Frailty in Older Patients undergoing Emergency Laparotomy: Results from The ELF Study

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ON BEHALF OF THE ELF STUDY GROUP

Older Surgical Patients

- 30,000 Emergency Laparotomies per year (England and Wales)
- Over half are performed on Older Adults (aged ≥65)
- Highest risk of mortality
- Population is ageing significantly
- Scottish database: 1672 cases over 7 months (220/month)

- 50% performed on Older Adults (aged ≥65)

Other Evidence

- ↑Post-op complications in older patients[1,2]
- Complications in older patients lead to ↑mortality rates (> x3) [3,4]
- Post-operative mortality rates in emergency general surgery increase with age with every decade above 50 years [5,6]
- ↑ Utilisation intensive care resources & LOS
- ↓ Ability to lead independent life

1. *Polanczyk et al. Impact of age on periop complications and LOS in pts undergoing noncardiac surgery. Ann Intern Med. 2001;134(8):637-433.*
2. *Hamel MB et al. Surgical outcomes for patients aged 80 and older: morbidity and mortality from major noncardiac surgery. J Am Geriatr Soc. 2005;53(3):424-9*
3. *Merani et al. Predictors of in-hospital mortality and complications in very elderly patients undergoing emergency surgery. World J Emerg Surg. 2014;9:43.*
4. *Speicher PJ et al. Expectations and outcomes in geriatric patients with DNAR undergoing ES management of bowel obstruction. JAMA Surg. 2013;148(1):23-8.*
5. *Svenningsen et al. Increased mortality in the elderly after emergency abdominal surgery. Dan Med J. 2014;61(7)*
6. *Symons NR et al. Mortality in high-risk emergency general surgical admissions. Br J Surg. 2013;100(10):1318-25*

Older Surgical Patients

3rd report concluded

- More should be done to specifically target outcomes in older patients undergoing emergency laparotomy
- Need improved understanding of influencing

factors

NELA project team. Third Patient report of the National Emergency Laparotomy Audit. RCoA London 2017

E L f Limitations of current evidence

- Little insight into Older Adults undergoing Emergency Laparotomy
- Previous prognostic scores on younger population
- Few covering both mortality and morbidity

- Complex heterogeneous group, with different needs from younger adults:
    - polypharmacy
    - multi-morbidity
    - cognitive impairment

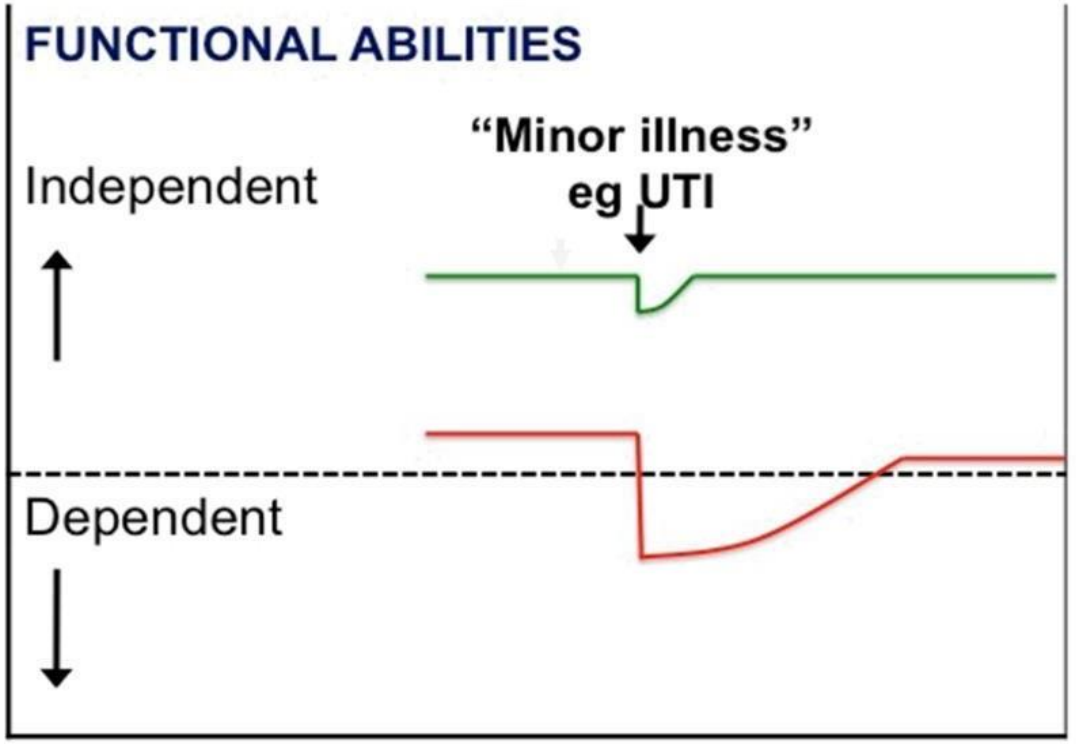
- **frailty**

Frailty

A relatively new medical concept

- An objective measure of increased vulnerability and decreased physiological reserves, resulting from the age-associated accumulation of deficits in multiple physiological systems

- **Frailty results in decreased resilience to any physiological insult and can prevent recovery or achievement of the same functional level after the insult**



E L f Evidence for Frailty & Surgery

Frailty in Older People. Clegg et al. Lancet 2013 2;381:752-762

- High pre-operative frailty scores have been shown to correlate with:

  ↑ Post-operative complications
  ↑ Length of stay
  ↑ 30 and 90 day mortality and
  ↑ Likelihood of institutionalisation

- The majority of these previous studies have been performed in elective rather than emergency patients

Hewitt et al, Am J Surg 2016
Farhat et al, J Trauma Acute Care Surg 2012

Does the use of a validated frailty score correlate with outcomes in older surgical patients undergoing emergency laparotomies?

Methods

- **Study Set Up**
  - Older Persons Surgical Outcomes Collaboration (OPSOC)
  - North West Research Collaborative (NWRC)
- **Protocol development and publication**
- **Inclusion criteria consistent with NELA**
  - Older adults ≥65 undergoing Emergency Laparotomy
- **Site Recruitment**
  - Participation invited via National Research Collaborative Meeting
  - Social media

Methods

- **Primary Outcome Measure: 90 day mortality**

- **Secondary Outcome Measures:**
  - 30 day mortality & re-admission
  - Post-operative Length of Stay
  - Post-operative Length of ICU/HDU Stay
  - Post-operative Complications

E L f Clinical Frailty score

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 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	Dependent on others for activities of daily living, or terminally ill

Rockwood K, et al. A global clinical measure of fitness and frailty in elderly people. CMAJ. 2005;173:489-95

Power calculation

- Using unpublished OPSOC data, frailty exists in 28% of all patients undergoing emergency laparotomy
- In order to detect a 10% difference in mortality rate at Day 90 between frail and non frail patients, a sample size of 480 is required
- Aim: to recruit **500 patients**

E L f Protocol publication

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Influence of frailty in older patients undergoing emergency laparotomy: a UK-based observational study

Kat L Parmar[1], Lyndsay Pearce[2], Ian Farrell[2], Jonathan Hewitt[3], Susan Moug[4]

Abstract

Introduction The National Emergency Laparotomy Audit (NELA) has reported that older patients (≥65 years) form a large percentage of emergency high-risk cases with increased postoperative morbidity and mortality. With the population continuing to age rapidly, it is clear that a greater understanding of the factors affecting surgical outcomes in older patients is required. Frailty is a relatively new concept taking into account a variety of factors that increase an individual's vulnerability to increased dependency and death. Research has suggested that high frailty scores increase postoperative complications, length of stay and mortality but the majority of these studies have been carried out on elective patients. Knowledge of how frailty affects patients in an emergency setting would aid clinicians' and patients' decision-making process.

