

Emergency Surgical Patients – why and how to start a Geriatrician Liaison Service

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Aim

- Why we need Geriatric Surgical Liaison Services?
- NELA – national, regional and local
- Risk calculators – can we prioritise effectively and guide decision making process?
- What can we do to improve patient outcomes?
- Outline UHND service that started in Dec 2015
- Present some data – e.g. patient numbers

The ageing problem in surgery

- Ageing associated with reduced physiological reserve, frailty and multiple co-morbidities¹
- Increased risk of adverse outcome after emergency abdominal surgery²
- Complex medical, nursing and social issues

¹Barnett K et al. Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. *Lancet* 2012;380(9836):37–43.

²Ingraham AM et al. Variation in quality of care after emergency general surgery procedures in the elderly. *J Am Coll Surg* 2011;212(6):1039–1048

NCEPOD 2010: An age old problem³

- *“Routine daily input from Medicine for the Care of Older People should be available to elderly patients undergoing surgery and is integral to inpatient care pathways in this population”*
- Highlights importance of frailty, disability, co-morbidity and nutrition
- Emphasises MDT approach

³ http://www.ncepod.org.uk/2010report3/downloads/EESE_fullReport.pdf

Fourth NELA Report 2018⁴

- Almost half of patients undergoing emergency laparotomy were over 70 years of age.
- A fifth of patients over the age of 70 died within 30 days of surgery
- Longer length of stay
- 23% of patients >70 years and 34% >90 years had an assessment by an MCOP specialist after surgery.
- *Recommendations:*
“early involvement of a Medicine for Care of the Older Person (MCOP) specialist in the care of older patients”.

⁴NELA report 2018 – Executive Summary (*Patients from Dec 2016 – Nov 2017*)

The implications of ageing in surgery

Over 70s account for 44% of all patients

Age Group	No of Pts	Freq (%)
18-39	2,657	11
40-49	2,212	10
50-59	3,477	15
60-69	4,773	20
70-79	5,954	25
80-89	3,987	17
>90	528	2

Figure 15.1 ONS 30-day and 90-day mortality, by age

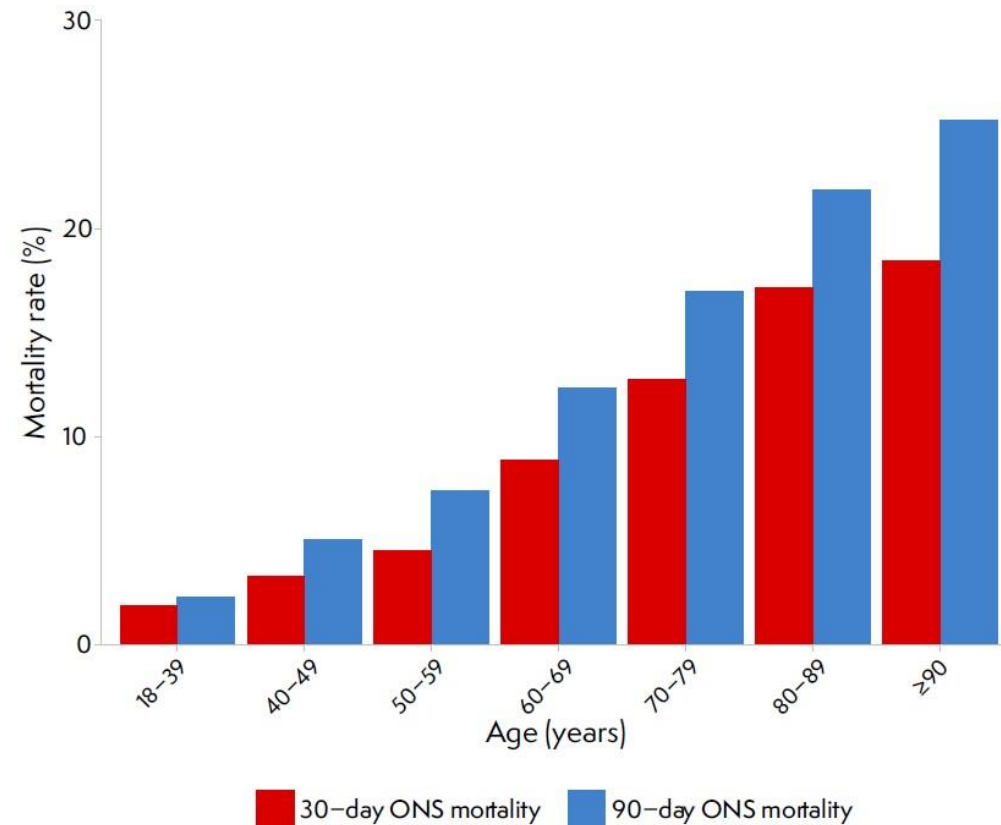
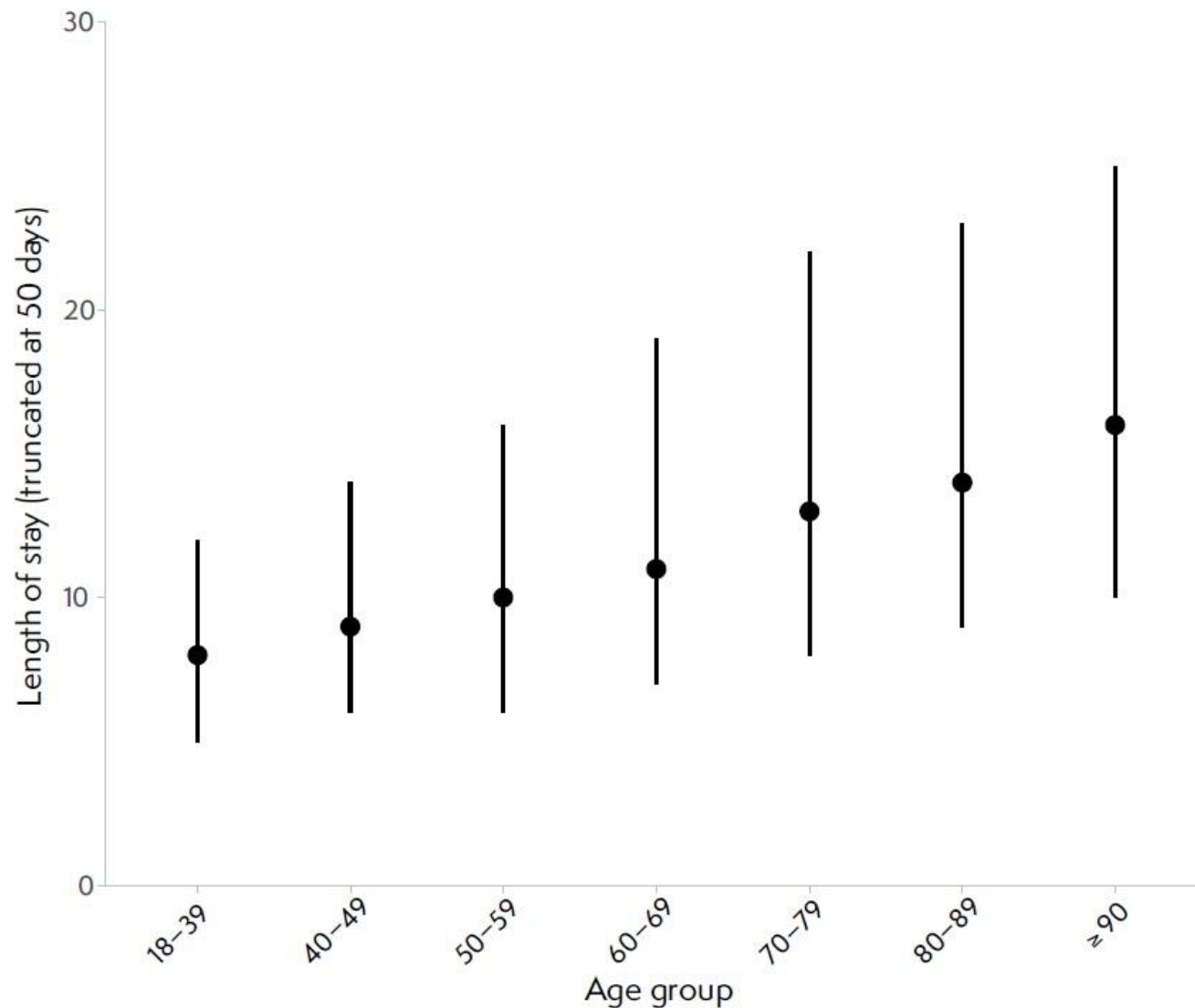


Table 2 and Figure 15 from NELA report (NELA, 2018)

Patient Stay by Age – NELA report, 2018

Figure 15.2 Postoperative length of stay in patients surviving to hospital discharge, by patient age



1 **23,929 patients** were entered into the audit, from **183 hospitals** in England and Wales.



