


# Detecting and managing frailty

Jugdeep Dhesi  
Geriatrician  
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**POPS** Proactive care of Older People  
who are undergoing Surgery

*"Improving the care of older surgical patients  
through collaboration, education and research"*

Guy's and St Thomas' **NHS**  
NHS Foundation Trust

KING'S  
HEALTH  
PARTNERS



# Frailty is 'news'...



## Acute Frailty Network Reducing Dependence on Admission for Frail Older People



Royal College of  
General Practitioners

## Fit for Frailty

Part 2: Developing, commissioning and managing services  
for people living with frailty in community settings

Guidance for GPs, Geriatricians, Health Service managers, social service managers and  
commissioners of services

A report by the  
**British Geriatrics Society and  
the Royal College of General  
Practitioners**

in association with Age UK

January 2015

# ...and relatively 'hot' news in perioperative medicine...



Anaesthesia 2014, 69 (Suppl. 1), 26-34

doi:10.1111/anae.12490

## Review Article

### Patient frailty: the elephant in the operating room

R. E. Hubbard<sup>1</sup> and D. A. Story<sup>2</sup>

*1 Senior Lecturer in Geriatric Medicine, Centre for Research in Geriatric Medicine, The University of Queensland, Brisbane, Queensland, Australia*

*2 Professor and Chair of Anaesthesia, Melbourne Medical School, University of Melbourne, Melbourne, Victoria, Australia*



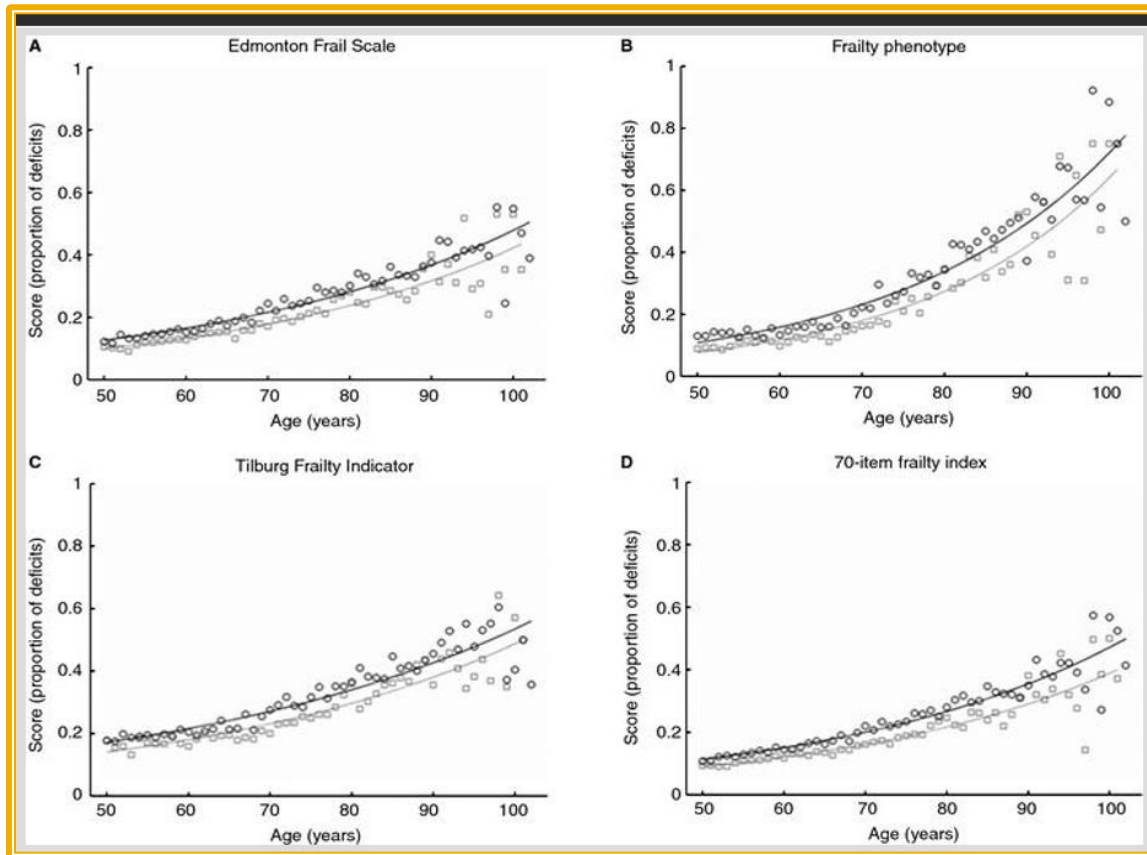
A report by the  
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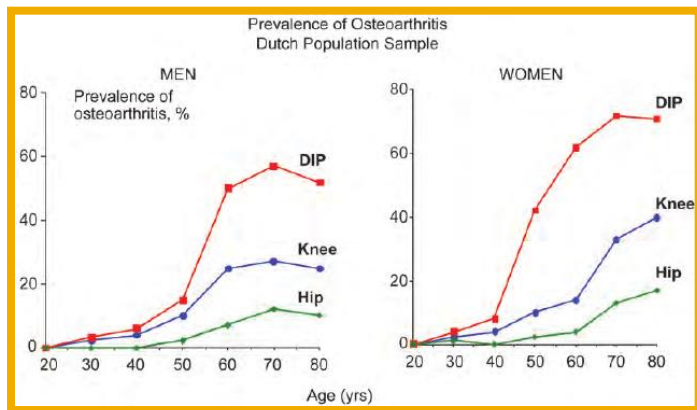
...which is unsurprising as frailty is associated with ageing...