Methods and analysis This multicentre study will include consecutive adult patients aged 65 years and over undergoing emergency laparotomies over a 3-month period at 52 National Health Service hospitals across the UK. The primary outcome will be 90-day mortality. Secondary outcomes will include length of hospital stay, 30-day complications, change in level of independence and 30-day readmission. This study has been powered to detect a 10% change in mortality associated with frailty (n=500 patients).

Ethics and dissemination This study has been approved by the National Health Service Research Ethics Committee. It has been registered centrally with HRA for English sites, NRSPCC for Scottish sites and Health and Care Research Permissions Service for sites in Wales.Dissemination will be via international and national surgical and geriatric conferences. In addition, manuscripts will be prepared following the close of the project.

Trial registration number This study is also registered online at www.clinicaltrials.gov (registration number NCT02952430).

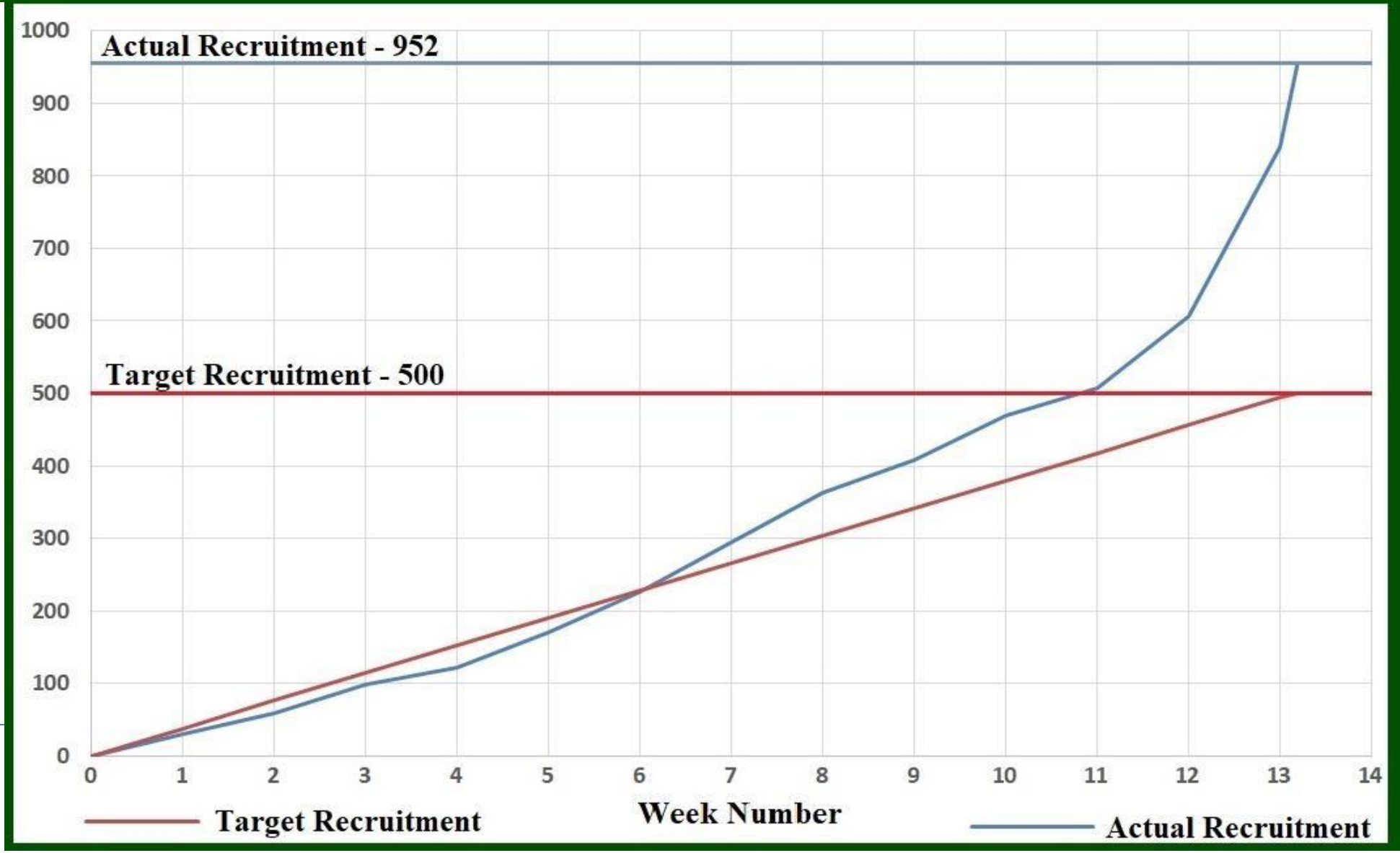
http://dx.doi.org/10.1136/bmjopen-2017-017928

Recruiting sites (49)