2 The number of days a patient spends in hospital has fallen further, to **15.6 days in 2017** down from **16.6 days in 2016** and **19.2 days in 2013**, when NELA began.



3 This saved acute NHS Hospitals an estimated **108,000 bed days** and **£34 million** in 2017.



4 Since 2013, national **30-day mortality rate** has fallen from **11.8% to 9.5%**



5 This means that **~700 fewer patients die each year** after emergency laparotomy surgery.



6 **77% of patients are alive** at one year post-surgery, **71%** at two years, and **66%** at three years.



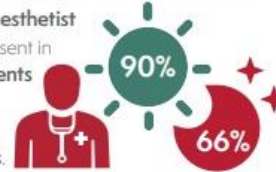
7 **87% of patients received a pre-operative CT scan** compared to **80%** when NELA began, a sustained improvement.



8 **76% of patients with sepsis did not receive antibiotics within timescales** This should happen within **1 hour** of diagnosis.



9 Both a **consultant anaesthetist and surgeon** were present in theatre for **90%** of patients during the daytime, but only **66%** of patients out of hours.



10 **27%** of patients needing the most urgent surgery did not get to the operating theatre in the recommended timeframes.



11 **25-35 critical care beds are needed every day** to care for emergency laparotomy patients. **90%** of patients with a pre-operative risk score of **>10%** went to critical care.



12 **77%** ~Half of patients are aged over 70, but were not seen by a geriatrician

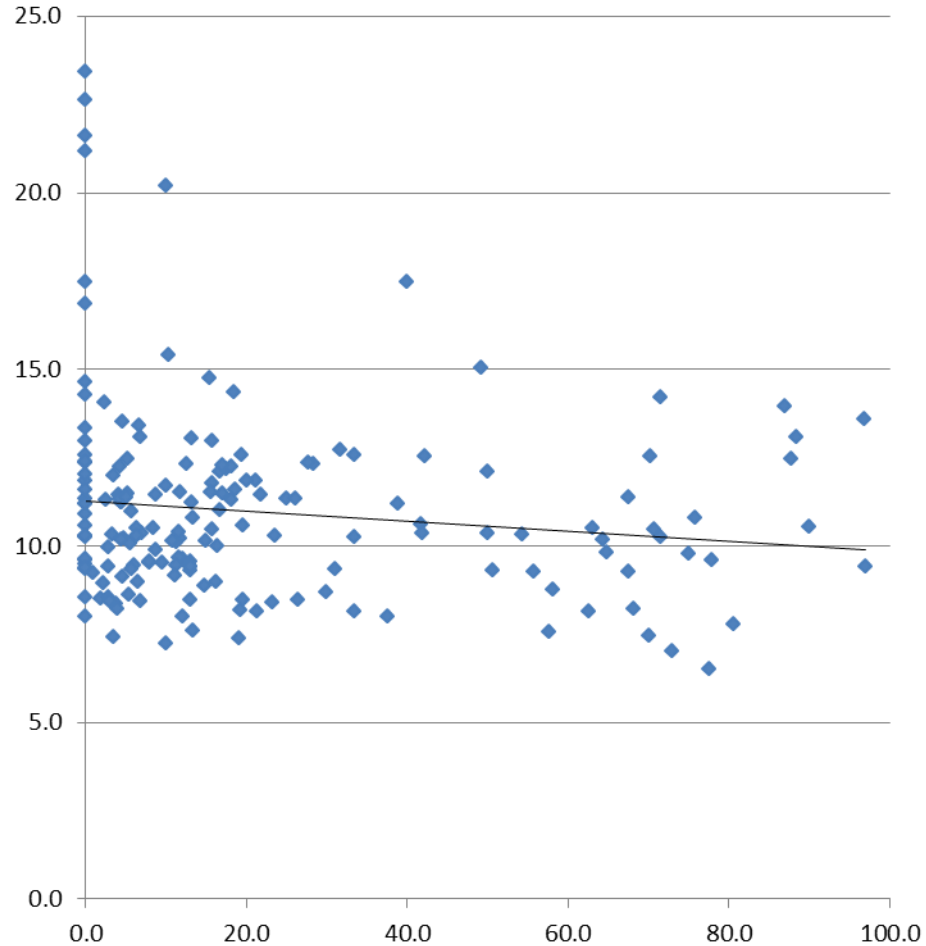


Academic Health Services Network - from NELA report 2018

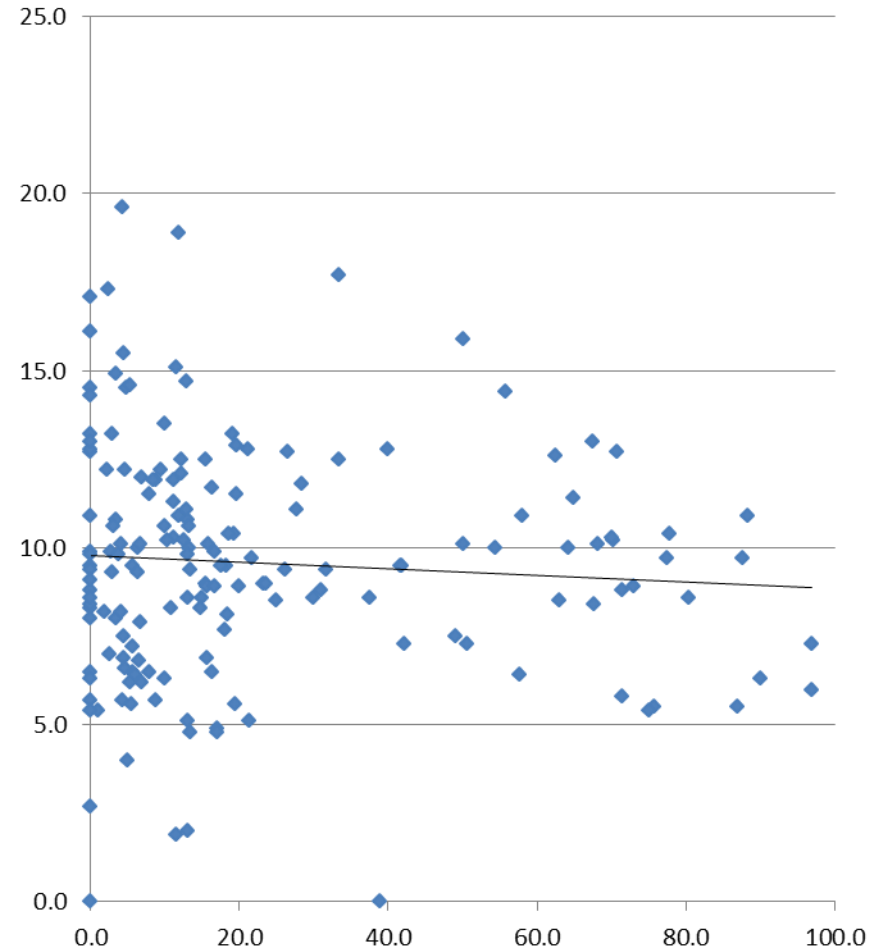
Hospital	Number of cases in year 4	Adjusted Mortality Rate (%)	Over 70s seen by Geriatrician (%) (National = 21%) AHSN = 32%	Length of stay post operative (days)
Darlington	97	6.5	7.9	10
Durham	137	6.0	96.9	9
Freeman	84	10.6	10.0	20
Northumbria	269	8.9	73.0	7
North Tees	150	8.6	80.5	8
Gateshead	100	14.7	12.8	9
RVI	214	8.5	63.0	10
JCUH	150	10.9	11.8	11
South Tyneside	77	12.9	19.5	11
Sunderland	196	9.8	0.0	10