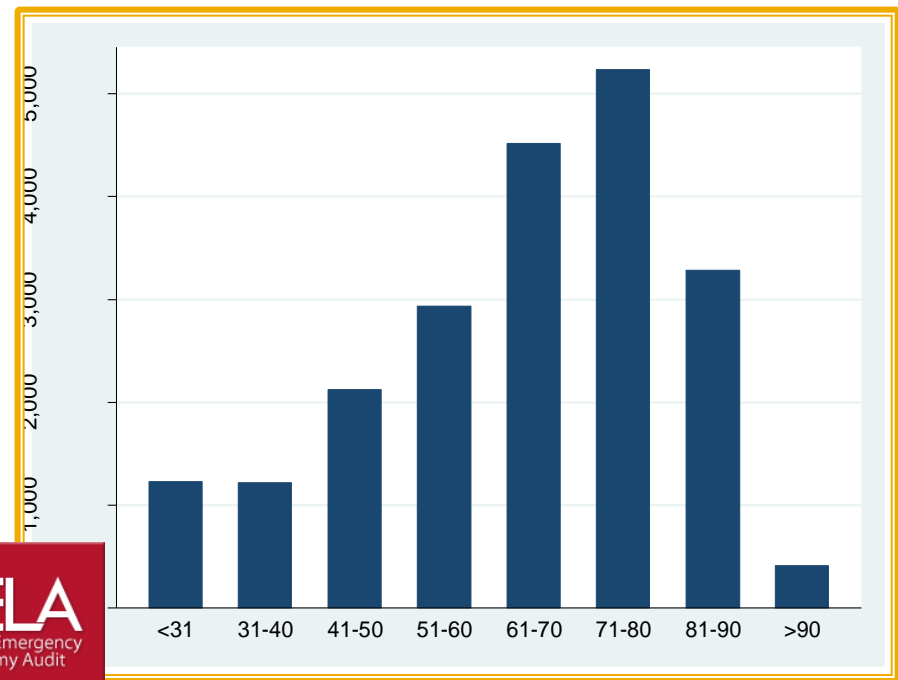
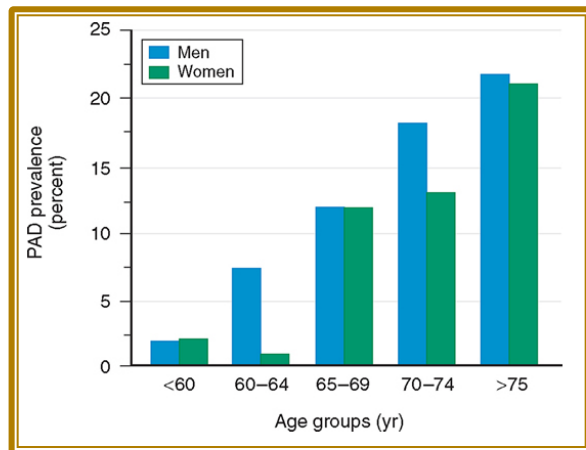
# ...and the surgical population is ageing

