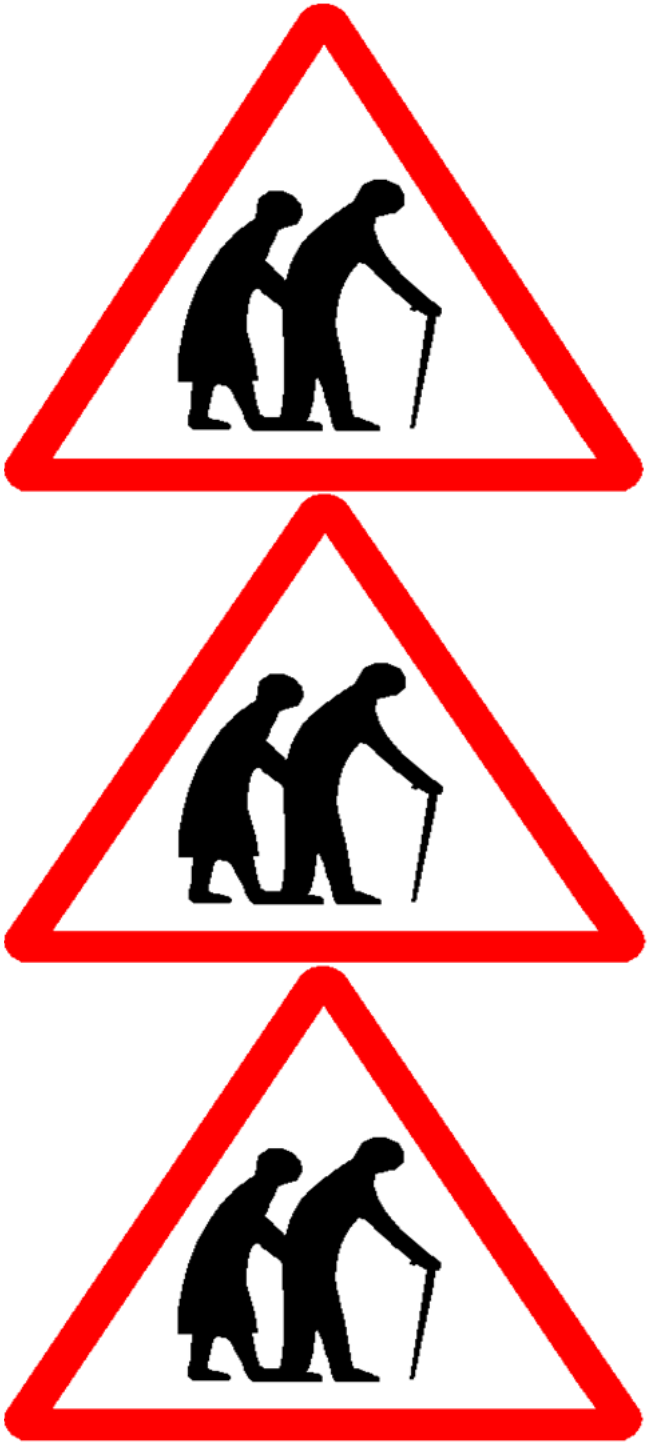

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Prehabilitation for the Surgical Patient

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Prehabilitation

- **Maximize function before surgery**
- **“Going into training”**
- **A lot of us already do it…**
  - Incentive spirometer
  - ‘Go for long walks’
  - ‘Eat lean protein’

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Why is this important?

- **Frailty and functional dependence are associated with adverse surgical outcomes**
- **We like to stratify risk**
  - Age, comorbidities
  - Informed consent
- **We want to modify risk factors**
  - Optimization
    - Cardiopulmonary, nutrition
    - What about function?

What is frailty?