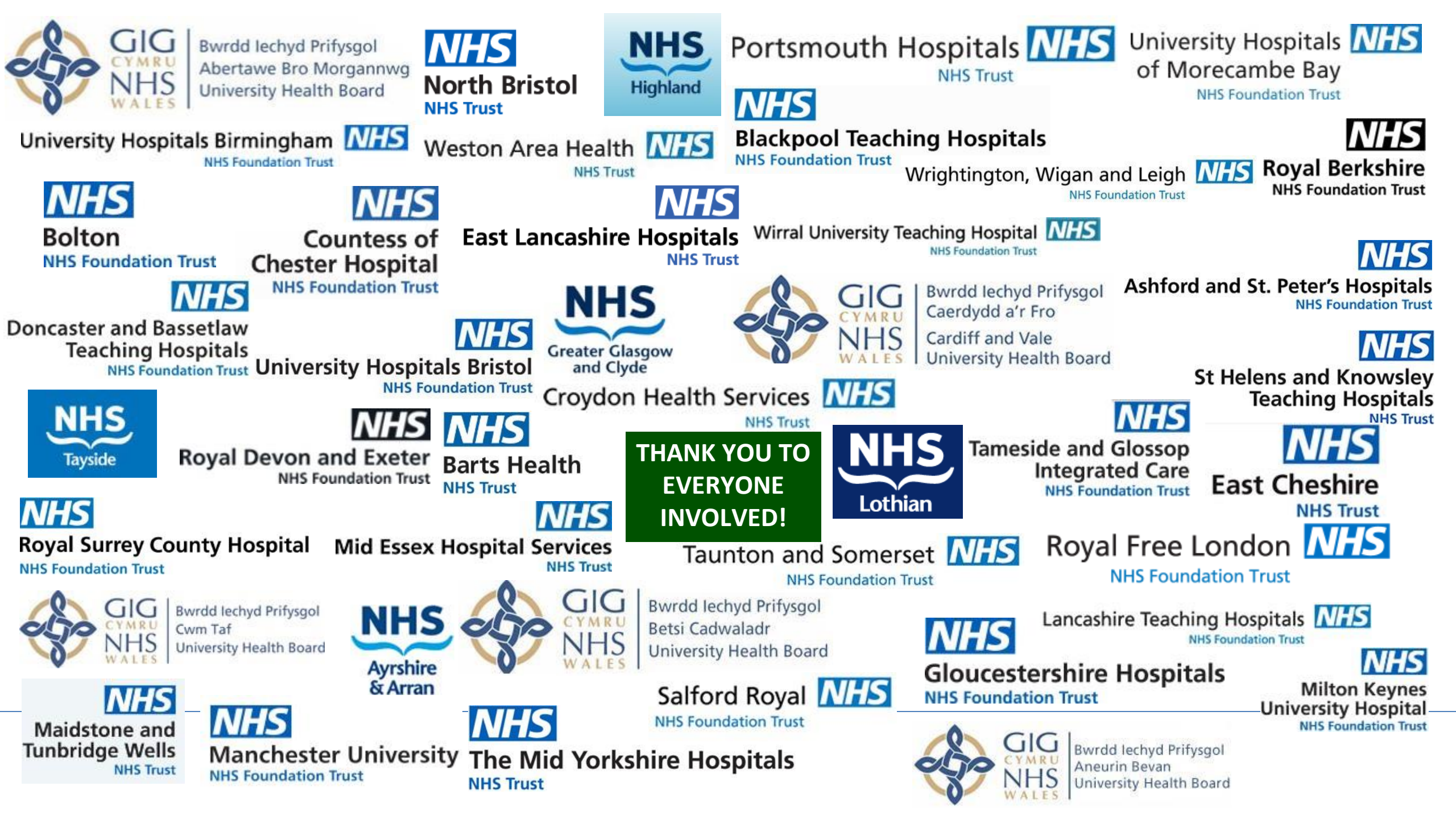
26.	Maidstone & Tunbridge Wells
27.	Macclesfield
28.	Manchester Royal Infirmary
29.	Mid Yorkshire
30.	Milton Keynes
31.	Newport
32.	North Bristol
33.	North Somerset
34.	Oban
35.	Paisley
36.	Portsmouth
37.	Preston
38.	Reading
39.	Royal Free
40.	Royal London
41.	Royal Surrey
42.	Salford
43.	Swansea
44.	Tameside
45.	Taunton
46.	Whiston
47.	Wigan
48.	Wrexham
49.	Wythenshawe

1.	Addenbrookes
2.	Arrowe Park
3.	Ashford
4.	Barrow
5.	Birmingham
6.	Blackburn
7.	Blackpool
8.	Bolton
9.	Bristol Royal Infirmary
10.	Cardiff
11.	Chester
12.	Croydon
13.	Doncaster
14.	Dundee
15.	Edinburgh Western General
16.	Edinburgh Royal Infirmary
17.	Essex
18.	Exeter
19.	Glamorgan
20.	Glan Clywd
21.	Glasgow QEUH
22.	Glasgow Royal Infirmary
23.	Gloucestershire
24.	Kilmarnock
25.	Lancaster