Assoc between outcomes and Geriatrician review

Median Post-op Length of stay in patients surviving to discharge



Adjusted Mortality Rate (%)



Summary of the problem

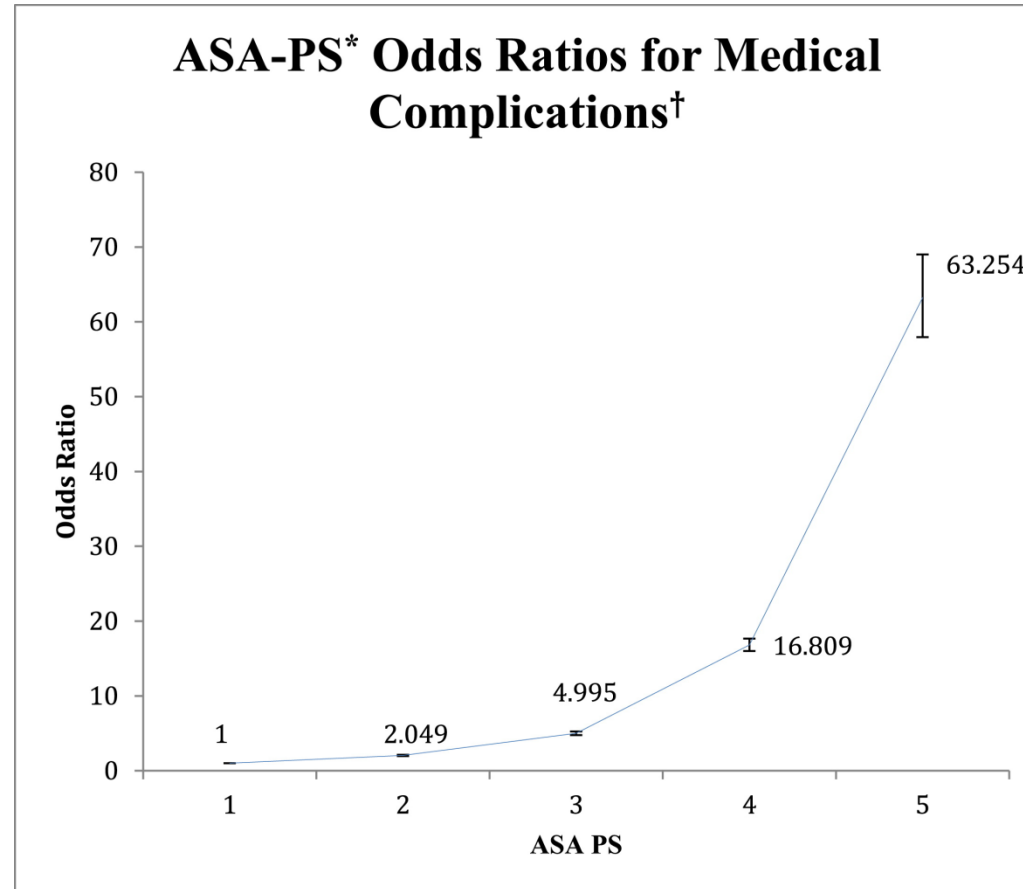
- Increasingly older patients are having major emergency surgery
- Increased length of stay and mortality
- Despite this, the proportion of over 70s seen by a Geriatrician has remained very poor – only 23% (*last quarterly report showed 32%*)
- Large centers of excellence – but only 7 out of 165 managed to see over 80% of over 70s
- (*UHND, UHNT, Royal Derby, Royal Preston, Romford, King's, Bronglais*)

What frailty scores are useful and evidence based?

- Edmonton Frail scale?
- Clinical Frail Scale?
- Modified Frailty Index?

- It is useful to remember why we calculate them – we want to help risk stratify and guide treatment plans

ASA and outcomes



*American Society of Anesthesiologists Physical Status Classification

†Error Bars denote 95% confidence interval

(Hackett et al, 2015)

First of all – what is frailty?

- “A physiological syndrome characterised by decreased reserve and reduced resistance to stressors, resulting from cumulative decline across physiological systems resulting in vulnerability to adverse outcomes”
 - (Ferruci et al, 2004)
- In other words, somebody who is frail is more likely to have a bad outcome if put under the same stressor (e.g. surgery) as somebody who is not frail.

How do we detect/measure frailty?

- **Frailty scores** (based on the phenotypic definition of frailty)
 - E.g Cardiovascular Health Study Frailty Score (Fried et al, 2001)
 - E.g Edmonton Frail Scale (Rolfson et al, 2006)
- **Frailty indexes** (frailty in relation to deficit accumulation)
 - E.g Frailty Index using the Comprehensive Geriatric Assessment (FI-CGA) tool (Jones et al, 2004)
 - E.g. Modified Frailty Index (Farhat et al, 2012)

Edmonton Frail Scale (EFS)

- Edmonton, Alberta, Canada (Rolfson et al, 2006)
- Patients over the age of 65
- 158 patients included, mean age 80.4
- Completed by non-medically trained individual
- Takes less than 5 minutes
- Further validation studies, particularly in the surgical pre-op clinics
- Like a mini-CGA – highlights areas that require further attention
- Is being utilised widely now – including POPS

Edmonton Frail Scale

Frailty Domain	Item	0 Point	1 Point	2 Points
Cognition	Clock drawing, “ten after eleven”	No errors	Minor spacing errors	Other errors
General Health Status	In the past year, how many times admitted to hospital?	0	1-2	3+
	In general, how would you describe your health?	Excellent, Very Good, Good	Fair	Poor
Functional independence	With how many of the following do you require help? Meals, Shopping, Transportation, Telephone, Housekeeping, Laundry, Managing money, Taking meds	0 – 1	2 – 4	5 – 8
Social Support	When you need help, can you count on someone who is willing and able to meet your needs?	Always	Sometimes	Never
Medication Use	Do you use five or more different prescription meds on a regular basis?	No	Yes	
	At times, do you forget to take your prescription medications?	No	Yes	

Edmonton Frail Scale

Frailty Domain	Item	0 Point	1 Point	2 Points
Nutrition	Have you recently lose weight such that your clothing has become looser?	No	Yes	
Mood	Do you often feel sad or depressed?	No	Yes	
Continence	Do you have a problem with losing control of urine when you don't want to?	No	Yes	
Functional Performance	Timed Up and Go (Get up from chair, walk 3 metres, return to chair and sit down)	0 – 10 s	11 – 20 s	>20 s Unwilling, Req assist
Totals	Final score is the sum of column totals			

It is hard to use this in the emergency setting
 – even though excellent in the elective setting

CFS (7) predicts mortality

- 2,279 patients, including patients not having surgery – median age of 54
- Primary end point was 90 day mortality
- There is an increase in poor outcomes with frailty detected by the CFS
- Limitations include that the study is not specifically NELA patients
- Still awaiting linear relationship like that seen with MFI (*ELF study still awaiting full publication*)

Clinical Frailty Scale

(Rockwood et al, 2005)