70% colorectal cancer diagnosed  $\geq 65$

60% having cancer surgery  $\geq 70$



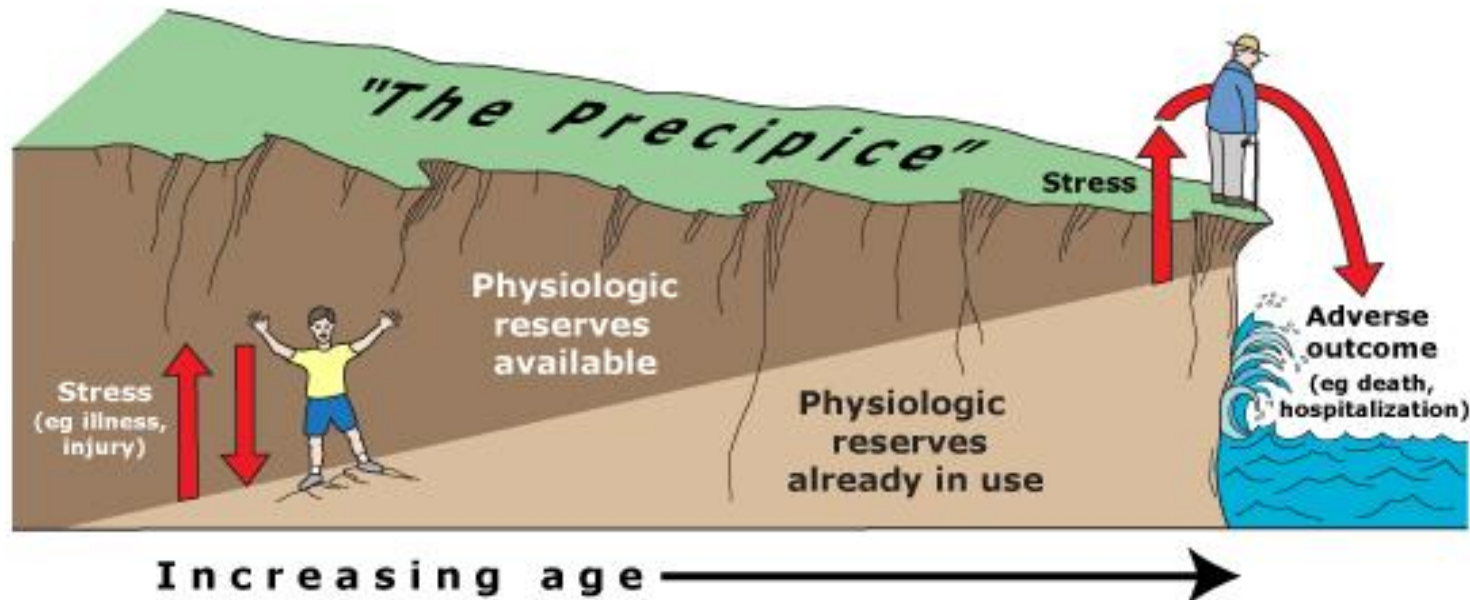
40% having EGS  $>70$



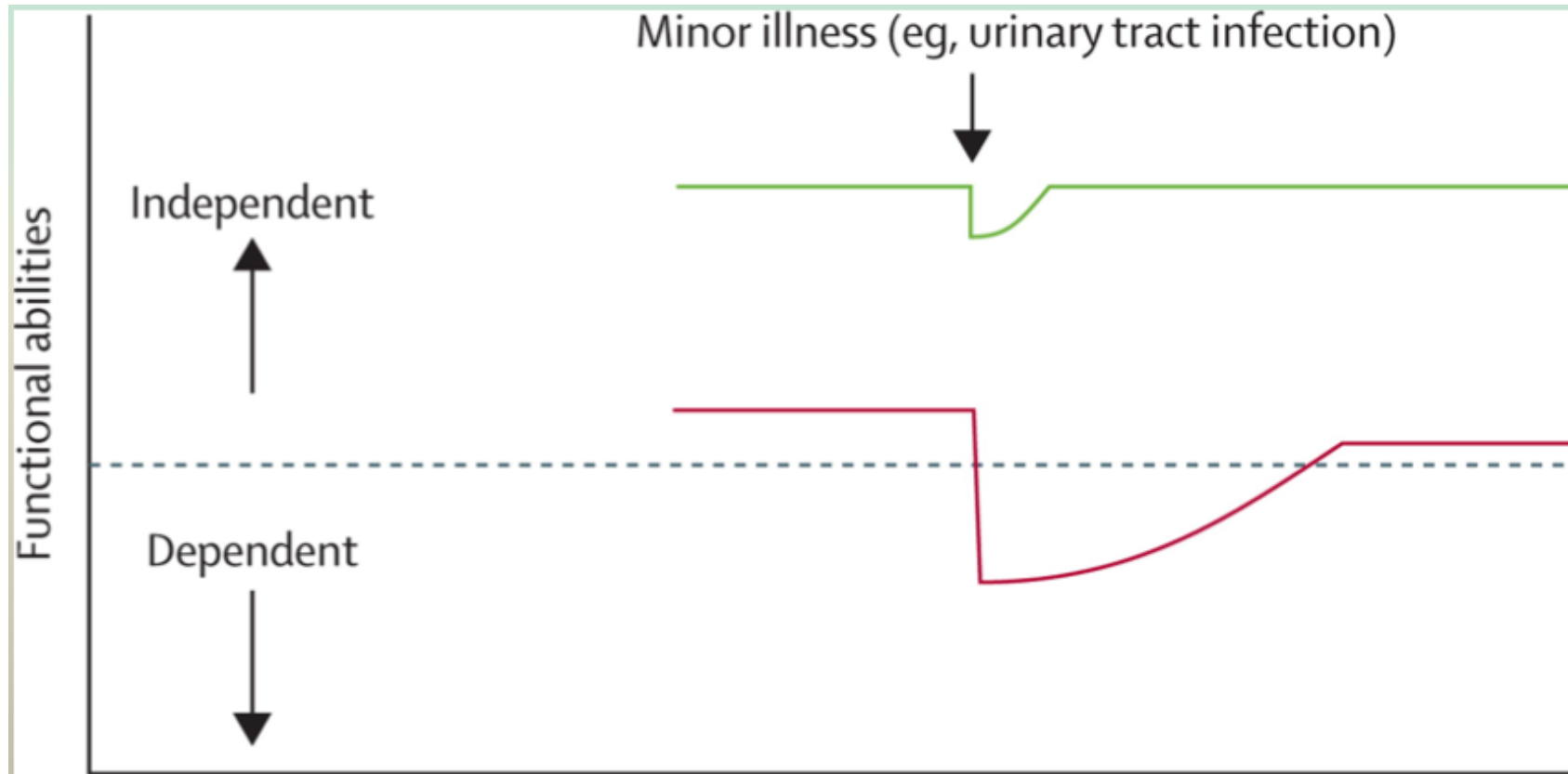
# What is frailty?

"Frailty is a **distinctive** health state **related** to the ageing process in which **multiple** body systems gradually lose their in-built **reserves**."

*Fit for Frailty*  
*British Geriatrics Society 2014*



# Vulnerability to minor external stressors



Clegg , Lancet 2013

# The frailty paradigms

Frailty index <i>(Rockwood 2005)</i>	Count of accumulated deficits across various domains
Frailty phenotype <i>(Fried 2001)</i>	Relationship between set of five criteria and clinical outcomes



# Frailty Index (Rockwood)

Number of deficits accrued over many domains  
Eg current illnesses, ability to manage ADL, physical signs

## Appendix 1: List of variables used by the Canadian Study of Health and Aging to construct the 70-item CSHA Frailty Index

- |   |  |   |
|---|--|---|
| <ul style="list-style-type: none"><li>• Changes in everyday activities</li><li>• Head and neck problems</li></ul>   | <ul style="list-style-type: none"><li>• Mood problems</li><li>• Feeling sad, blue, depressed</li></ul>   | <ul style="list-style-type: none"><li>• Seizures, partial complex</li><li>• Seizures, generalized</li></ul>   |
| <ul style="list-style-type: none"><li>• Changes in general mental functioning</li><li>• Onset of cognitive symptoms</li><li>• Clouding or delirium</li><li>• Paranoid features</li><li>• History relevant to cognitive impairment or loss</li><li>• Family history relevant to cognitive impairment or loss</li><li>• Impaired vibration</li><li>• Tremor at rest</li></ul> | <ul style="list-style-type: none"><li>• Myocardial infarction</li><li>• Arrhythmia</li><li>• Congestive heart failure</li><li>• Lung problems</li><li>• Respiratory problems</li><li>• History of thyroid disease</li><li>• Thyroid problems</li><li>• Skin problems</li><li>• Malignant disease</li></ul> |   |
| <ul style="list-style-type: none"><li>• Poor standing posture</li><li>• Irregular gait pattern</li><li>• Falls</li></ul>  | <ul style="list-style-type: none"><li>• Intention tremor</li><li>• History of Parkinson's disease</li><li>• Family history of degenerative disease</li></ul>   | <ul style="list-style-type: none"><li>• Presence of snout reflex</li><li>• Presence of the palmomental reflex</li><li>• Other medical history</li></ul> |

*A global clinical measure of fitness and frailty in elderly people. Rockwood. CMAJ. 2005*

# Frailty Index (Rockwood)

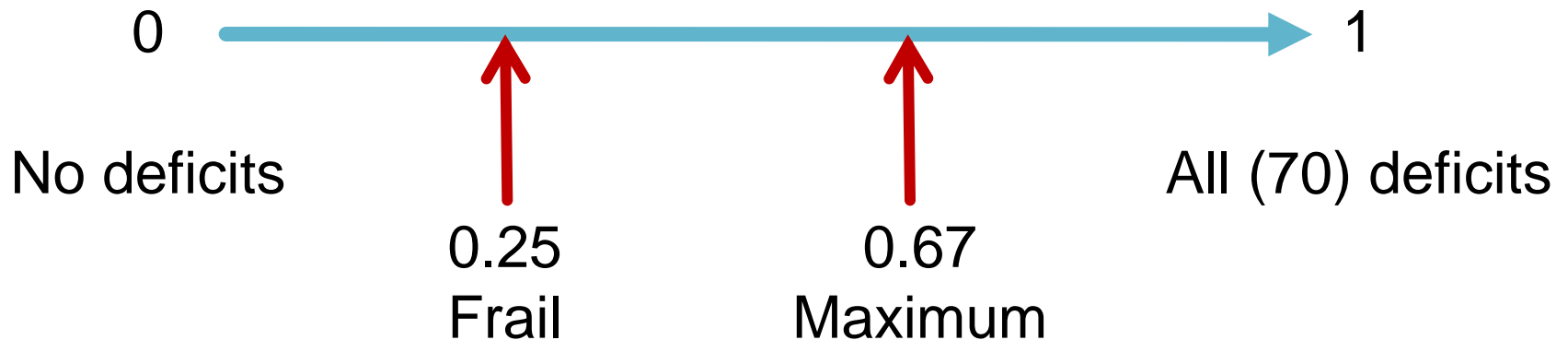
Number of deficits accrued over many domains

Domains e.g. current illnesses

ability to manage activities daily living

physical signs

## Calculating Frailty Index



*A global clinical measure of fitness and frailty in elderly people. Rockwood. CMAJ. 2005*

