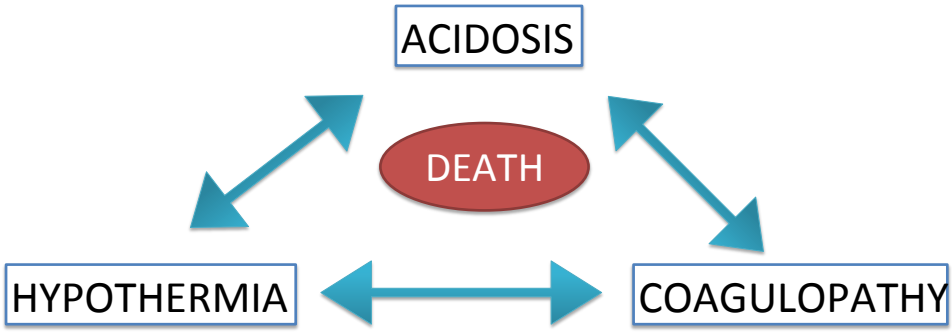
The completeness of operative repair is sacrificed in order to limit physiological deterioration

More likely to die from physiological failure rather than failure to complete the definitive operation



Damage Control Surgery

The Lethal Triad



4 Stages of Damage Control Surgery

1. Decision to perform DCS
2. The Operation
3. ICU Resuscitation
4. Retook +/- definitive surgery

Outcomes following DCS

- Reduced mortality compared to definitive surgery
- Possible reduced stoma formation
- Not without its complications

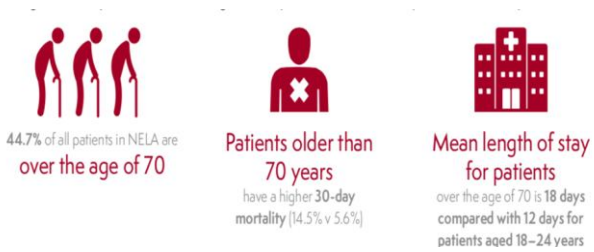
Intra-abdominal Abscesses 83%

Enteric Fistula 2-25%

Abdominal Compartment Syndrome 10-40%

Fasciae Dehiscence 9-25%

Elderly patients and frailty - National



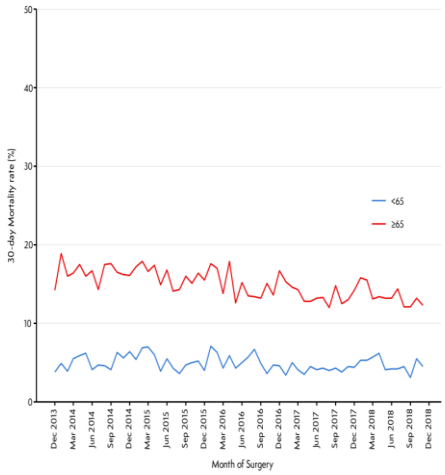
NELA National Emergency Laparotomy Audit

Table 8.1 Proportion of patients by age assessed by a geriatrician

Age (years)	Total number of patients in age group (n)	Proportion of patients assessed by a geriatrician
70–79	6,162	19.1%
80–89	4,200	26%
≥90	516	33.9%
Overall	10,878	22.5%

Mortality and LoS – National (patients over 65)

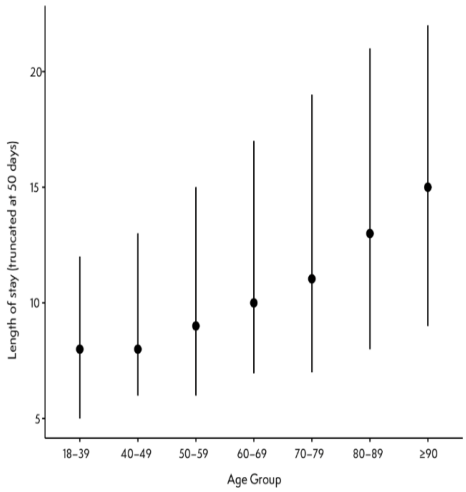
Figure 8.3 Comparison of 30-day mortality in two groups of patients over time; patients over the age of 65 years and patients under the age of 65 years



NELA National Emergency Laparotomy Audit

Mortality and LoS – National (patients over 65)

Figure 8.2 Postoperative length of stay in patients surviving to hospital discharge, by patient age



[NOTE: Median time (in days) and interquartile range (IQR)]

NELA National Emergency Laparotomy Audit

Assessment of frailty - National

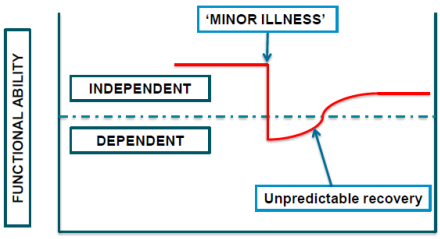
- 19% of patients over age of 65 underwent a frailty assessment, and 50.8% of patients who had a frailty assessment met the criteria for frailty syndrome.
- Frailty was associated with increased mortality, regardless of patients age.
- If found to be frail and aged over 70 years, 30-day mortality was 23.4% compared to 14.5% if not frail.