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

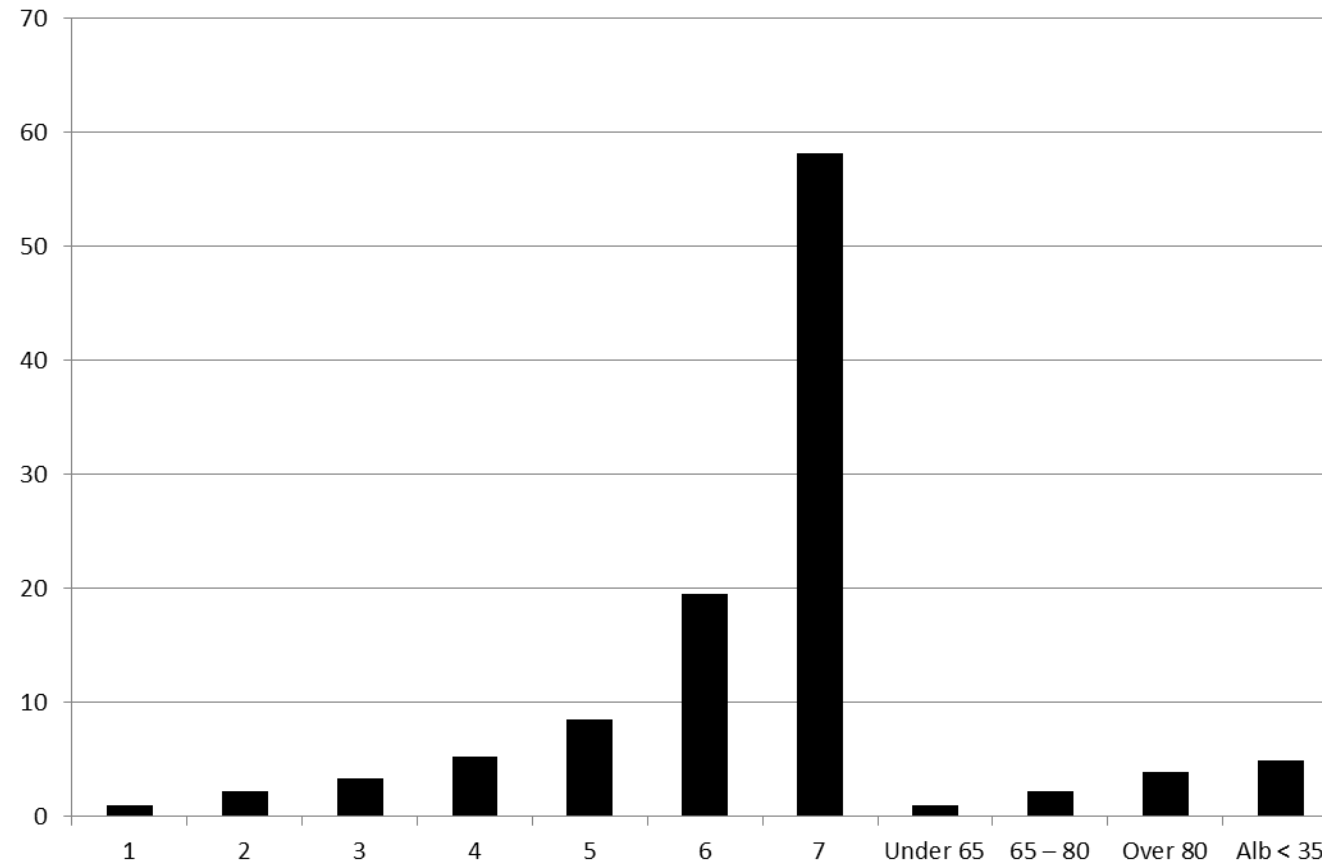
Note: CSHA = Canadian Study of Health and Aging.

CFS (7) predicts mortality

Variable	Level	Unadjusted OR	P value	Adjusted OR	P value
CFS	1	Ref		Ref	
	2	2.25	0.029	1.68	0.175
	3	3.34	0.001	1.63	0.211
	4	5.26	<0.001	2.09	0.071
	5	8.54	<0.001	2.62	0.022
	6	19.5	<0.001	5.39	<0.001
	7	58.2	<0.001	24.6	<0.001
Age	Under 65	Ref		Ref	
	65 – 80	2.26	0.002	1.72	0.043
	Over 80	3.88	<0.001	3.28	<0.001
Albumin	< 35	4.85	<0.001	4.55	<0.001

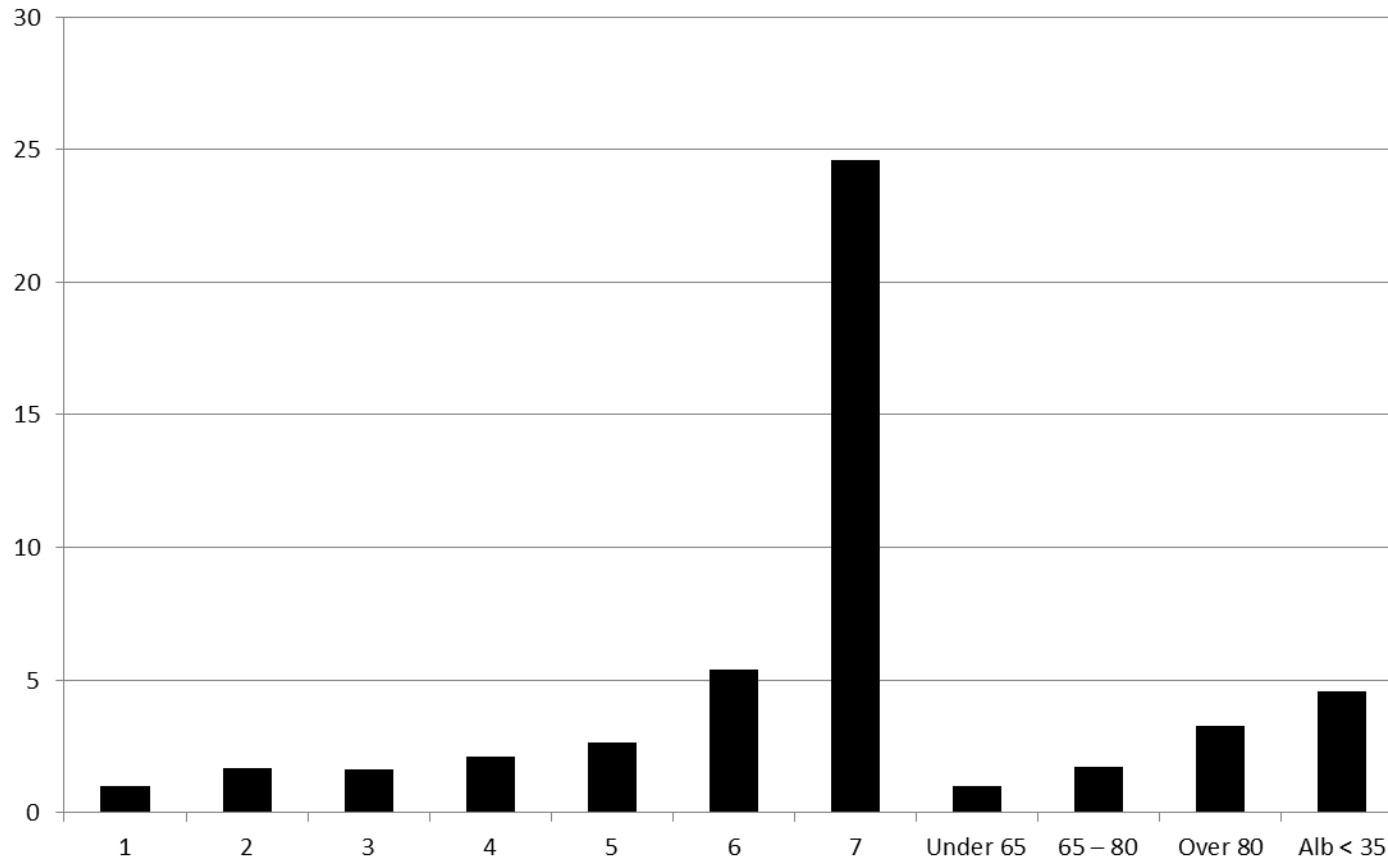
Table 2 from “Frailty predicts mortality in all emergency surgical admissions regardless of age. An observational study”. (Hewitt et al, 2019)

CFS (7) and mortality at 90 day - Unadjusted OR



Generated from Table 2 from “Frailty predicts mortality in all emergency surgical admissions regardless of age. An observational study”. (Hewitt et al, 2019)

CFS (7) and mortality at 90 day - Adjusted OR



Generated from Table 2 from “Frailty predicts mortality in all emergency surgical admissions regardless of age. An observational study”. (Hewitt et al, 2019)

CFS predicts mortality

- **Clinical Frail Scale (9 points) is now requested as part of the NELA data set**

- (1 – 3) – Not frail
- 4 – Vulnerable
- 5 – Mildly frail
- 6 – Moderately frail
- 7 – Severely frail – completely dependent for personal care
- 8 – Very severely frail
- 9 – Terminally ill

- *1 – Robust, active, commonly exercise regularly*
- *2 – Without active disease but less fit than category 1*
- *3 – Disease symptoms are well controlled*
- *4 – Commonly complain of being slowed up or disease symptoms*
- *5 – Limited dependence on others for IADLs*
- *6 – Help is needed with BADLs and IADLs*
- *7 – Completely dependent for all BADLs and IADLs*
- *8 – Completely dependent, approaching end of life*
- *9 – Life expectancy <6 months, but not otherwise frail*
- (Taken from Moorhouse and Rockwood, 2012) – highly recommended reading!