# Frailty phenotype (Fried)

## Criteria that define frailty

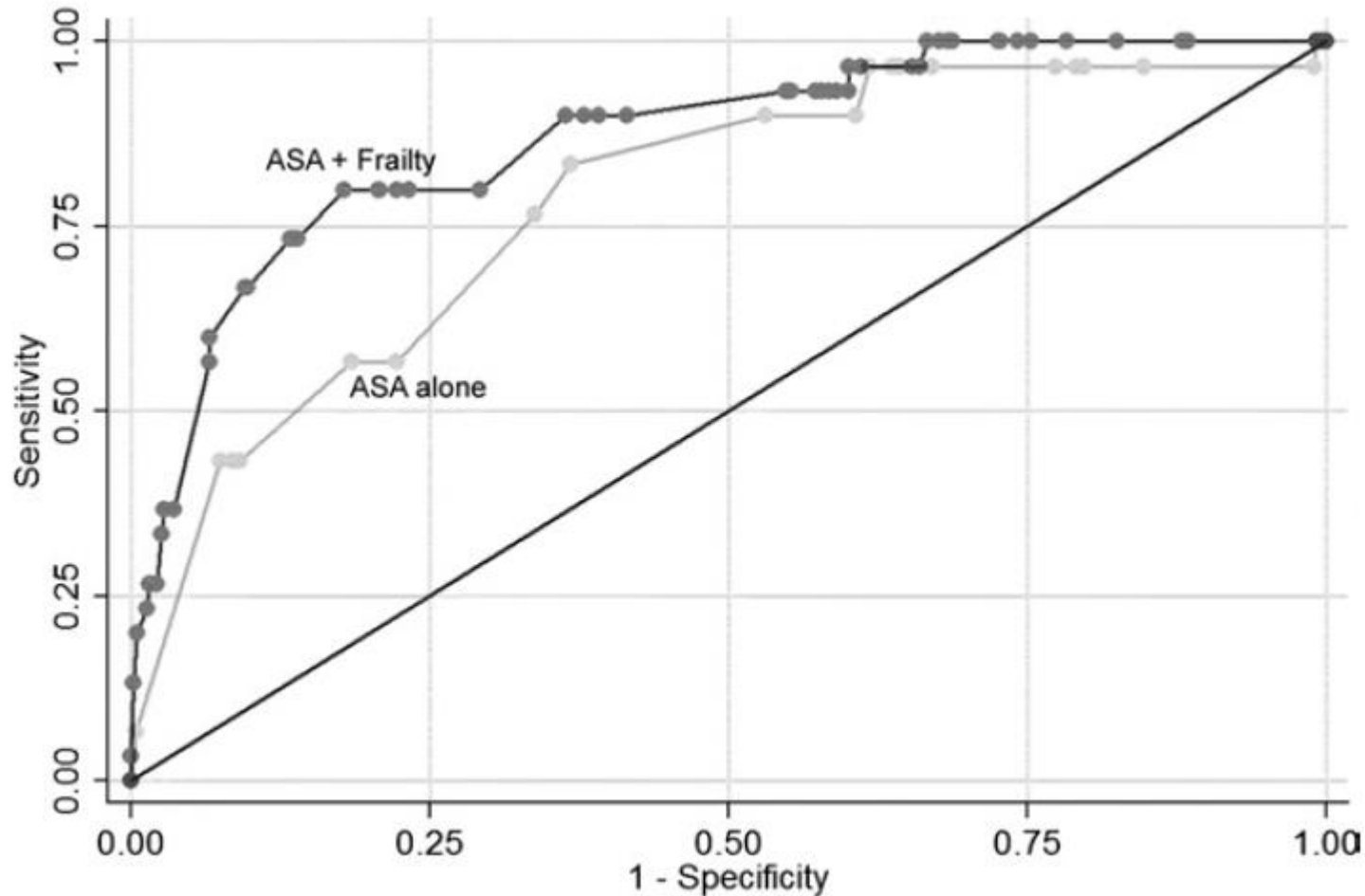
Weight loss  
Reduced grip strength  
Slow walking speed  
Low level of activity  
Exhaustion



## Outcomes (e.g.)

Falls  
Worse mobility  
Hospitalisation  
Death

# Does frailty matter in the perioperative setting?



Area under ROC curve = 0.8694

(Makary 2010)

# Does frailty matter in the perioperative setting?

Method of measuring frailty	Impact of frailty on surgical outcome	Surgical population studied	Authors and reference
Grip strength	Increased postoperative complications Increased LOS	All ages Elective major abdominal surgery	Klidjian <i>et al</i> [44]
Gait speed	Composite endpoint of in-hospital postoperative mortality or major morbidity (as defined by Society of Thoracic Surgeons criteria)	≥70 years old	Afilalo <i>et al</i> [16]
Edmonton Frail Scale	Cardiac surgery Postoperative complications Prolonged LOS Increased institutionalisation rate	≥70 years old Lower limb orthopaedic surgery Spinal surgery Abdominal surgery Vascular surgery	Dasgupta <i>et al</i> [13]
Frailty score based on frailty phenotype	Postoperative complications Prolonged LOS New institutionalisation at discharge	≥65 years old Elective surgery (major and minor)	Makary <i>et al</i> [14]
Comprehensive Assessment of Frailty Score	Increase in 30-day mortality	Cardiac surgery	Sundermann <i>et al</i> [15]
8 'markers' of frailty (age, cognition, recent weight loss, BMI, serum albumin, falls, depression, haematocrit)	Increase in 6-month mortality (although underpowered for this) Post-discharge institutionalisation	≥65 years old General, thoracic, urology and vascular surgery (patients undergoing major elective surgery necessitating postoperative surgical ICU admission)	Robinson <i>et al</i> [46]
14 frailty 'characteristics' in 6 domains (comorbidity, function, cognition, geriatric syndromes, extrinsic frailty) NB: most closely associated were TUAG ≥ 15 seconds and functional dependence	Institutionalisation at hospital discharge	≥ 65 years old Elective general, cardiac, thoracic, urology and vascular surgery (patients undergoing major elective surgery necessitating postoperative surgical ICU admission)	Robinson <i>et al</i> [47]
Frailty defined as any impairment in activities of daily living (Katz index) or impairment of ambulation or diagnosis of dementia	In-hospital mortality Institutional discharge Mid-term survival	All ages Cardiac surgery	Lee <i>et al</i> [17]
Groningen frailty indicator	Post-operative delirium	All ages Elective vascular surgery	Pol <i>et al</i> [86]

# Impact of frailty on surgical patients in the short term...

Method of measuring frailty	Impact of frailty on surgical outcome	Surgical population studied	Authors and reference
Grip strength	Increased postoperative complications Increased LOS	All ages Elective major abdominal surgery	Klidjian <i>et al</i> [44]
Gait speed	Composite endpoint of in-hospital postoperative	≥70 years old	Afilalo <i>et al</i> [16]
Edmonton Frail	<div> <p>↑postoperative complications</p> <p>↑30-day mortality rate</p> <p>↑length of hospital stay</p> </div>		Dasgupta <i>et al</i> [13]
Frailty score based on phenotype			Makary <i>et al</i> [14]
Comprehensive Assessment of Frailty Score			Sundermann <i>et al</i> [15]
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# ...and in the longer term...