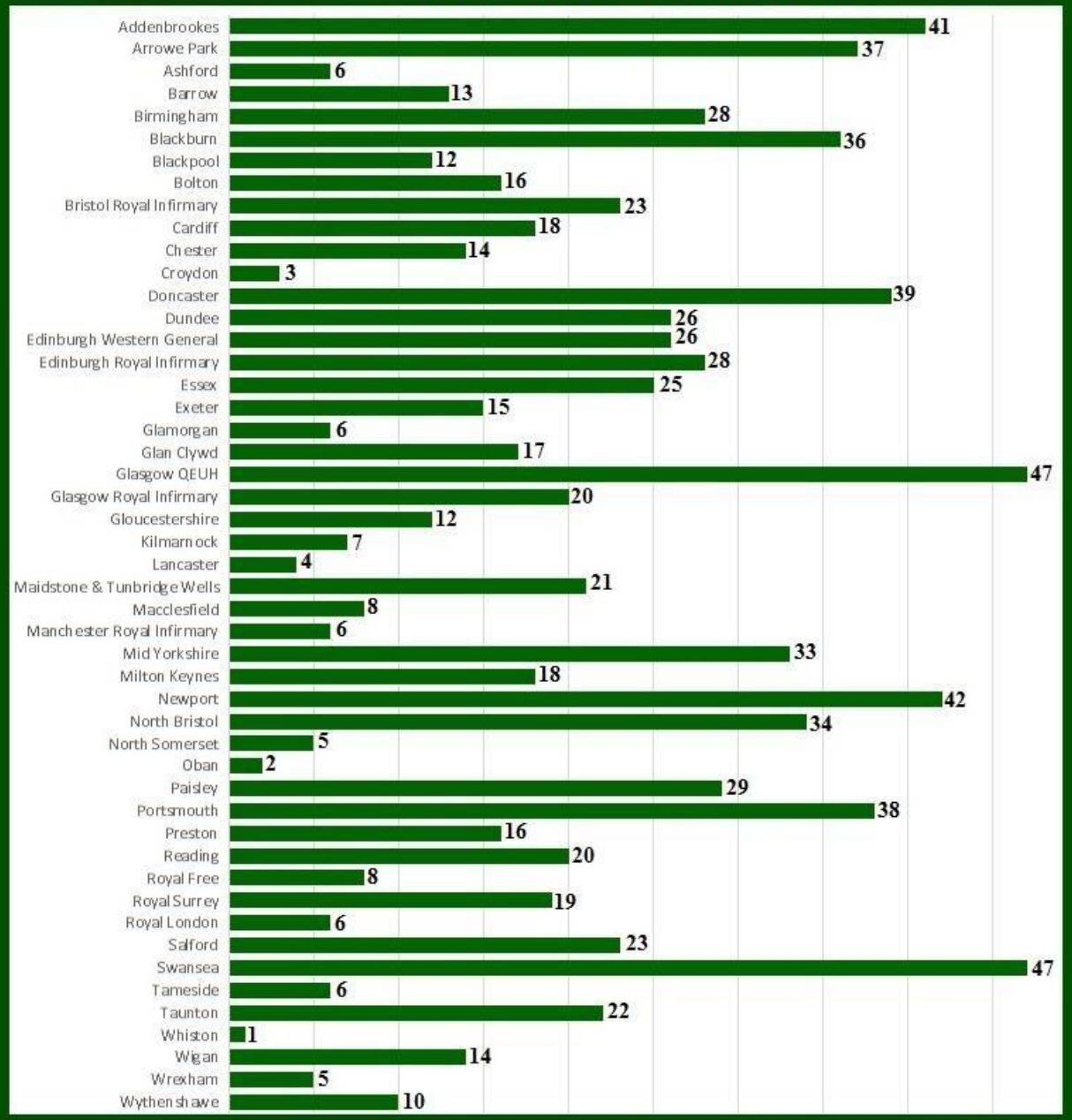
Final recruitment

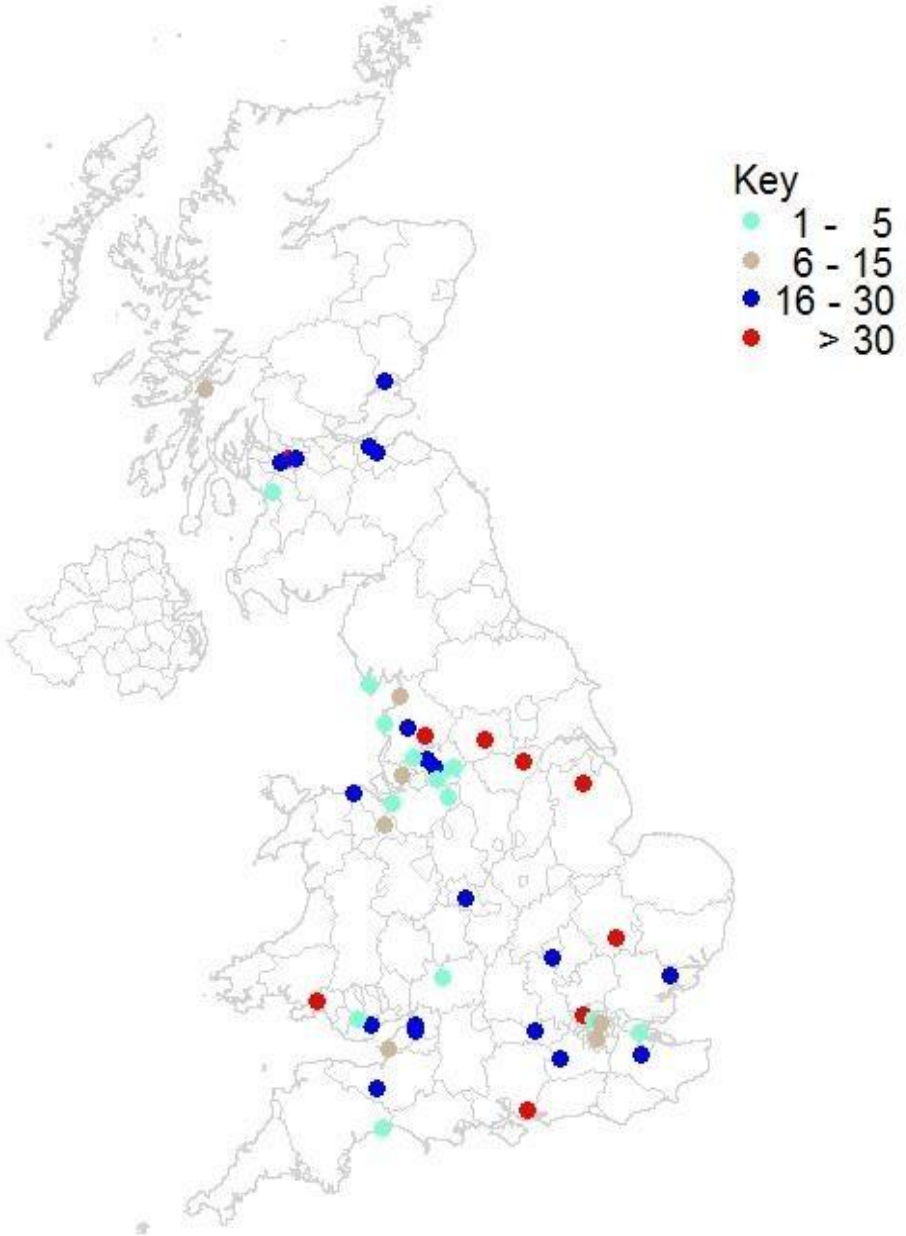


15 excluded
N=937

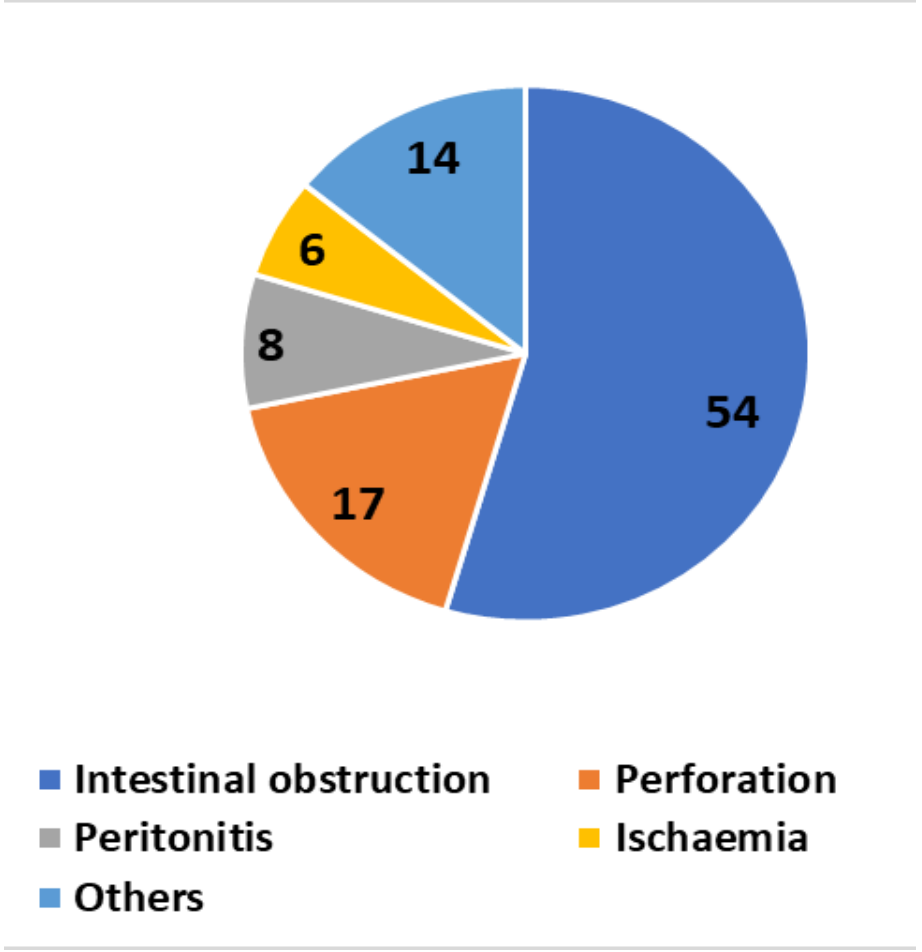

GIG CYMRU NHS WALES
Bwrdd Iechyd Prifysgol Abertawe Bro Morgannwg University Health Board
NHS North Bristol NHS Trust
NHS Highland
Portsmouth Hospitals NHS Trust
University Hospitals of Morecambe Bay NHS Foundation Trust
University Hospitals Birmingham NHS Foundation Trust
Weston Area Health NHS Trust
NHS Blackpool Teaching Hospitals NHS Foundation Trust
Wrightington, Wigan and Leigh NHS Foundation Trust
NHS Royal Berkshire NHS Foundation Trust
NHS Bolton NHS Foundation Trust
NHS Countess of Chester Hospital NHS Foundation Trust
NHS East Lancashire Hospitals NHS Trust
Wirral University Teaching Hospital NHS Foundation Trust
NHS Ashford and St. Peter's Hospitals NHS Foundation Trust
NHS Doncaster and Bassetlaw Teaching Hospitals NHS Foundation Trust
NHS University Hospitals Bristol NHS Foundation Trust
NHS Greater Glasgow and Clyde
GIG CYMRU NHS WALES
Bwrdd Iechyd Prifysgol Caerdydd a'r Fro
Cardiff and Vale University Health Board
NHS St Helens and Knowsley Teaching Hospitals NHS Trust