Modified Frailty Index

- Farhat et al, 2012 developed MFI, **a deficit accumulation model of frailty** (11 items)
- Developed in emergency admission unit (>35,000 pts)
- Diabetes Mellitus
- Congestive Heart Failure
- Hypertension
- TIA/CVA
- Functional status 2 (not independent)
- Myocardial infarction
- Peripheral vascular disease
- CVA with neurological deficit
- COPD/pneumonia
- Impaired sensorium
- PCI/PCS/Angina.
- MFI = No. of variables / 11

Deficit Accumulation FI for Acute Surgical Patients

<p>Modified Frailty Index (MFI) (Farhat et al, 2012)</p>	<p>11 items –</p> <ul style="list-style-type: none"> • Diabetes Mellitus • Congestive Heart Failure • Hypertension, • TIA/CVA, • Functional status 2 (not independent), • Myocardial infarction • Peripheral vascular disease • CVA with neurological deficit • COPD/pneumonia • Impaired sensorium • PCI/PCS/Angina. 	<p>Each variable scores 1 point, then divide by 11= MFI (Deficit accumulation model)</p>	<p>Acute admission for emergency surgery, mostly GI surgery 35,334 patients</p>	<p>Morbidity including complications such as wound infections 30-day Mortality</p>
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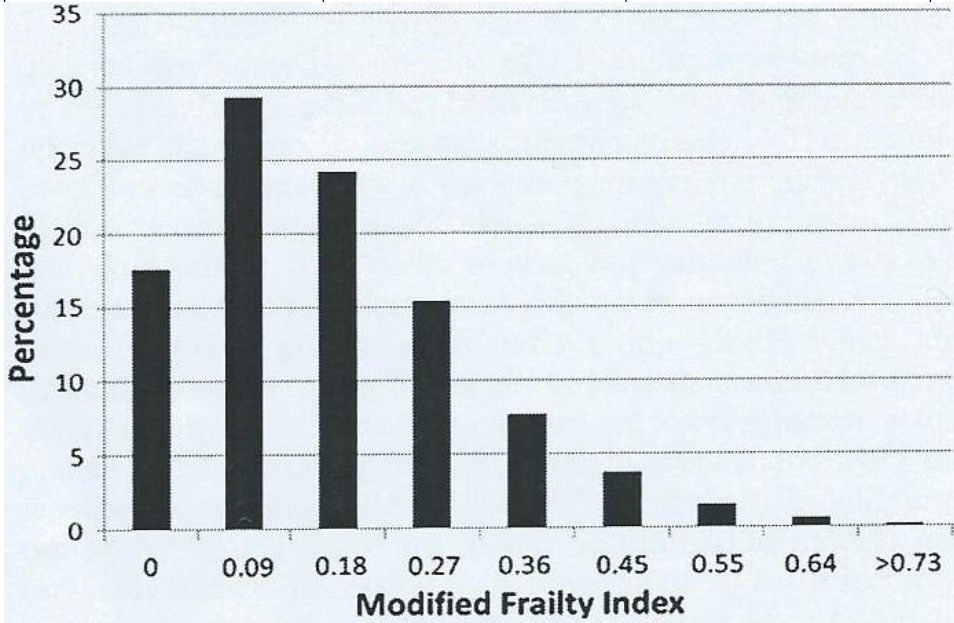
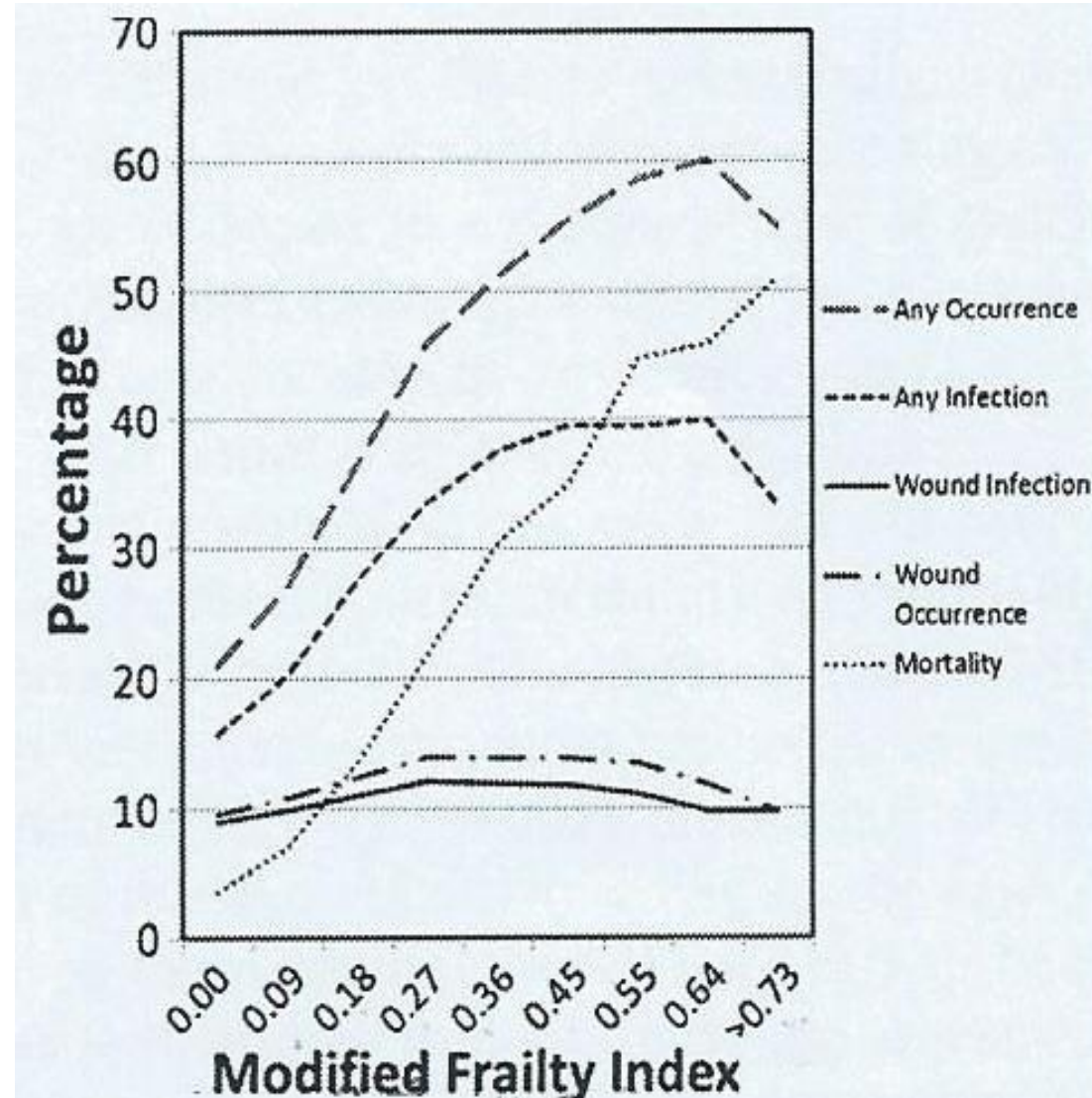


Figure 1. Distribution of MFI across population. Most common frailty index score was 0.09.