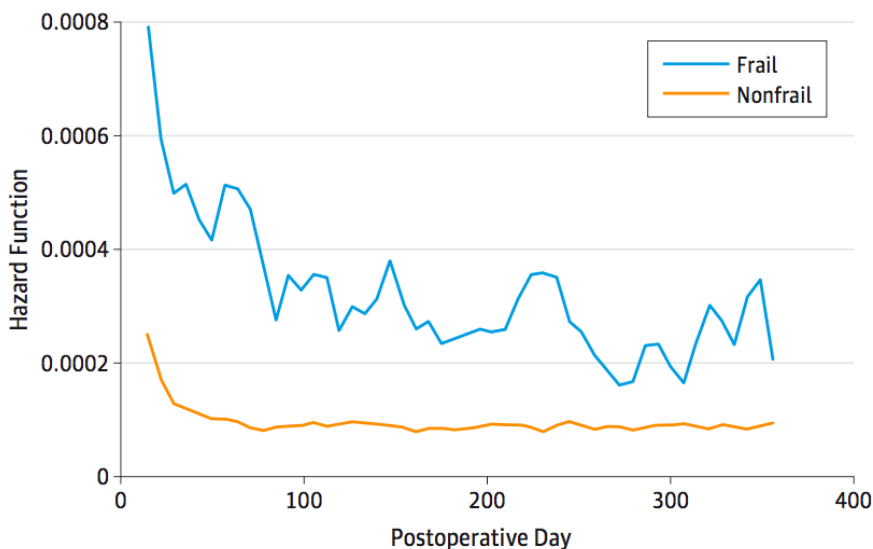
## Original Investigation

### Association of Frailty and 1-Year Postoperative Mortality Following Major Elective Noncardiac Surgery A Population-Based Cohort Study

Daniel I. McIsaac, MD, MPH, FRCPC; Gregory L. Bryson, MD, FRCPC, MSc; Carl van Walraven, MD, FRCPC, MSc

*JAMA Surg.* 2016;151(6):538-545. doi:10.1001/jamasurg.2015.5085  
Published online January 20, 2016.

**B** Hazard functions



- Elevated relative hazard in first 30 days in frail pts
- 13.6% frail vs 4.8% non-frail died in 1<sup>st</sup> postop year
- 1 year mortality rate 5:1 in frail patients (urology, GI, vasc)

# ...as illustrated in a systematic review

Lin et al. *BMC Geriatrics* (2016) 16:157  
DOI 10.1186/s12877-016-0329-8

BMC Geriatrics

RESEARCH ARTICLE

Open Access

## Frailty and post-operative outcomes in older surgical patients: a systematic review



Hui-Shan Lin<sup>\*</sup> , J. N. Watts, N. M. Peel and R. E. Hubbard

Frailty associated with

- 30 day, 60 day and 1 year mortality
- Postoperative complications
- Length of stay



# So frailty is common and bad



# A multitude of tools/measures/scores...

- Surrogate measures      *grip strength/gait speed*
- Scales/scores      *frailty index, EFS, CFS*
- Biomarkers      *CRP, IL-6*
- Disease specific scores      *CAF*
- Surgery specific scores      *FORECAST*

# Gait speed

**Table 1.** Summary of diagnostic test accuracy results for seven simple instruments for

Index test (units)	Cut-off	Reference standard	Sensitivity	Specificity	Positive predictive value
.....					
Gait speed (m/s)	<0.7	Phenotype model	0.93	0.77	0.35
Gait speed (m/s)	<0.8	Phenotype model	0.99	0.64	0.26
Gait speed (m/s)	<0.9	Phenotype model	1.00	0.56	0.22
PRISMA 7	≥3	Phenotype model	0.83	0.83	0.40
Timed-up-and-go test (s)	>10	Phenotype model	0.93	0.62	0.17
Self-rated health	≤6	Phenotype model	0.83	0.72	0.29
General Practitioner assessment	Dichotomous	Phenotype model	0.67	0.76	0.28
Polypharmacy	≥5 medications	Phenotype model	0.67	0.72	0.24
Groningen Frailty Indicator	≥4	Phenotype model	0.58	0.72	0.22

*Diagnostic test accuracy of simple instruments for identifying frailty in community-dwelling older people: a systematic review. Clegg. Age and Ageing 2015*

# Clinical Frailty Scale

## Clinical Frailty Scale\*



**1 Very Fit** – People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.



**2 Well** – People who have **no active disease symptoms** but are less fit than category 1. Often, they exercise or are very **active occasionally**, e.g. seasonally.



**3 Managing Well** – People whose **medical problems are well controlled**, but are **not regularly active** beyond routine walking.



**4 Vulnerable** – While **not dependent** on others for daily help, often **symptoms limit activities**. A common complaint is being “slowed up”, and/or being tired during the day.



**5 Mildly Frail** – These people often have **more evident slowing**, and need help in **high order IADLs** (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.



**6 Moderately Frail** – People need help with **all outside activities** and with **keeping house**. Inside, they often have problems with stairs and need **help with bathing** and might need minimal assistance (cuing, standby) with dressing.



**7 Severely Frail** – **Completely dependent for personal care**, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months).



**8 Very Severely Frail** – Completely dependent, approaching the end of life. Typically, they could not recover even from a minor illness.



**9. Terminally Ill** - Approaching the end of life. This category applies to people with a **life expectancy <6 months**, who are **not otherwise evidently frail**.

### Scoring frailty in people with dementia

The degree of frailty corresponds to the degree of dementia. Common **symptoms in mild dementia** include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

In **moderate dementia**, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting.

In **severe dementia**, they cannot do personal care without help.

\* 1. Canadian Study on Health & Aging, Revised 2008.