NHS Tayside
Croydon Health Services NHS Trust
NHS Royal Devon and Exeter NHS Foundation Trust
NHS Barts Health NHS Trust
THANK YOU TO EVERYONE INVOLVED!
NHS Lothian
NHS Tameside and Glossop Integrated Care NHS Foundation Trust
NHS East Cheshire NHS Trust
NHS Royal Surrey County Hospital NHS Foundation Trust
NHS Mid Essex Hospital Services NHS Trust
Taunton and Somerset NHS Foundation Trust
Royal Free London NHS Foundation Trust
GIG CYMRU NHS WALES
Bwrdd Iechyd Prifysgol Cwm Taf University Health Board
NHS Ayrshire & Arran
GIG CYMRU NHS WALES
Bwrdd Iechyd Prifysgol Betsi Cadwaladr University Health Board
Lancashire Teaching Hospitals NHS Foundation Trust
NHS Gloucestershire Hospitals NHS Foundation Trust
NHS Milton Keynes University Hospital NHS Foundation Trust
NHS Maidstone and Tunbridge Wells NHS Trust
NHS Manchester University NHS Foundation Trust
NHS The Mid Yorkshire Hospitals NHS Trust
Salford Royal NHS Foundation Trust
GIG CYMRU NHS WALES
Bwrdd Iechyd Prifysgol Aneurin Bevan University Health Board

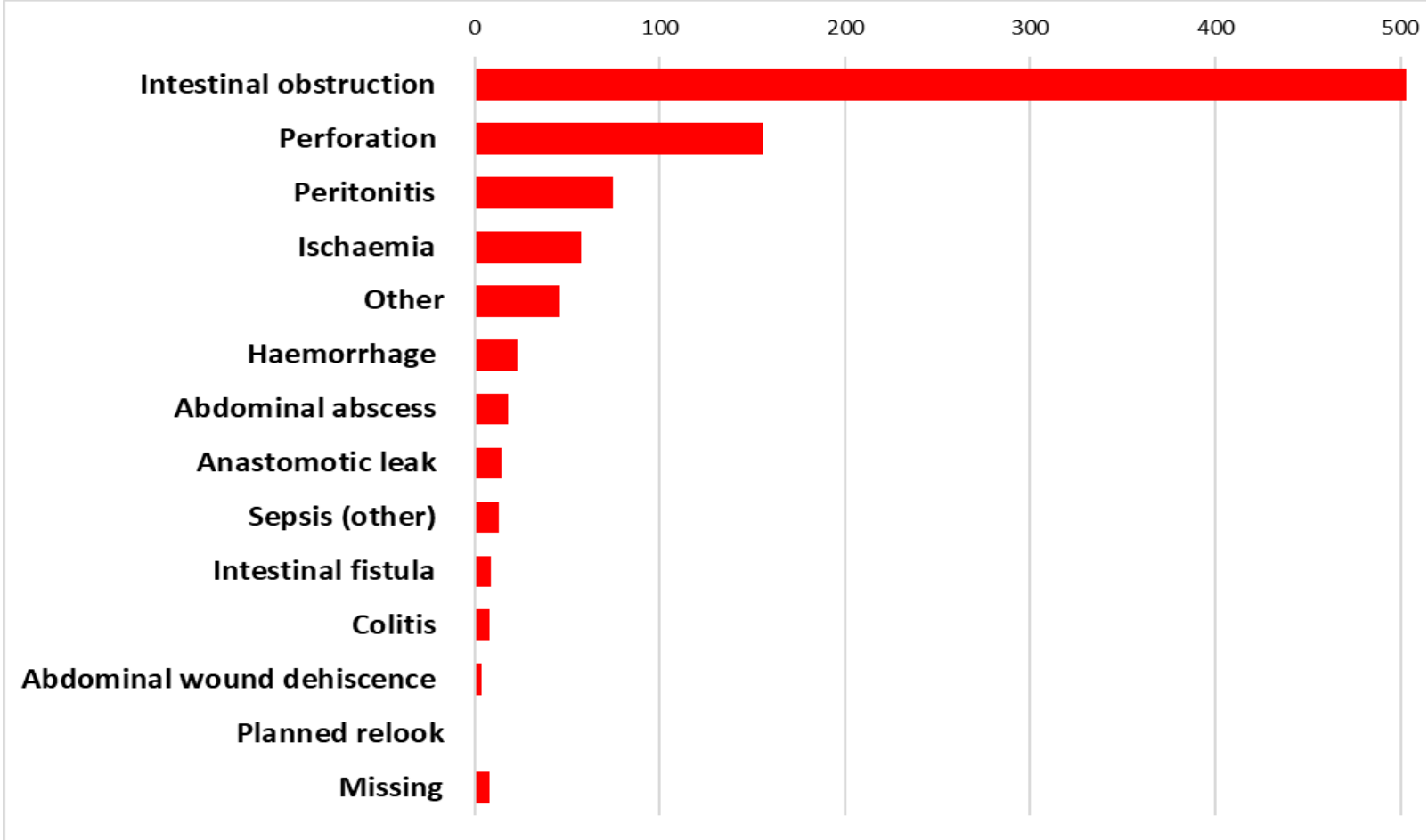
Final Recruitment By Site 20/06/2017
952 Patients in Total