Table 8.3 Year 5 data to describe the proportion of patients over the age of 70 years who had a frailty assessment and risk adjusted mortality

Frailty assessment result	Number of patients in total	30-day mortality	90-day mortality
Not frail	1,790	5.1%	8.3%
Frail	1,476	21.7%	28.1%
Unknown/missing	186	13.3%	22%

What does NHS England mean by frailty?

- ***A long-term condition characterised by lost biological reserves across multiple systems and vulnerability to decompensation after a stressor event***

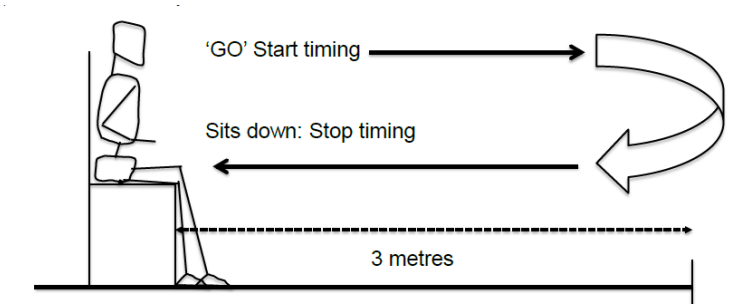


www.england.nhs.uk

Assessment of Frailty

- Frailty Phenotype
- Deficit Accumulation Model
- Assessment is difficult

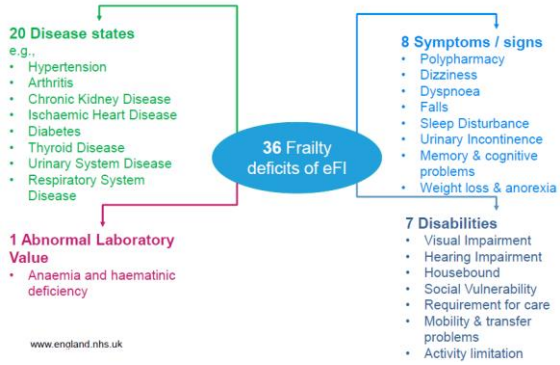
Timed Up and Go Test (TUGT)



Greater than 10 seconds to complete TUGT suggests frailty

www.england.nhs.uk

Electronic Frailty Index



The **electronic frailty index** (eFI) uses the existing information within the **electronic** primary health care record to identify populations of people aged 65 and over who may be living with varying degrees of **frailty**.

Clegg et al: Age Ageing 2016: 45:353-360

eFI Risk Prediction

The eFI is presented as a score (e.g. if 9 deficits are present out of a possible total of 36 the FI score = 0.25)
Higher scores indicate increasing frailty and greater risk of adverse outcomes

1 year outcome	Mild (0.13 – 0.24)	Moderate (0.25 – 0.36)	Severe (>0.36)
Mortality	1.92	3.1	4.52
Hospitalisation	1.93	3.04	4.73
Nursing Home admission	1.89	3.19	4.76

Rockwood Clinical Frailty Score

Box 1: The CSHA Clinical Frailty Scale

1 *Very fit* — robust, active, energetic, well motivated and fit; these people commonly exercise regularly and are in the most fit group for their age

2 *Well* — without active disease, but less fit than people in category 1

3 *Well, with treated comorbid disease* — disease symptoms are well controlled compared with those in category 4

4 *Apparently vulnerable* — although not frankly dependent, these people commonly complain of being "slowed up" or have disease symptoms

5 *Mildly frail* — with limited dependence on others for instrumental activities of daily living

6 *Moderately frail* — help is needed with both instrumental and non-instrumental activities of daily living

7 *Severely frail* — completely dependent on others for the activities of daily living, or terminally ill

Note: CSHA = Canadian Study of Health and Aging.

CMAJ. 2005 Aug 30; 173(5): 489–495.