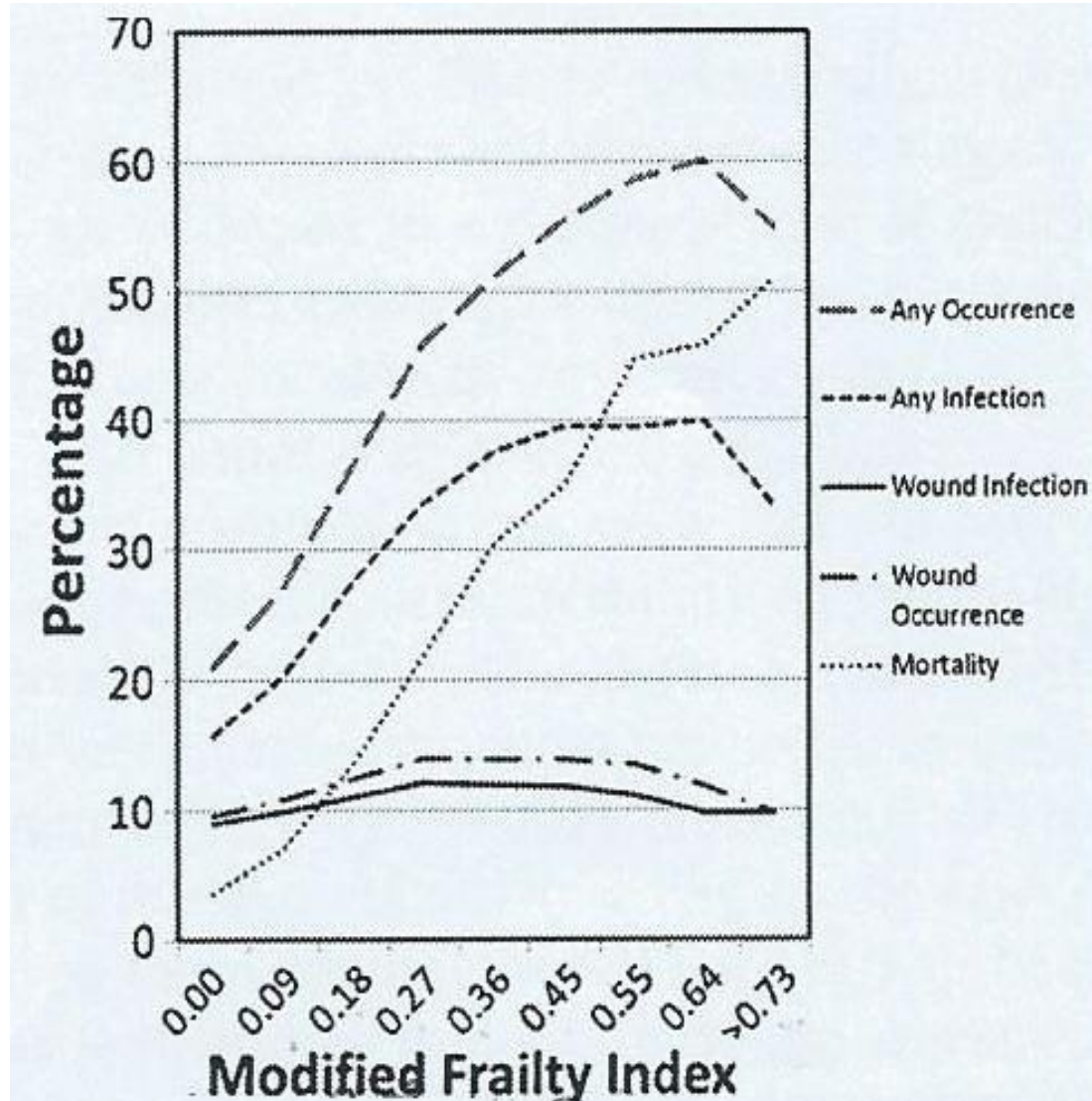
Modified Frailty Index

- The power of deficit accumulation models is that they can generate linear relationships with outcomes, such as mortality, wound infections etc
- Referral cut off is set as 3/11 for non-NELA



Modified Frailty Index

- The downside is that it uses less than 30 variables, which is what Rockwood recommends as the minimum
- Frailty vs co-morbid?
- Risk calculator is important when limited resource – patient triage



Electronic Frailty Index?

Electronic Frailty Index (eFI)

- Dr Andrew Clegg and team at Leeds University
- Validated using commonly available GP data
- 931,541 patients, aged 65 - 95
- Useful for risk stratifying patients
- TPP, EMIS Health and Vision (100% of GPs)
- Endorsed by NICE and RCP
- $eFI = \text{Number of variables} / 36$
- Fit, Mild, Moderate and Severe Frailty
- (Clegg et al, 2016)

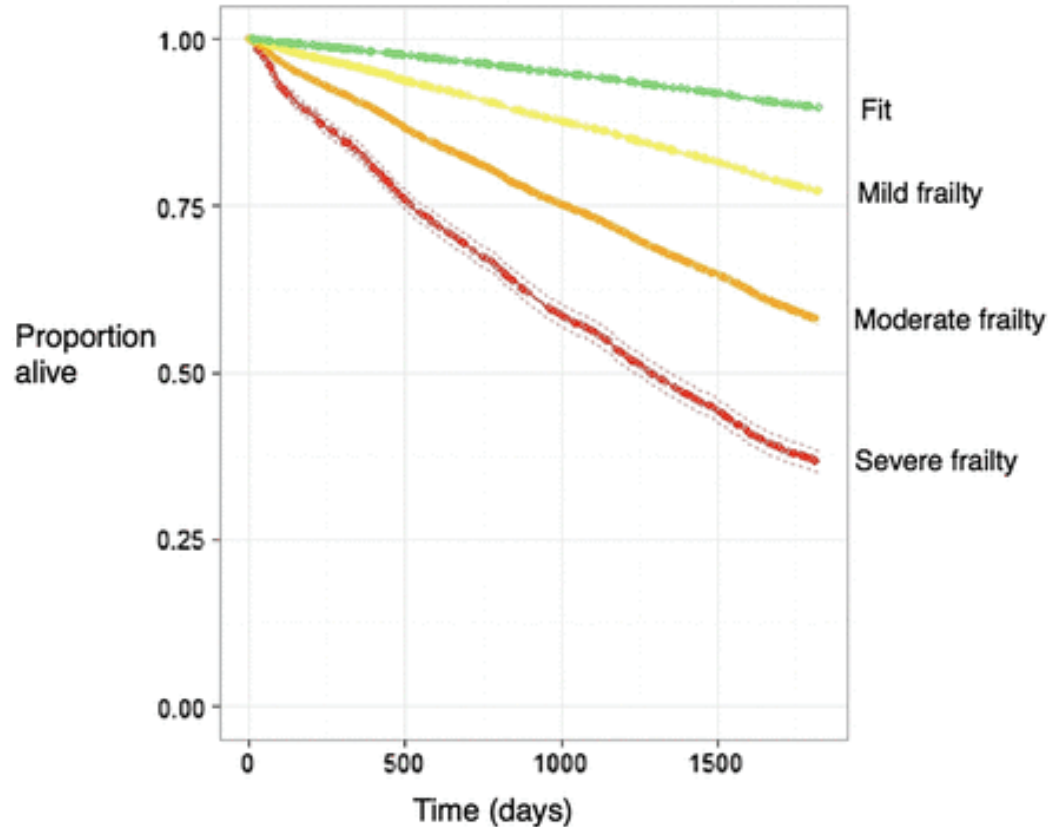
Electronic Frailty Index (eFI)

Characteristic	Development cohort (n = 207,814)	Internal validation cohort (n = 207,720)	External validation cohort (n = 516,007)
Age (years)	75.0 (7.2)	75.0 (7.3)	75.0 (7.3)
Gender			
Male	45%	45%	44%
Female	55%	55%	56%
FI score: mean (SD)	0.14 (0.09)	0.14 (0.09)	0.15 (0.10)
FI score 99th centile	0.49	0.49	0.42
Frailty category			
Fit (0 – 0.12)	50%	50%	43%
Mild (>0.12 – 0.24)	35%	35%	37%
Moderate (>0.24 – 0.36)	12%	12%	16%
Severe (>0.36)	3%	3%	4%
Number of comorbidities	2.1 (1.2)	2.2 (1.1)	2.3 (1.3)
Number of medications	8 (8.0)	8 (8.1)	9 (6.8)

Electronic Frailty Index (eFI)