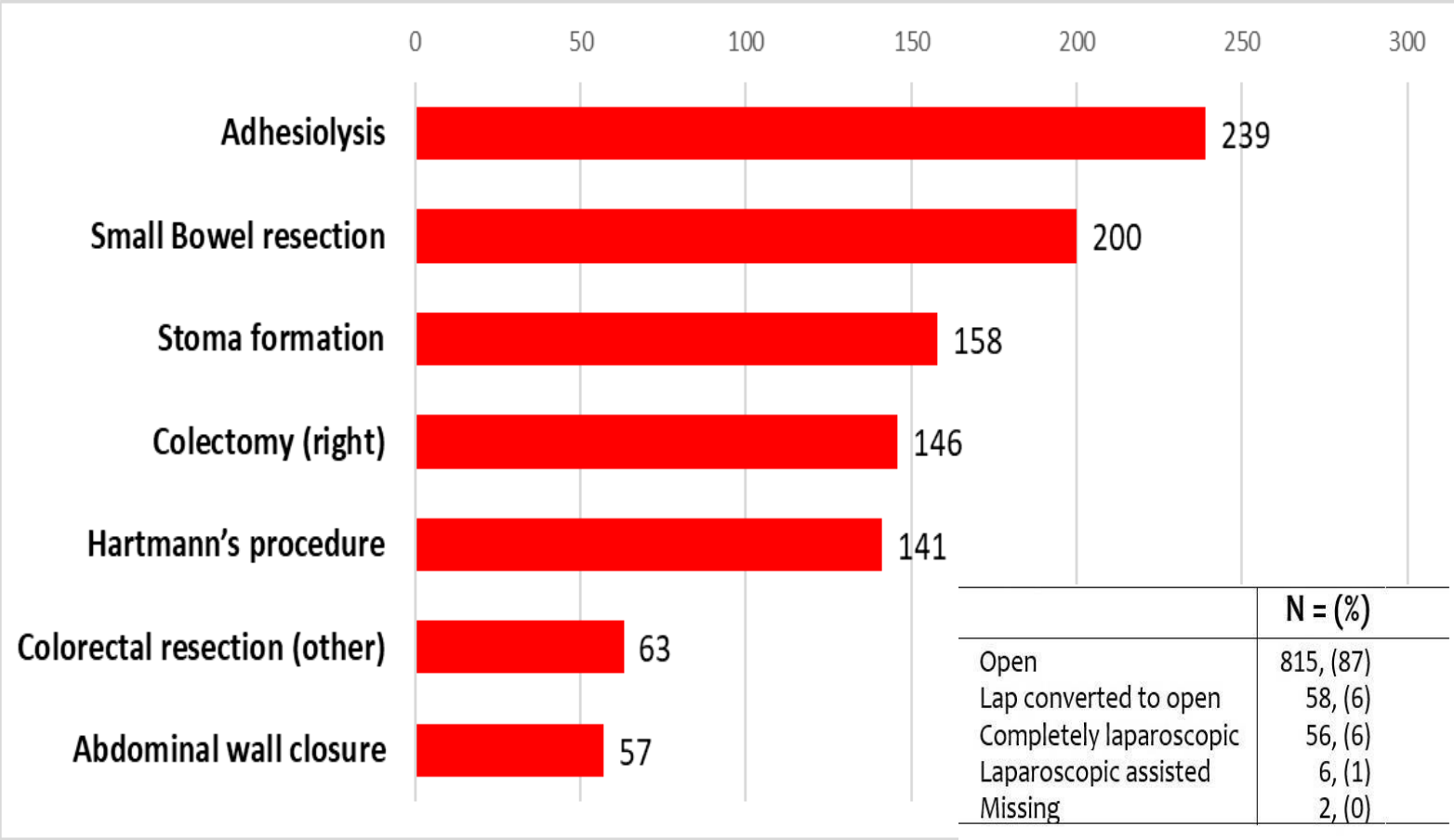

Key
1 - 5
6 - 15
16 - 30
> 30

Results: Indication for surgery




0
100
200
300
400
500
Intestinal obstruction
Perforation
Peritonitis
Ischaemia
Other
Haemorrhage
Abdominal abscess
Anastomotic leak
Sepsis (other)
Intestinal fistula
Colitis
Abdominal wound dehiscence
Planned relook
Missing

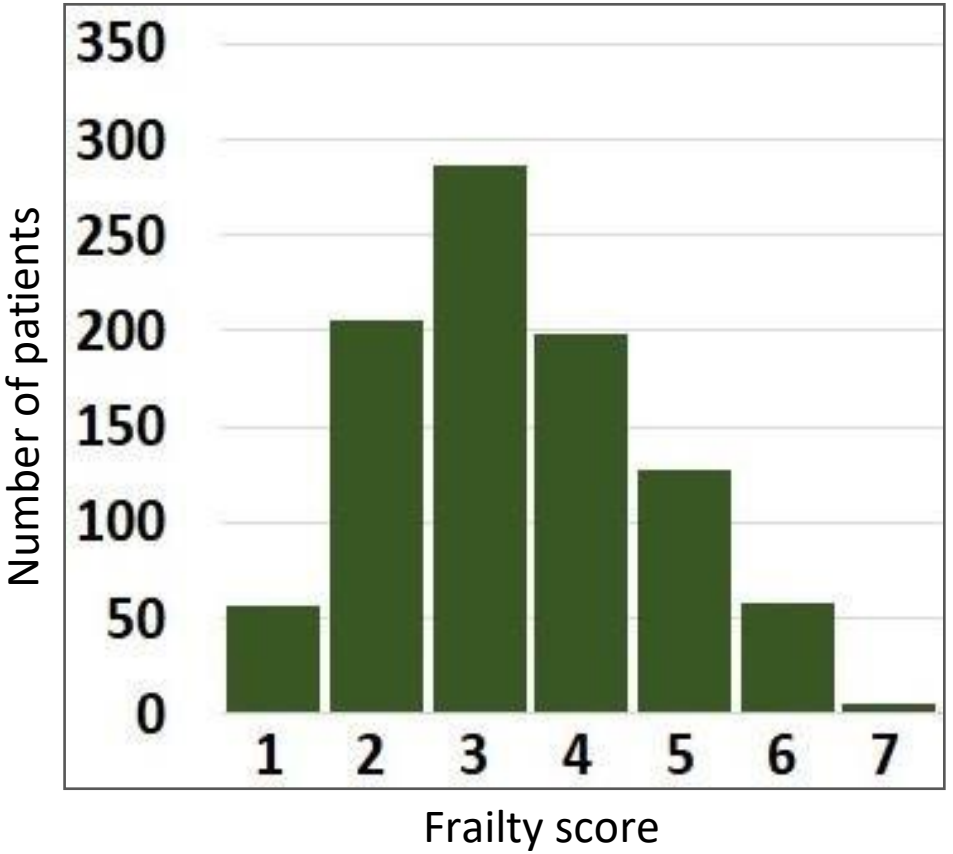
Results: Surgery performed



	N = (%)
Open	815, (87)
Lap converted to open	58, (6)
Completely laparoscopic	56, (6)
Laparoscopic assisted	6, (1)
Missing	2, (0)