In Hospital Risk Prediction

- **Severe frailty adversely impacts mortality in acute care**
- **Severe frailty, acute illness, delirium and dementia all lead to longer LOS**

Age and Ageing. 2018; 47: 242-248
BMC Geriatrics. 2017; 17:2
BMC Geriatrics. 2016. 16:117

Clinical frailty adds to acute illness severity in predicting mortality in hospitalized older adults: An observational study☆

Roman Romero-Ortuno [a,b,*], Stephen Wallis [a], Richard Biram [a], Victoria Keevil [a,b]

[a] Department of Medicine for the Elderly, Addenbrooke's Hospital, Cambridge, United Kingdom
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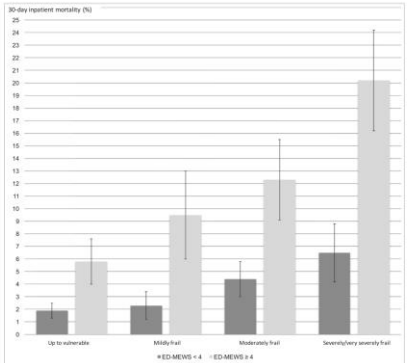

CFS category	ED-MEWS	n (total)	n (deaths)	30-day mortality (%)	95% CI (lower)	95% CI (upper)
Up to vulnerable	ED-MEWS < 4	1798	35	1.9%	1.3%	2.3%
Up to vulnerable	ED-MEWS ≥ 4	633	37	5.8%	4.0%	7.6%
Mildly frail	ED-MEWS < 4	683	16	2.3%	1.2%	3.4%
Mildly frail	ED-MEWS ≥ 4	274	26	9.5%	6.0%	13.0%
Moderately frail	ED-MEWS < 4	865	38	4.4%	3.0%	5.8%
Moderately frail	ED-MEWS ≥ 4	397	49	12.3%	9.1%	15.5%
Severely/very severely frail	ED-MEWS < 4	463	30	6.5%	4.3%	8.8%
Severely/very severely frail	ED-MEWS ≥ 4	392	79	20.2%	16.2%	24.2%

Fig. 1. Thirty-day inpatient mortality proportion by Clinical Frailty Scale (CFS) categories and Modified Early Warning Score in the Emergency Department (ED-MEWS) status (high acuity: ED-MEWS ≥ 4; low acuity: ED-MEWS < 4). CI: confidence interval; n: number.

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Clinical frailty adds to acute illness severity in predicting mortality in hospitalized older adults: An observational study☆

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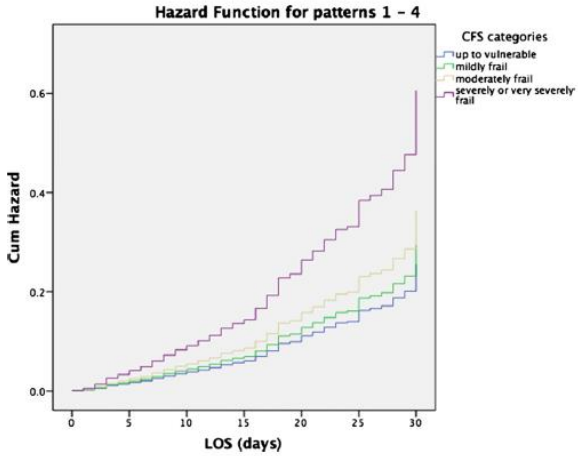

Assessment before Emergency Surgery

Original article

Association between preadmission frailty and care level at discharge in older adults undergoing emergency laparotomy

B. Carter[1], J. Law[3,8], J. Hewitt[4], K. L. Parmar[5], J. M. Boyle[2], P. Casey[6], I. Maitra[7], L. Pearce[9] and S. J. Moug[10], on behalf of the ELF Study Group*

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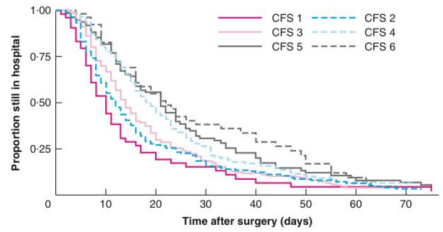
- Patients over 65 undergoing an emergency laparotomy
- Multicentred and recruited 934 patients

Original article

Association between preadmission frailty and care level at discharge in older adults undergoing emergency laparotomy

B. Carter[1], J. Law[3,8], J. Hewitt[4], K. L. Parmar[5], J. M. Boyle[2], P. Casey[6], I. Maitra[7], L. Pearce[9] and

Fig. 2 Kaplan–Meier plot of time from surgery until discharge in relation to preoperative frailty among patients aged 65 years or older undergoing emergency laparotomy



No. of patients still in hospital

CFS 1	54	28	12	7	4	2	2	2
CFS 2	197	118	52	32	22	15	11	6
CFS 3	275	183	81	44	28	22	9	8
CFS 4	187	133	76	40	24	16	10	9
CFS 5	120	88	51	23	17	10	7	5
CFS 6	61	43	27	18	14	9	4	1

Clinical Frailty Score (CFS) 6 and 7 were combined; and 40 patients were deemed to have an unreliable date of surgery or discharge.