2. K. Rockwood et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489-495.

# Edmonton Frailty Scale

Edmonton Frail Scale				Score:
				17
Frailty Domain	Item	0 points	1 point	2 points
<b>Cognition</b>	Clock drawing	No errors	Minor spacing errors	Other errors
<b>General health status</b>	In the past year, how many times have you been admitted to a hospital?	0	1-2	≥ 2
	In general, how would you describe your health?	'Excellent' 'Very good' 'Good'	'Fair'	'Poor'
<b>Functional independence</b>	With how many of the following activities do you require help? (meal preparation, shopping, transportation, telephone, housekeeping, laundry, managing money, taking medications)	0-1	2-4	5-8
<b>Social support</b>	When you need help can you count on someone who is willing and able to meet your needs?	Always	Sometimes	Never
<b>Medication use</b>	Do you use five or more different prescription medications on a regular basis?	No	Yes	-
	At times, do you forget to take your prescription medications?	No	Yes	-
<b>Nutrition</b>	Have you recently lost weight such that your clothing has become looser?	No	Yes	-
<b>Mood</b>	Do you often feel sad or depressed?	No	Yes	-
<b>Continence</b>	Do you have a problem with losing control of urine when you don't want to?	No	Yes	-
<b>Functional performance</b>	Timed up and go	0-10 s	11-20s	>20 s Unwilling/unable
<b>Total:</b>				

(Rolfson 2006, Dasgupta 2009)

# electronic Frailty Index



- Based on frailty index (Rockwood)
- Anonymised data from 935,541 patients aged 65-95 years
- emis & SystmOne (tpp) cover 90% UK primary care population
- Mean eFI score 0.14
- eFI predictive of mortality, hospitalisation, nursing home admission at 1,3 and 5 years

*Development and validation of an electronic frailty index using routine primary care electronic health record data. Clegg. Age & Ageing. 2016*

# But can't endorse one above the other...

**Table 3**  
Assessment on clinimetric properties.

Instrument/study	Reliability	Agreement	Construct validity	Responsiveness	Interpretability	Content validity	Internal consistency	Floor- and ceiling effects
Frailty Phenotype/Fried et al. (2001), Cigolle et al. (2009), Kiely et al. (2009), and Rockwood et al. (2007)	0	0	+	0	?	0	0	—
Frailty Index, accumulation of deficits/Mitnitski et al. (2001), Cigolle et al. (2009), Rockwood et al. (2007), and Rockwood (2006)	0	0	+	0	?	0	0	?
Modified Functional Independence Measure	0	0	+	0	?	0	0	?
Instrument 'Chirac' Law/Chirac et al. (1999)	0	0	+	0	0	0	0	0
Instrument 'Puts'/Puts et al. (2005)	0	0	+	0	0	0	0	0
Instrument 'Ravaglia'/Ravaglia et al. (2008)	0	0	+	0	0	0	0	0
Instrument 'Winograd'/Winograd et al. (1991)	0	0	+	0	0	0	0	0
Grip strength as a single marker/Syddall et al. (2003)	0	0	+	0	0	0	0	0
1994 Frailty Measure Strawbridge/Cigolle et al. (2009) and Matthews et al. (2004)	0	0	—	0	?	0	0	0
Self-report Screening Instrument/Brady (1997)	0	0	+	0	0	0	0	0
Geriatric Functional Evaluation (GFE)/Scarcella et al. (2005)	0	0	+	0	?	0	0	—
Frailty Index-Comprehensive Geriatric Assessment (FI-CGA)/Jones et al. (2004, 2005)	0	0	+	0	?	0	0	+

+, instrument fulfills the mentioned criterion; —, instrument does not fulfill the mentioned criterion; ?, doubtful design or method; 0, no information found (Terwee et al. 2007).

Lack of evaluation of clinimetric properties

- Reliability, validity, responsiveness
- Clinical feasibility

# ...and no consensus in the perioperative setting



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journal homepage: [www.elsevier.com/locate/archger](http://www.elsevier.com/locate/archger)



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Frailty syndrome and pre-operative risk evaluation: A systematic review

Cristina Buigues, Pilar Juarros-Folgado, Julio Fernández-Garrido, Rut Navarro-Martínez, Omar Cauli\*

*Department of Nursing, University of Valencia, Valencia, Spain*

 CrossMark

*“Even though several reports demonstrated that frailty is an independent factor useful for measuring risk stratification, **the question about the best clinical tool for assessing frailty remains unanswered.**”*



# What should we do?



# A pragmatic approach

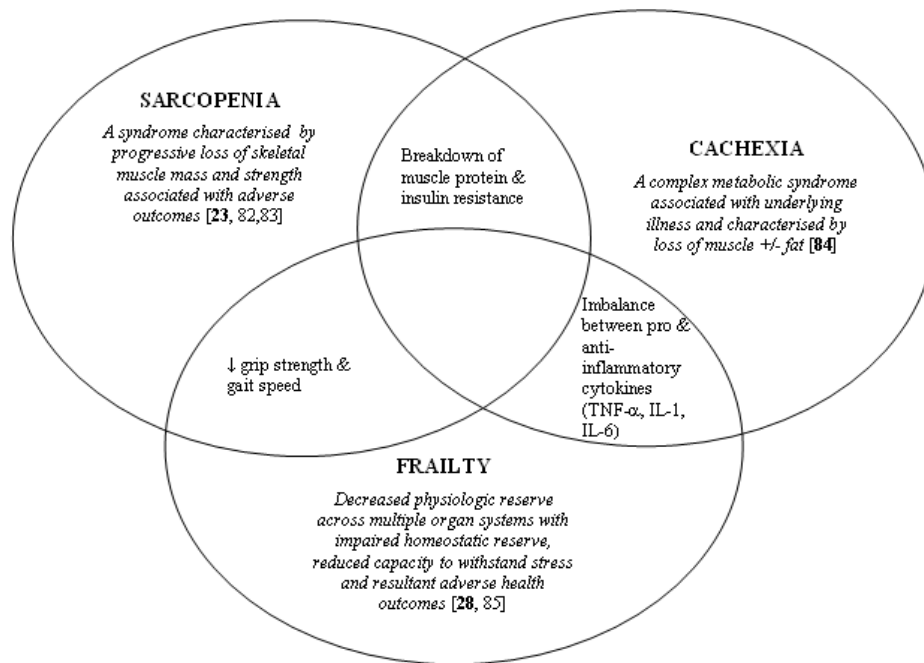
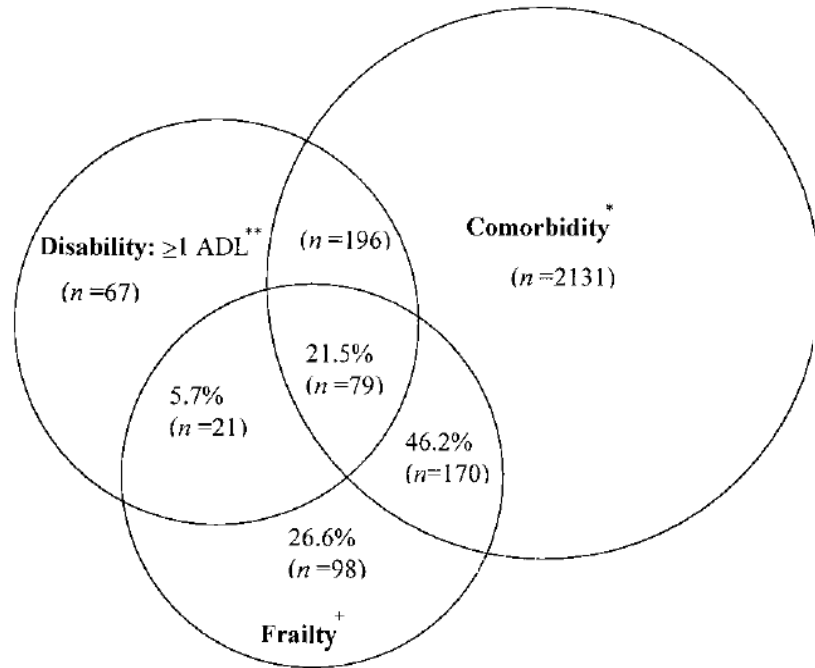
- Primary care
  - eFI
- Elective surgery
  - Gait speed, CFS, EFS
- Emergency surgery
  - CFS, EFS