- Activity limitation
- Anaemia and haematinic deficiency
- Arthritis
- Atrial Fibrillation
- Cerebrovascular disease
- Chronic kidney disease
- Diabetes
- Dizziness
- Dyspnoea
- Falls
- Foot problems
- Fragility fracture
- Hearing impairment
- Heart failure
- Heart valve disease
- Housebound
- Hypertension
- Hypotension/syncope
- Ischaemic heart disease
- Memory and cognitive problems
- Mobility and transfer problems
- Osteoporosis
- Parkinsonism and tremor
- Peptic ulcer
- Peripheral vascular disease
- Polypharmacy (*over 5 medications*)
- Requirement for care
- Respiratory disease
- Skin ulcer
- Sleep disturbance
- Social vulnerability
- Thyroid Disease
- Urinary incontinence
- Urinary system disease
- Visual impairment
- Weight loss and anorexia

Electronic Frailty Index (eFI)

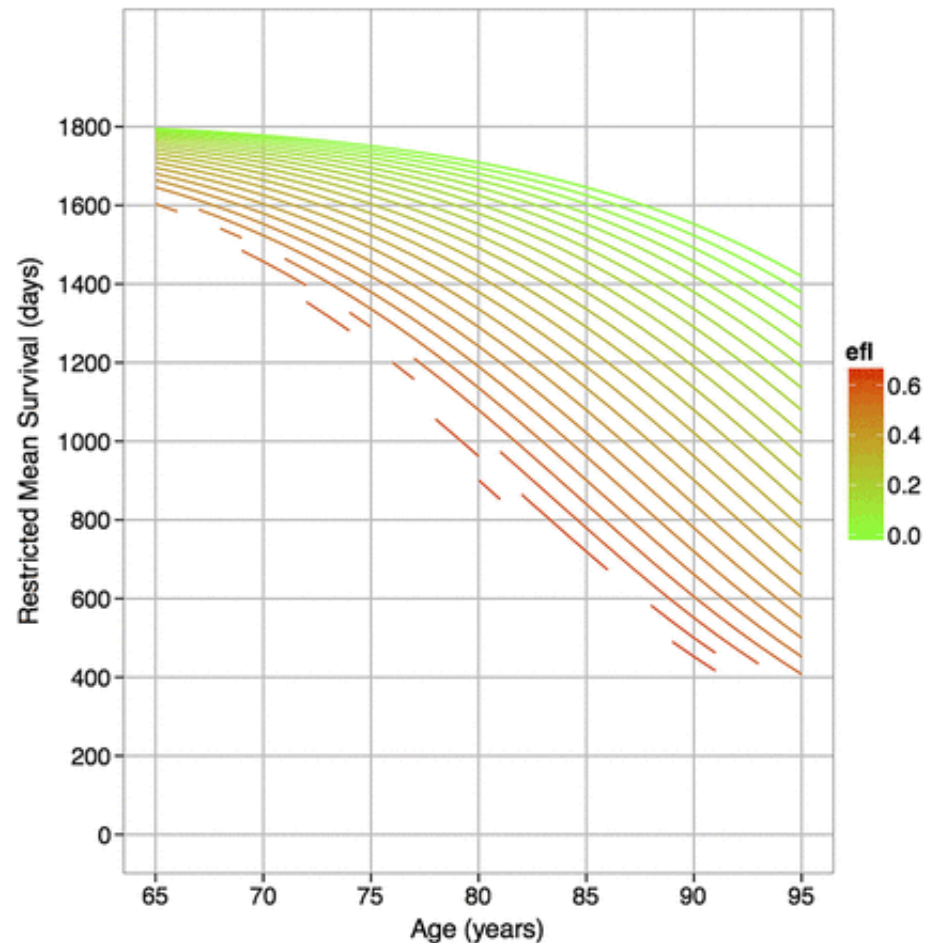


- Fit (0 – 0.12)
- Mild (>0.12 – 0.24)
- Moderate (>0.24 – 0.36)
- Severe (>0.36)

- Risk stratification for:
 - Mortality
 - Hospital admissions
 - Nursing Home Adm

- Figure 1 is independent of age

Electronic Frailty Index (eFI)



- Fit (0 – 0.12)
- Mild (>0.12 – 0.24)
- Moderate (>0.24 – 0.36)
- Severe (>0.36)

- Figure 2 shows that increasing eFI reduces life expectancy at any age

Electronic Frailty Index (eFI)

- It seems a good tool for identifying those at risk of negative outcomes using GP data
- Already has good evidence for risk assessment for hospital admissions, institutionalisation and death (Clegg et al, 2016)
- Evidence for predicting post-operative outcomes is less clear, ease in emergency?!
- One study looked at 860,649 operations does suggest that it correlates well with change in eFI after surgery and survival (Narganes et al, 2018)

NELA Risk Score

- Similar to P-POSSUM scoring but more accurate for NELA
- Free Downloadable App
- <http://data.nela.org.uk/riskcalculator/>

NELA Risk Score

- Variables – Age, Gender, ASA score, Na, K, Ur, Cr, Hb, WCC, Pulse rate, Systolic BP, GCS
- ECG – N, AF + AF (fast)
- Cardiac signs and CXR
- Breathlessness and CXR
- Operation severity
- Blood loss
- Peritoneal soiling
- Malignancy?
- Urgency

NELA Risk Score

Patient name	A
Hospital Number	D
Age on arrival?	80
Sex	Male
Hospital / Ward	UHND
Consultant	Deane
What was the ASA score?	3: Severe systemic disease, not life-threatening
Serum sodium concentration (mmol/l)	145 mmol/l
Serum potassium concentration (mmol/l)	6.0 mmol/l
Serum urea concentration (mmol/l)	4.5 mmol/l
Serum creatinine (micromol/l)	123 micromol/l
Haemoglobin (g/l)	130 g/l
Serum white cell count ($\times 10^9 / l$)	12 $\times 10^9 / l$
Pulse rate (bpm)	90
Systolic blood pressure (mmhg)	120 mmhg
Glasgow coma scale	15
Select an option that best describes this patient's ECG	No abnormalities
Select an option that best describes this patient's cardiac signs and chest xray appearance	Diuretic, digoxin, antianginal or antihypertensive therapy
Select an option that best describes this patient's respiratory history and chest xray appearance?	Dyspnoea on exertion or CXR: mild COPD
Select the operative severity of the intended surgical intervention?	Major
Including this operation, how many operations has the patient had in the 30 day period prior to this procedure?	1
Based on your clinical experience of the intended surgery, please estimate the likely intraoperative blood loss (ml)	101-500
Please select a value that best describes the likely degree of peritoneal soiling	None
What severity of malignancy is anticipated to be present?	None
Please select the <i>urgency</i> of surgical intervention	2B. Urgent (6-18 hours)
Estimated mortality using NELA risk adjustment model:	<input type="text" value="13.1%"/>
Estimated morbidity using POSSUM risk adjustment model:	<input type="text" value="67.3%"/>

NELA Risk Score

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13.1%

Estimated morbidity using POSSUM risk adjustment model:

67.3%

Select an option that best describes this patient's cardiac signs and chest xray appearance	Diuretic, digoxin, antianginal or antihypertensive therapy
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Estimated mortality using NELA risk adjustment model:	13.1%
Estimated morbidity using POSSUM risk adjustment model:	67.3%

Emergency Surgical Frailty

- Frailty associated with poor outcomes
- No perfect frailty score currently
- Evidence base is growing
- Are they better than ASA? *(Hackett et al, 2015)*
- I would like to see the NELA website used to compare CFS, MFI, ASA, eFI and other frailty scores to see which one is the best at predicting outcomes

What is the point of frailty scores?

- The purpose of risk scores is to guide decision making – shared decision making
- Will the surgeon be willing to operate?
- Will the anaesthetist do it?
- Should they have surgery?
- What does the patient want?
- What are their priorities?
- Are they likely to return to their normal level of function?