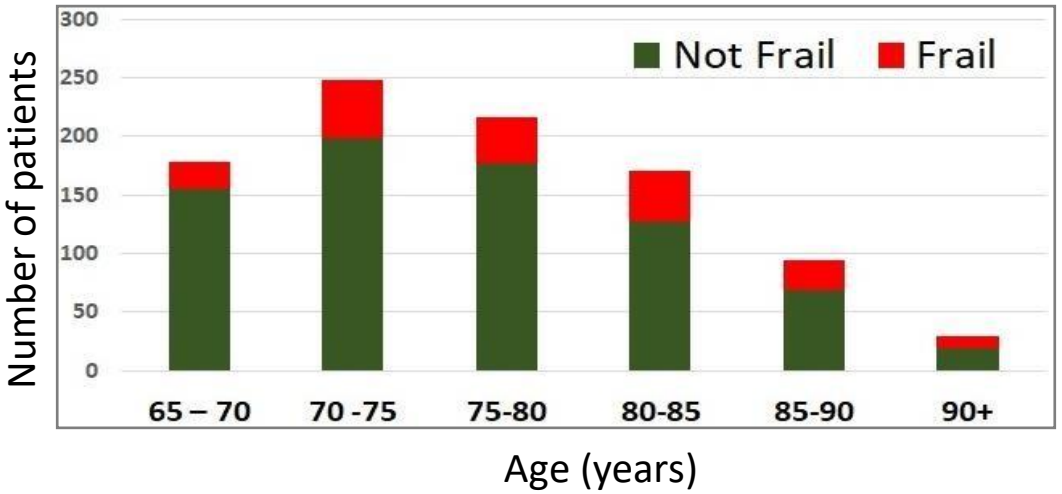
E L f Results: Clinical Frailty Score

- Frailty defined as a CFS ≥5
- Frailty present in 20% patients >65years

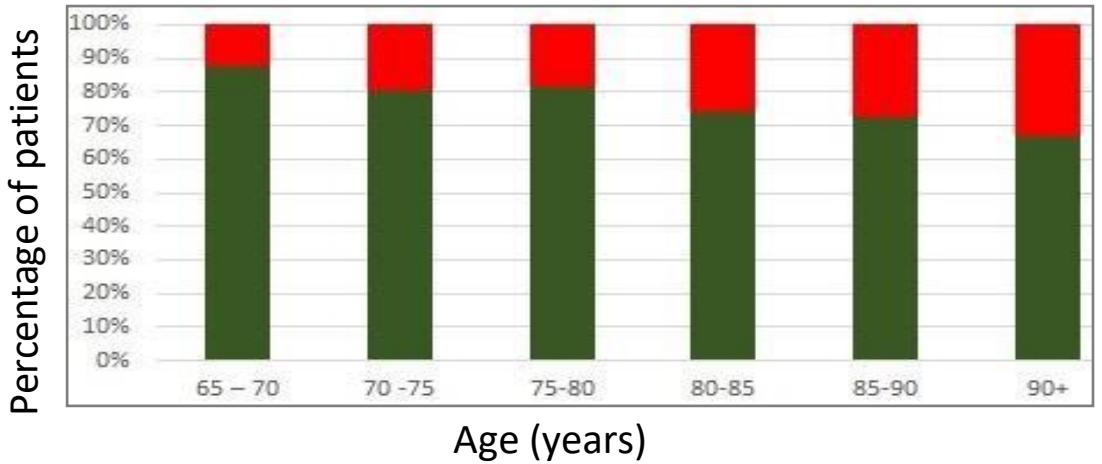


Results: Frailty by age

Actual number of patients in each age group

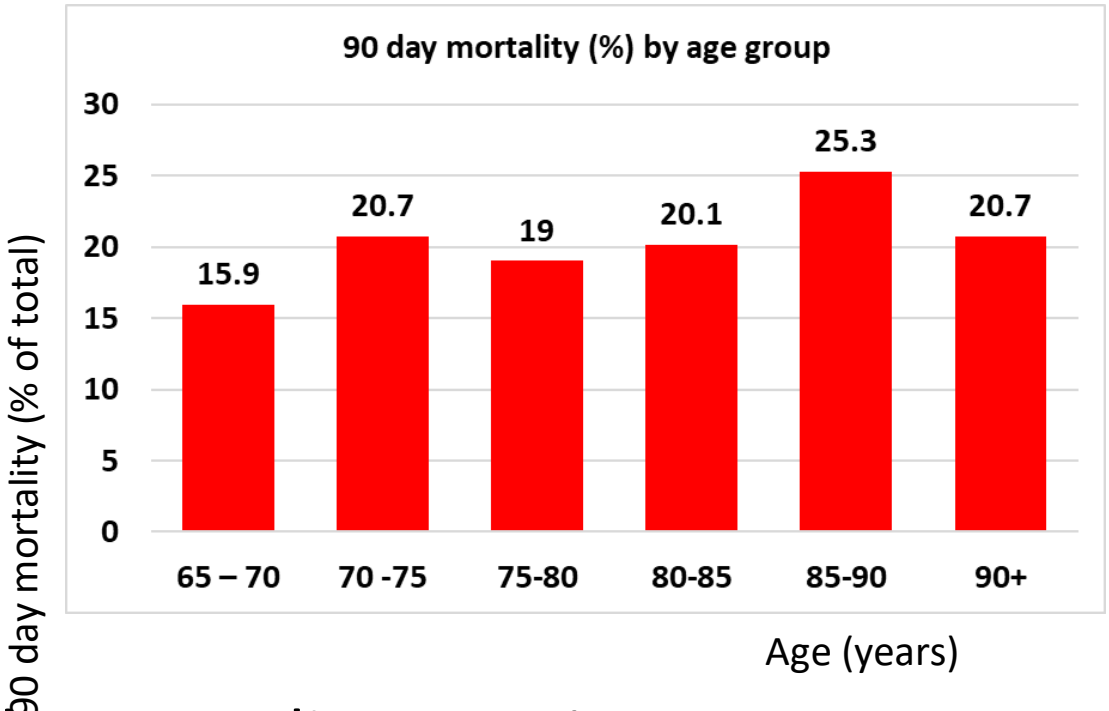


Percentage of each age group scored as frail



Frailty present throughout all age subgroups of the older adult

Results: 90 day mortality



Overall 90-day mortality 19.5%

E L f 90 day Mortality risk by CFS

90 Day Mortality	Crude OR (95% CI)	p-value	aOR* (95% CI)	p-value
1 (Very Fit) – Reference				
2 Well	0.82 (0.31 to 2.17)	0.69	**0.84** (0.32 to 2.22)	0.72
3 Managing well	1.36 (0.54 to 3.40)	0.51	**1.38** (0.55 to 3.46)	0.49
4 Vulnerable	3.12 (1.25 to 7.75)	0.014	**3.15** (1.27 to 7.84)	**0.014**
5 Mildly frail	3.12 (1.24 to 7.99)	0.017	**3.18** (1.24 to 8.14)	**0.016**

6&7 Moderately & severely frail	5.89 (2.19 to 15.86)	0.001	**6.10** (2.26 to 16.45)	**<0.001**

*(*OR adjusted for age and sex)*

E L f 30 day Mortality risk by CFS

30 Day Mortality	Crude OR (95% CI)	p-value	aOR* (95% CI)	p-value
1 (Very Fit) – Reference				
2 Well	1.99, (0.43 to 9.07)	0.38	**2.05** (0.45 to 9.37)	0.72
3 Managing well	3.08, (0.71 to 13.40)	0.13	**3.11** (0.71 to 13.57)	0.49
4 Vulnerable	7.41, (1.72 to	0.007	**7.49** (1.73 to	**0.014**

E L f 30 day Complications by CFS

	42.23)		42.91)	
6&7 Moderately & severely frail	10.04, (2.17 to 46.34)	0.003	**10.40** (2.24 to 48.18)	**<0.001**

*(*OR adjusted for age and sex)*

90 Day Mortality	Crude OR (95% CI)	p-value	aOR* (95% CI)	p-value
1 (Very Fit) – Reference				
2 Well	1.82 (0.91 to 3.63)	0.09	**1.85** (0.92 to 3.71)	0.08
3 Managing well	2.14 (1.09 to 4.21)	0.03	**2.20** (1.11 to 4.34)	**0.02**
4 Vulnerable	3.95 (1.95 to 8.01)	<0.001	**4.06** (1.99 to 8.22)	**<0.001**
5 Mildly frail	4.42 (2.11 to 9.24)	<0.001	**4.56** (2.17 to 9.60)	**0.001**
6&7 Moderately & severely frail	3.78 (1.64 to 8.73)	0.002	**3.92** (1.69 to 9.10)	**0.001**