# But after screening/diagnosis, then what?

	Frailty
Important health problem/recognised	+
Treatment should be available	+/-
Defined target population	+
Latent stage of disease	+
Available test/examination acceptable	+
Natural history of disease understood	+
Promote equity & access to screening for the entire target population	+
Benefits outweigh the harm	+

Wilson revised criteria

# The literature draws on sarcopenia/related disorders...



# ...focuses on individual interventions; exercise

- Why might exercise work?
  - Increase VO<sub>2</sub> max & muscle mass
  - Increase in gait speed improves survival
  - Self participation in exercise delays onset and progression
- Types of exercise
  - Aerobic / endurance training (muscle mass)
  - Resistance training (muscle strength)
- Outcomes
  - Improve muscle function, QoL, falls
  - Unclear if modifies frailty, does help with sarcopenia

*The Effectiveness of Exercise Interventions for the Management of Frailty:  
A Systematic Review. Theou. J Aging Res. 2011*

# ...with multiple unanswered questions...

- Why might exercise work?

- Increased VO<sub>2</sub> max
- Self-reported health

- Types

- Aerobic
- Resistance

- Outcomes

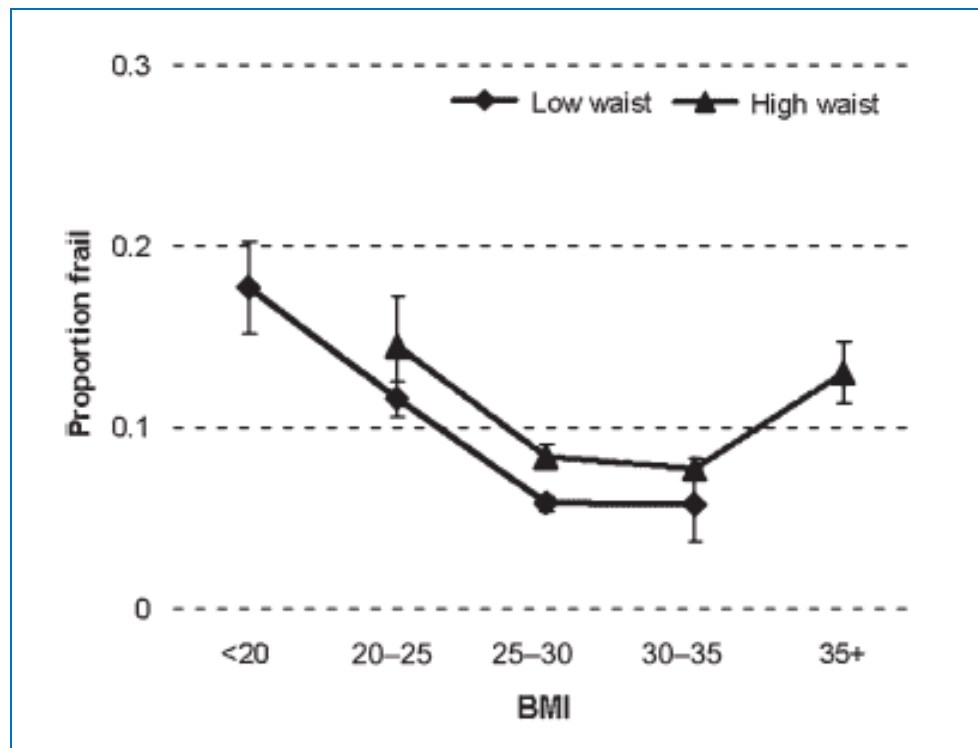
- Improved
- Unclear

## Unanswered questions remain ...

- Type of exercise
- Duration / timing of exercise
- Long term outcomes
- Do patients want to exercise?

# ...nutrition...

## English Longitudinal Study of Ageing 3,055 community-dwelling >65 yo



*Frailty, Body Mass Index, and Abdominal Obesity in Older People.  
Journals of Gerontology. Hubbard. 2009*

# ...with no clear answers...

- Protein supplementation
  - Benefit in prevention of sarcopenia
  - Controversy regarding amount and form
  - Weak evidence for recovery hip fracture
- Vitamin D supplementation
  - Not shown to modify frailty
  - Likely beneficial in sarcopenia

*Nutritional supplementation for hip fracture aftercare in older people.  
Cochrane Review. Avenell. 2011*



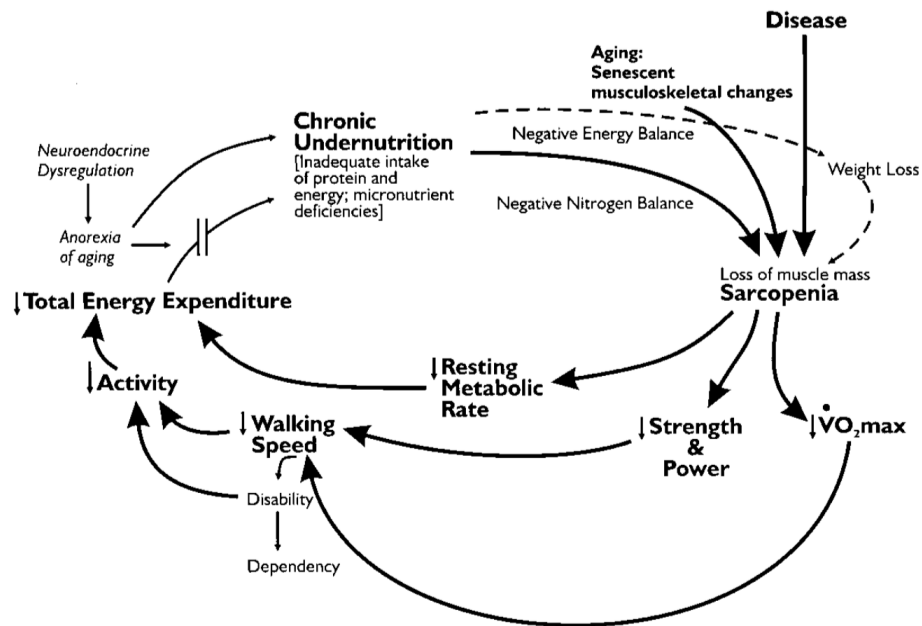
# ...and there's no evidence for pharmacological therapies

- Potential modulators include
  - Anabolic steroids
  - Growth hormone
  - Anticytokine agents
- Role of ACE–inhibitors?
  - Improved exercise capacity
  - Less postural instability/falls

*Sarcopenia – A Potential Target for Angiotensin-Converting Enzyme Inhibition?*  
*Gerontology. Sumukadas. 2006*

# But going back to what frailty is...

“Frailty is a distinctive health state related to the ageing process in which **multiple** body systems gradually lose their in-built reserves.”