Surgical Liaison Service UHND

- Commenced in University hospital of North Durham in December 2015
- Single geriatrician with an interest in surgical liaison and perioperative medicine
- Supporting 8 Consultant surgeons on a weekly basis
- Informal referral process
- Attendance at weekly surgical team meeting
- Support/Educate Junior Doctors

Results of UHND

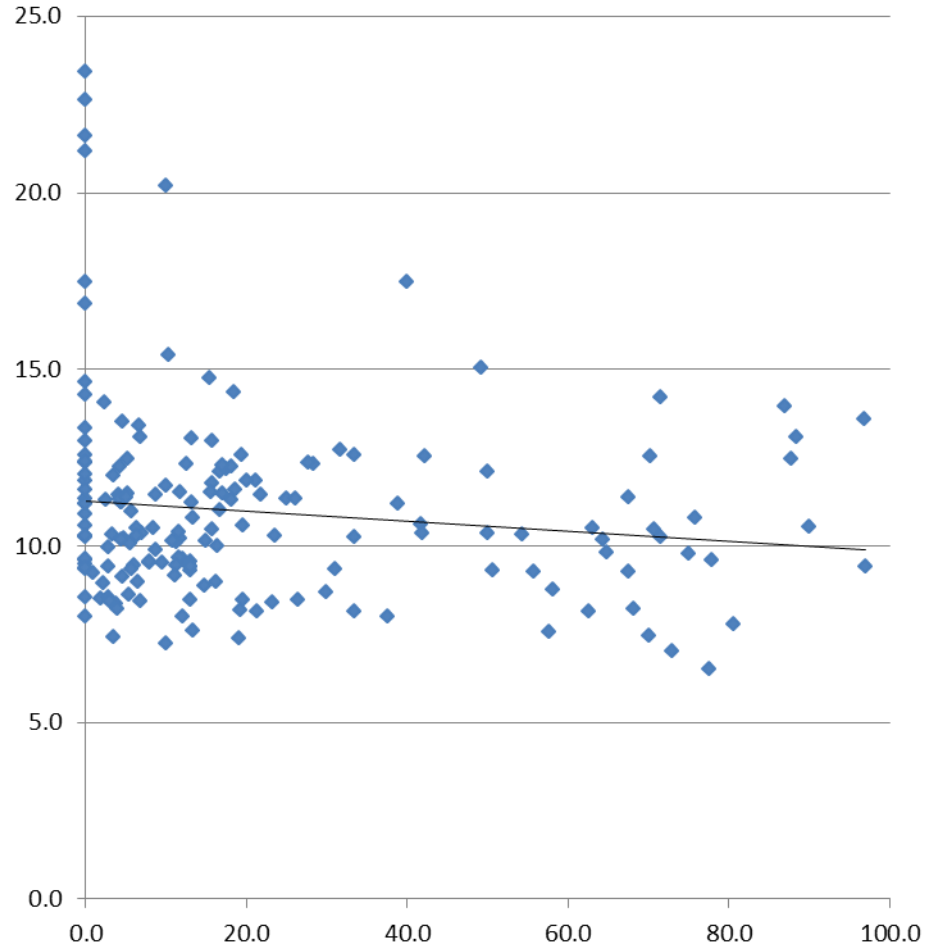
	Round 1 (2015)	Round 2 (2016)	Round 3 (2017)	Round 4 (2018)
Age (Years)	78.5 (\pm 6.3)	79.7 (\pm 5.8)	78.7 (\pm 6)	77.4 (\pm 4.1)
Male:female	12:18	10:20	10:20	14:15
Geriatrician Review	3.3%	90.0%	87%	73.3%
Medication Review	3.3%	90.0%	84%	33.3%
Diagnosis of Delirium	3.3%	20.0%	19%	0%
Cognitive Assessment	0%	36.7%	6%	10%
Overall Mortality	20%	20%	10%	16.7%
Post-operative length of stay (Days)	15 (0-50)	14 (2-64)	13 (6-41)	12 (4-89)

How many have I seen?

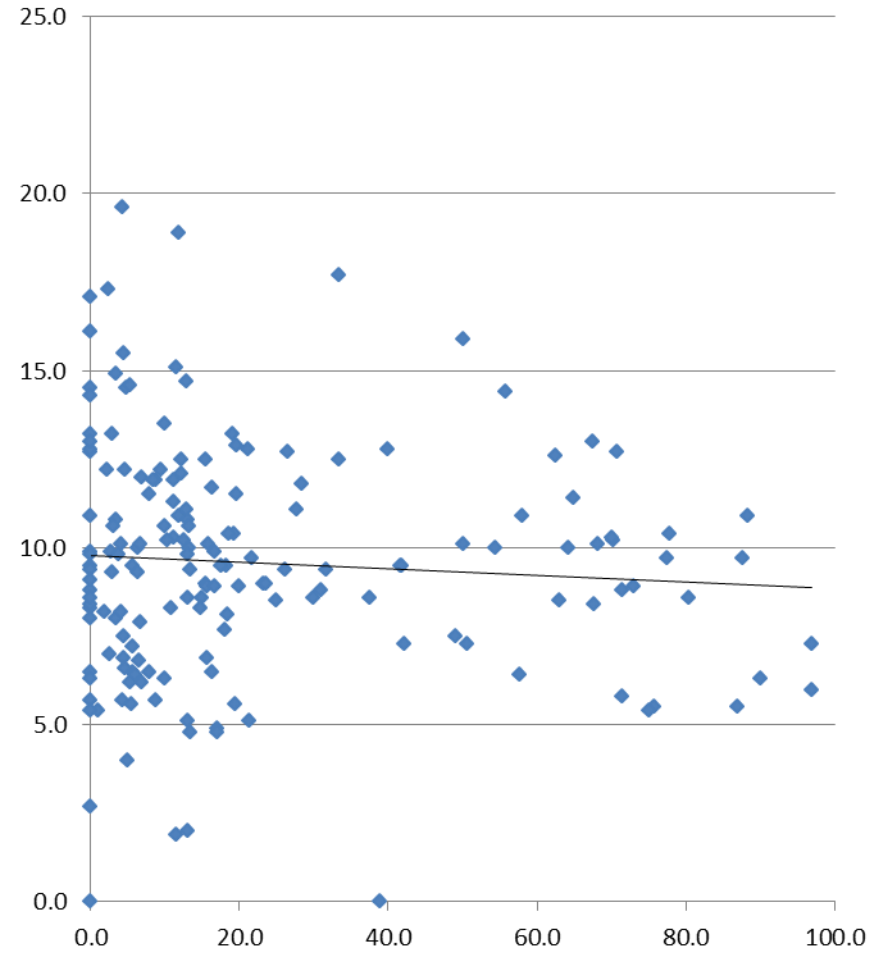
- 748 new patient reviews (as of May 2019)
- Mostly colorectal patients but also vascular
- Often review the same patient on multiple occasions
- Tend to see about 4 or 5 new patients per week and 3 or 4 reviews per week
- 1 or 2 NELA patients per week on average
- Intervention is CGA

Assoc between outcomes and Geriatrician review

Median Post-op Length of stay in patients surviving to discharge



Adjusted Mortality Rate (%)



Variety of patients and interventions

- Very frail patients where surgery is not appropriate – NELA risk score helpful, as is MFI and frailty scores
- Rehab referrals
- Fluid balance – patients regularly fluid overloaded
- Medication reviews – particularly anti-cholinergics, cardiac meds, PD meds, analgesia, anti-coagulation
- Raise awareness of refeeding syndrome / nutrition
- Delirium awareness and management
- Involvement of MDT and specialists
- Palliative care decisions / complex conversations

What can we do in emergency surgical patients?

- Comprehensive Geriatric Assessment
- Good medical management
- Medication reviews
- Pain management
- Involvement of MDT appropriately
- Comprehensive plans
- Ceiling of care decision making
- Education and training – medical and HCPs

Summary

- Outcomes for older patients undergoing emergency surgery are significantly worse than younger patients, elderly in NELA is >65
- There remains a lot to be done in terms of service innovation in the UK – Northeast is an outlier in positive way → this needs to be consolidated
- Frailty is helpful to calculate – CFS is part of NELA
- Geriatricians make a big impact – best when incorporated into the surgical team
- Surgical teams need to take initiative to include Geriatricians – advise 2 PAs as a start

References

- Barnett K et al. Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. *Lancet* 2012;380(9836):37–43.
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