Original article

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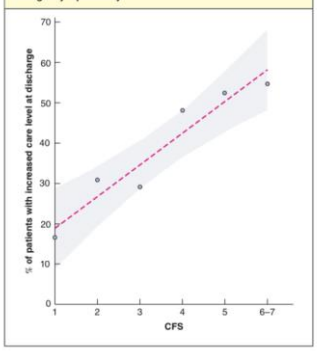
Association between preadmission frailty and care level at discharge in older adults undergoing emergency laparotomy

B. Carter[1], J. Law[3,8], J. Hewitt[4], K. L. Parmar[5], J. M. Boyle[2], P. Casey[6], I. Maitra[7], L. Pearce[9] and

Fig. 1 Relationship between frailty and increased level of care at discharge of patients aged 65 years or older undergoing emergency laparotomy



Moderately and severely frail patients (Clinical Frailty Score (CFS) 6 and 7) were combined owing to low numbers. Shading represents the 95 per cent mean prediction interval. There was a linear association between CFS 2 and CFS 6–7 ($r = 0{\cdot}92$, $P = 0{\cdot}002$).

Surgical Management of Malignant Bowel Obstruction

- Up to 15% of cancer patients globally effected by MBO [(1)]
  - 50% in ovarian cancer, 29% in colorectal cancer [(1, 2)]
- Median survival after surgery 7 months [(1)]; 30 day mortality 6-32 % [(3)]
  - Greater survival from resection and primary anastomosis (7.2 months) vs. defunctioning stoma (3.4 months) and enteral bypass (2.7 months) [(4)]
- QoL outcomes following surgery from a meta-analysis [(3)]:
  - 45-75% able to resume oral intake
  - 34-75% able to be discharged
  - Recurrent obstruction 6-47%
  - Readmission 38-74%
  - Remaining life consumed by surgical recovery e.g. long-term hospitalisation 11-61%
- Spontaneous resolution occurs in 30% within 8 days of diagnosis without any intervention [(1)]

Surgical Management of Malignant Bowel Obstruction

- Poor prognostic factors
  - Age: mortality OR 1.85 for each 10 year interval after 65 years [1]
  - Deficient nutritional status and hypoalbuminaemia: mortality is 3 fold [1]
  - Advanced disease [1,2]
  - General decline e.g. reduced performance status [1, 2]
  - Persistent ascites [1, 2, 5]
- The aim always has to be to improve the **QUALITY** of life

Surgical Management of Malignant Bowel Obstruction

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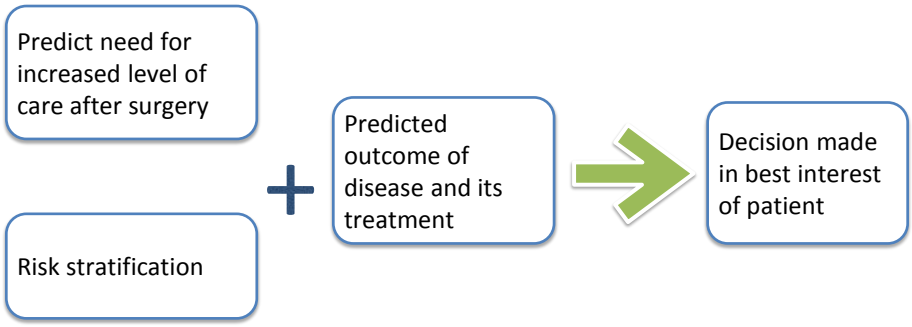
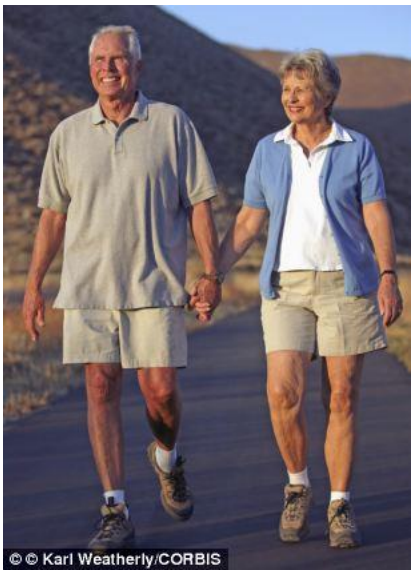
Assessment of Patient for Emergency laparotomy



Conclusion

- Laparotomy is a significant stress on the body
- Good anaesthetic and surgical care can improve outcomes
- The right patient selection is key and frailty scoring may assist in this
- Surgical pathology may be an end of life event and surgery may not be the answer

Why is this important?



PRISMA - 7

- **PRISMA 7 Self-completed questionnaire**
- 1. Are you more than 85 years?
- 2. Male?
- 3. In general do you have any health problems that require you to limit your activities?
- 4. Do you need someone to help you on a regular basis?
- 5. In general do you have any health problems that require you to stay at home?
- 6. In case of need can you count on someone close to you?
- 7. Do you regularly use a stick, walker or wheelchair to get about?

- **3 or more YES answers suggests frailty requiring further assessment**