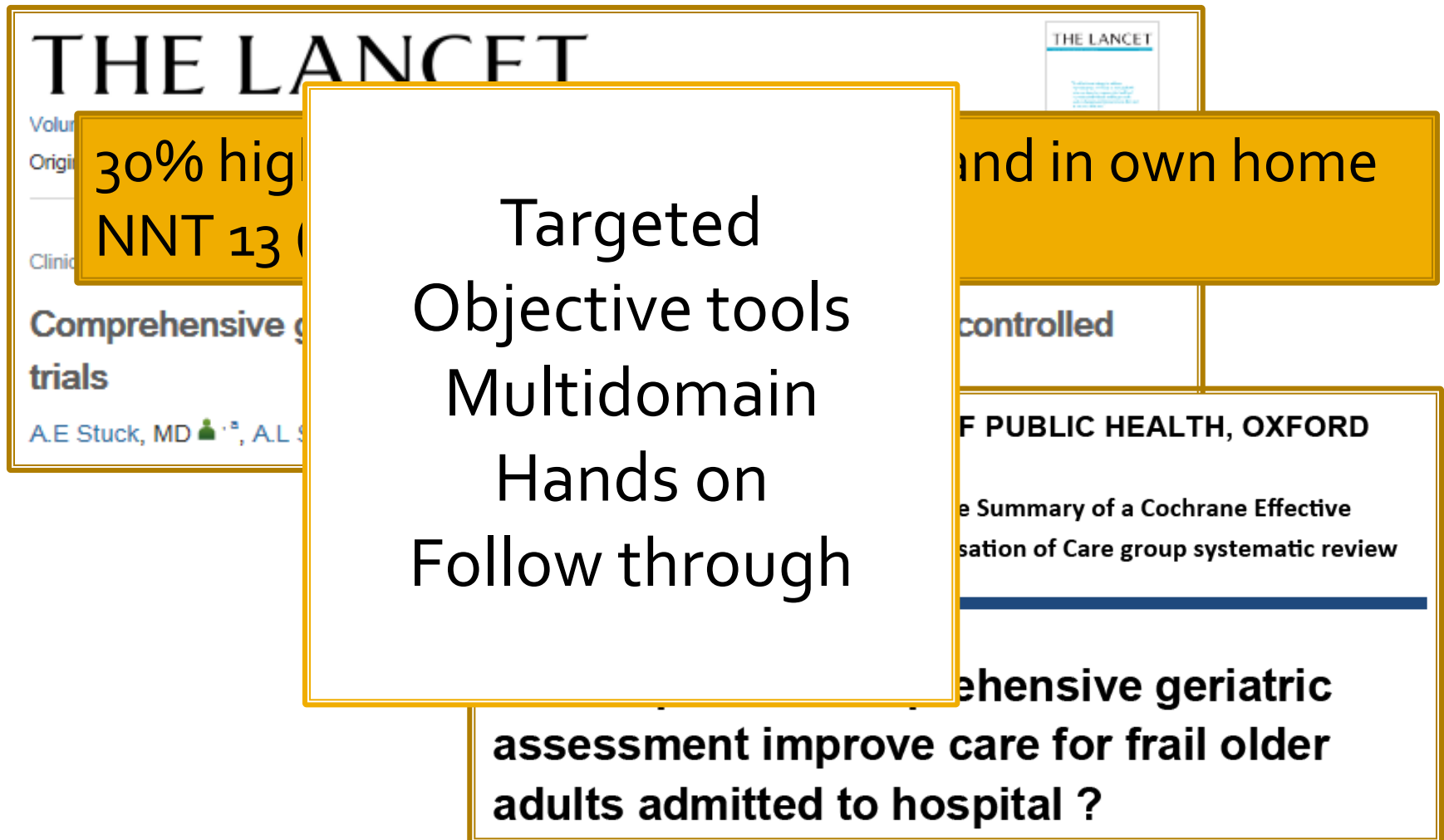


# ...which suggests a complex intervention is required...

...that provides

- Holistic, multidimensional, multidisciplinary assessment of an individual
- Formulation of
  - a list of needs and issues to tackle
  - an individualised but coordinated care and support plan
  - tailored to an individual's needs, wants and priorities

# ...and that fits with Comprehensive Geriatric Assessment and optimisation



# Using CGA & optimisation to address frailty preoperatively;...

Targeted multidomain,  
multidisciplinary assessment...

...to describe existing & new  
issues using objective tools

...and optimisation using  
evidence base applied to  
individual patient

**Screen**

eFI, CFS, gait speed

**Evaluate**

eg EFS/MoCA/HAD

**Optimise**

CGA



## ...for 'Jim'...

- 79 year old man
  - 2<sup>nd</sup> admission with acute urinary retention secondary to haematuria/clot retention
  - Diagnosis – BPH (will need TURP)
- Screening
  - Gait speed <0.8m/s, CFS 4-6, EFS 10/17
  - Board round – can't get out of bed

# ...who needs the application of EBM...

Issue	Diagnosis	Inves/optimisation
Slow gait speed Falls Constipation	Idiopathic Parkinson's disease	CT brain & DAT scan Sinemet, movicol Bone; DEXA, vit D, Ca, bisphosphonates, Falls & balance classes
Obs, TGUG Exertional breathlessness	Decompensated ischaemic cardiac failure	ECG, echo Diuretics, BB Holding ACEi OT intervention
Nutritional assessment Weight loss	Poor nutrition secondary to impaired functional status limiting access to food	Supplements (protein, vits) OT input – meals Physio input – mobility

# ...to inform the intra- and postoperative phases

Shared decision making (*Choosing wisely, GIRFT*)

Planned approach with anticipation of complications

Evidence based approaches throughout the pathway to recovery





# So, in summary, detecting and managing frailty is important!

- Surgical population is changing
- Impact of frailty recognised
- Screen, diagnose and **modify** the frailty syndrome in order to
  - To help objectively and individually describe periop risk
  - To inform shared decision making
  - To plan perioperative pathway
  - To improve outcomes in a vulnerable population
  - To refine case mix adjustment in research studies, national audit or in reporting hospital level mortality