'A condition or syndrome which results from a multi-system reduction in reserve capacity to the extent that a number of physiological systems are close to, or past, the threshold of symptomatic clinical failure'

'As a consequence the frail person is at increased risk of disability and death from minor external stresses'

- **AKA: 'knock him over with a feather' or 'not a candidate for a haircut'**

Campbell et al, *Age Ageing*, 1997

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What is frailty?

- **Complex and poorly defined, hotly debated**
- **Frailty phenotype**
  - Proposes a relationship between characteristics and outcomes
  - Criteria: weight loss, grip strength, exhaustion, gait speed, low physical activity
  - Inflammatory biomarkers: CRP, IL-6, TNF-a
  - Outcomes: new falls, loss of mobility, disability, hospitalization, death
- **Frailty index**
  - Deficit accumulation model

Regardless of the definition, it's a major issue for us….

- **4-9% of community dwelling elders are frail**
  - Syddal et al, *Age Ageing*, 2010
- **42-50% of older patients undergoing elective cardiac and noncardiac surgery are frail**
  - Makary et al, *J Am Coll Surg*, 2010
  - Sundermann et al, *Eur J Cardiothorac Surg*, 2011
  - Afilalo et al, *J Am Coll Cardiol*, 2010

Frailty predicts outcomes

Procedures	Findings	Reference
Abdominal surgery	↑ Compl, LOS	Klidjian, 1980
Cardiac surgery, 70+	↑ M&M	Afilalo, 2010
Multiple major, 70+	↑ Compl, LOS, SNF	Dasgupta, 2009
Major & minor, 65+	↑ Compl, LOS, SNF	Makary, 2010
Cardiac surgery	↑ 30d mortality	Sundermann, 2011
Major elective, 65+	↑ 6 mo mortality, SNF	Robinson, 2009
Cardiac surgery	↑ Mortality, SNF	Lee, 2010
Vascular surgery	↑ Post op delirium	Pol, 2011
Emergency GS	↑ Infection, mortality	Farhat, 2012
Elective CRS, 65+	↑ Cost	Robinson, 2011

How can surgeons assess frailty?

- **Single measure is attractive**
  - Grip strength
  - Timed get up and go
    - Time to rise from sitting, walk 3 meters, turn, walk back and sit down with usual aids
    - >=13s predicts falls
    - >=30s corresponds to functional dependence

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- **Single measure is attractive**
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    - >=13s predicts falls
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- **Surrogate measures may risk stratify but don't guide us in risk modification**
- **We need to identify aspects of frailty amenable to preoperative optimization**