*(*OR adjusted for age and sex)*

ICU Stay by Frailty

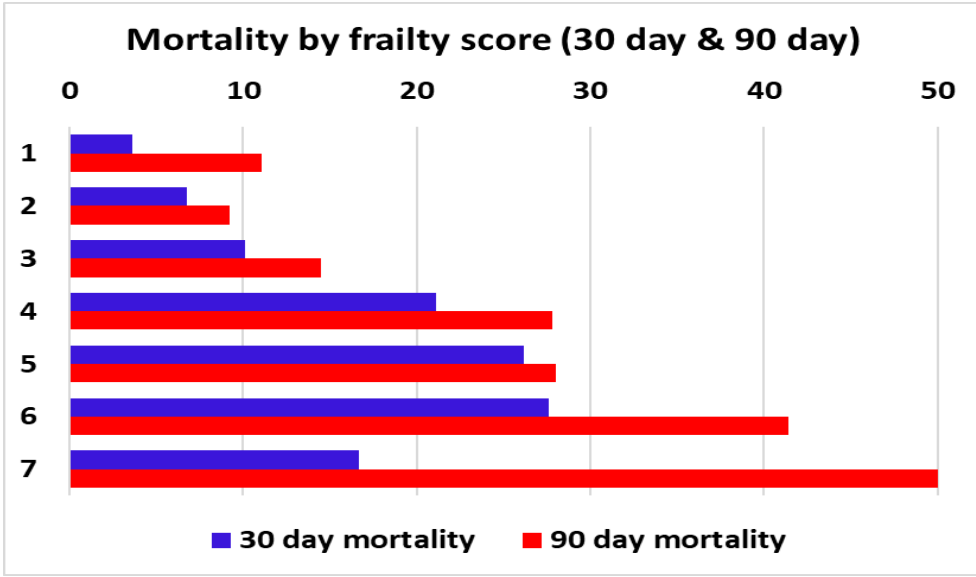
90 Day Mortality	Crude OR (95% CI)	p-value	aOR* (95% CI)	p-value
1 (Very Fit) – Reference				
2 Well	1.45, (0.82 to 2.59)	0.21	**1.50** (0.84 to 2.66)	0.17
3 Managing well	1.79, (1.02 to 3.13)	0.04	**1.89** (1.08 to 3.29)	**0.03**
4 Vulnerable	2.21, (1.24 to 3.95)	0.008	**2.31** (1.30 to 4.11)	**0.005**
5 Mildly frail	2.11, (1.14 to 3.89)	0.02	**2.15** (1.15 to 3.96)	**0.02**

6&7 Moderately & severely frail	4.00, (2.00 to 7.98)	<0.001	**4.18** (2.11 to 8.03)	**<0.001**

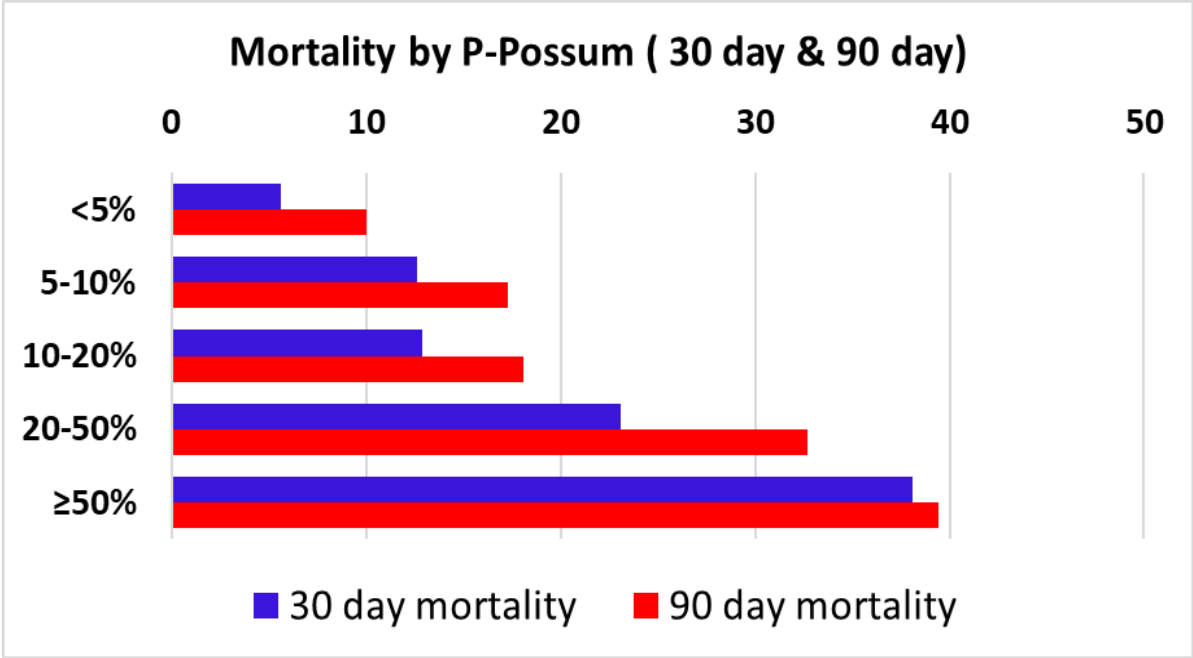
*(*OR adjusted for age and sex)*

E L f Frailty Vs P-Possum

Frailty Score	30 day mortality	90 day mortality
1	3.6	11.1
2	6.8	9.2
3	10.1	14.5
4	21.1	27.8
5	26.2	28.0
6	27.6	41.4
7	16.7	50.0



P-Possum	30 day mortality	90 day mortality
<5%	5.6	10.0
5-10%	12.6	17.3
10-20%	12.9	18.1
20-50%	23.1	32.7
≥50%	38.1	39.4



Summary

- Overall 90 day mortality 19.5%
- Frailty present in 20% and independent of age
- Increasing frailty score correlates with:
    - 90-day mortality
    - 30-day mortality

- Post-operative complications
- Length of hospital and ICU stay

Implications

- First score for older adults undergoing Emergency Laparotomy
- Improved our understanding of this group
- Simple to use
- Highlights opportunity to intervene in frail patients
    - Frailty is modifiable
    - Majority of NELA participating hospitals have access to geriatricians

- Concept that patients may understand – shared decision making

- **Frailty scoring should be integrated in acute surgical practice**

Dissemination – Oral Presentations

- **2018 (May):** Association of Surgeons of Great Britain International Surgical Congress Liverpool, England
- **2018 (July):** Association of Coloproctology of Great Britain and Ireland Annual Meeting Birmingham, England
- **2018 (Nov):** Scottish Society Anaesthetists/ Royal College Anaesthetists Joint Meeting Dundee, Scotland

- **2018 (Nov):** Association of Surgeons of Great Britain Emergency Laparotomy Meeting
  Birmingham, England
- **2019 (April):** British Geriatric Society Spring Meeting
  Cardiff, Wales
- **2019 (July):** Association of Coloproctology of Great Britain and Ireland Annual Meeting
  Dublin, Ireland
  (Winner of ACPGBI British Journal of Surgery Prize for Best Paper)

Dissemination – Publications

- Parmar KL, Pearce L, Farrell I, Hewitt J, Moug S. Influence of frailty in older patients undergoing emergency laparotomy: a UK-based observational study. ***BMJ Open*** 2017;7(10):e017928. Published 2017 Oct 6. doi:10.1136/bmjopen-

2017-017928

- Parmar KL, Law J, Carter B, Hewitt J, Boyle JM, Casey P, Maitra I, Farrell IS, Pearce L, Moug SJ and the ELF Study Group. Frailty in Older Patients Undergoing Emergency Laparotomy: Results From the UK Observational Emergency Laparotomy and Frailty (ELF) Study.
  Annals of Surgery 2019 Jun 7. doi: 10.1097/SLA.0000000000003402
  [Epub ahead of print]