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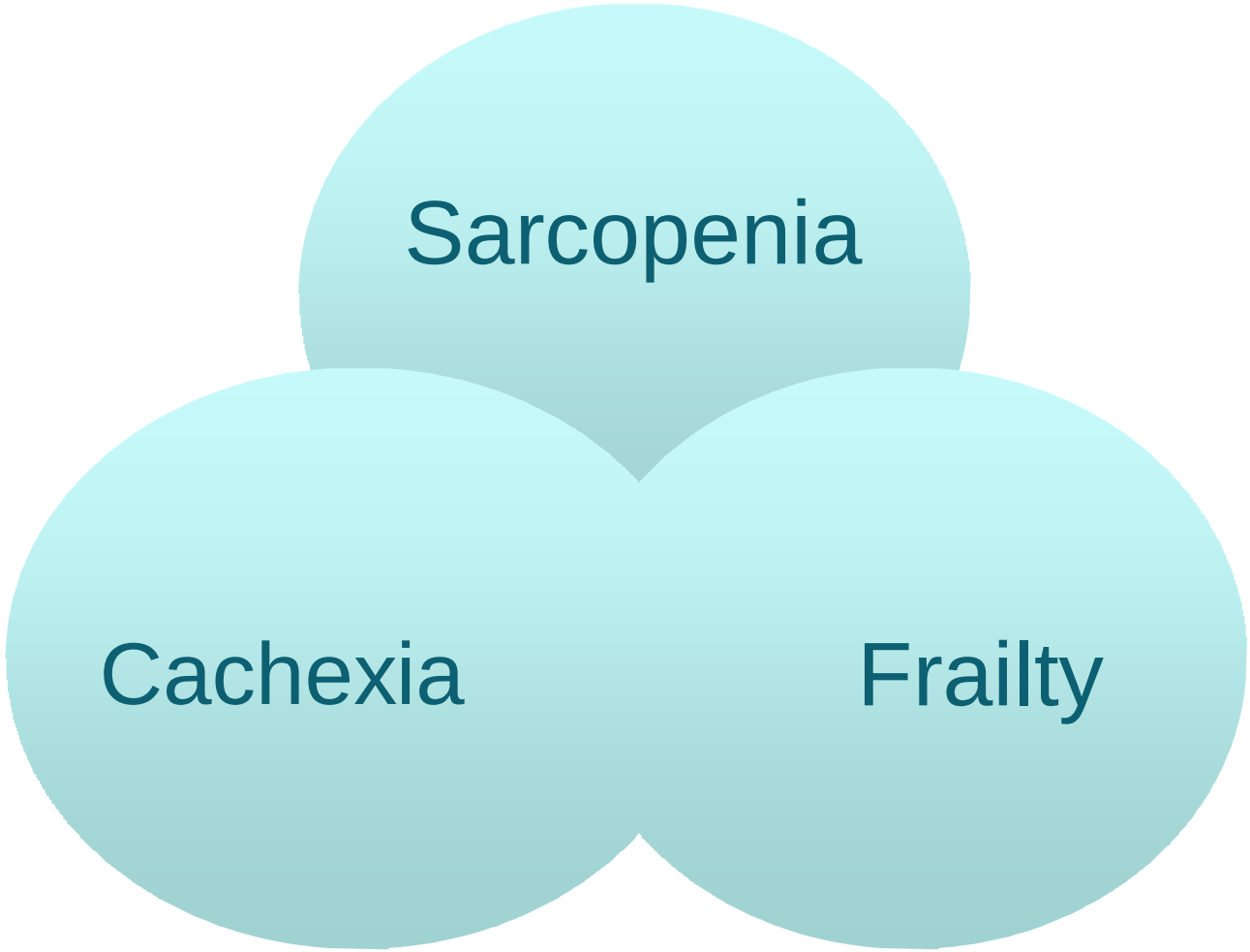
Overlapping geriatric syndromes



Redefining pre-op assessment

- **110 patients undergoing surgery with planned ICU admission**
- **Comprehensive geriatric assessment**
  - Mini-cog
  - Albumin
  - Falls
  - HCT
  - Functional status
  - Comorbidity
- **Outcome: 6 mo mortality**

Robinson et al, *Ann Surg*, 2009

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TABLE 3. Results of Univariate Logistic Regression With Cutoffs Predicting Six-Month Mortality

	OR (95% CI)	Univariate *P*
Mini-Cog <4	4.153 (1.246–13.846)	0.0205
Albumin ≤3.3	8.625 (2.538–29.308)	0.0006
Falls ≥1	5.072 (1.661–22.401)	0.0044
Hematocrit <35	10.671 (3.260–34.930)	<0.0001
ADLs < 6	13.908 (2.992–65.487)	0.0008
Charlson ≥3	3.890 (1.040–14.555)	0.0436

Robinson et al, *Ann Surg*, 2009

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Is frailty a modifiable risk factor?

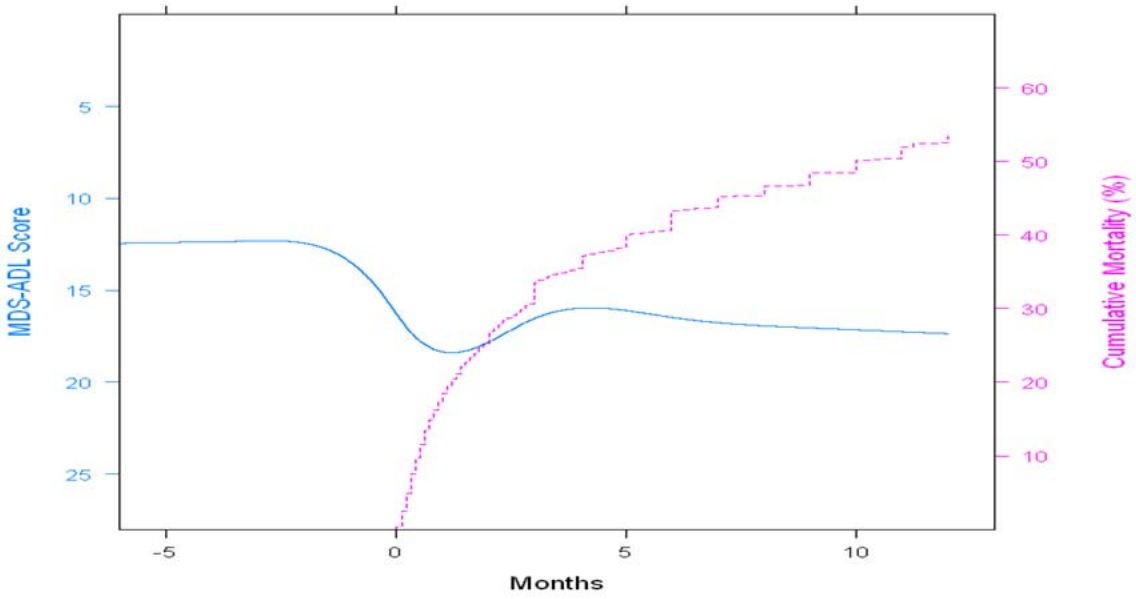
Can frailty be modified? Progression

- **Frailty is a dynamic process**
  - Transitions over time
    - 43% become more frail
    - 23% become less frail
      - Gill et al, *Arch Intern Med*, 2006

- **Interventions aimed at improving frailty may be effective**

Progressive Functional Decline Associated with Adverse Outcomes

- **6822 NH residents undergoing major surgery**
  - Functional decline 6 mo prior to surgery: 16%
    - 1 year mortality: 52% (OR 1.16, 1.06-1.27)
    - Post-op functional decline: 60% (OR 1.21, 1.11-1.32)



Finlayson et al, *JAGS*, 2011

Can frailty be modified? Exercise

- **Exercise has been shown to improve mobility and ADL in frail elders**
  - Forster A, *Age Aging*, 2010
- **Preoperative exercise interventions not well studied**

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Can frailty be modified? Nutrition

- **Contributes to anemia**
  - Iron, B12, folate at least 28d prior to surgery
    - Goodnough et al, *Br J Anaesth*, 2011
- **Vit D deficiency associated with frailty**
  - Supplementation NOT shown to improve function
    - Fiatarone et al, N Eng J Med, 1994; Latham et al, *J Am Geriatr Soc*, 2003
- **Amount and timing of protein supplementation for sarcopenia is controversial**
  - Leucine increases protein anabolism, decreases loss
    - Soybeans, beef, fish

Can frailty be modified? Misc

- **Drug therapy?**
  - Steroids, growth hormone, anticytokine
  - ACE-I improve function in ADL impaired elders
    - Sumukadas et al, *CMAJ*, 2007
- **Depression**
  - Independent predictor of development of frailty
  - Unclear if treatment will modify
- **SES factors**
  - Individual and neighborhood

POPS study: Proactive Care of Older Persons undergoing Surgery

- **Pre/post study, elective orthopedic surgery**
- **Preoperative comprehensive geriatric assessment (CGA)**
- **Referral if:**

Uncontrolled HTN	Poor nutrition
Recent MI	Falls
Unstable angina	Memory problems
Heart failure	Assist with toilet
Poorly controlled DM	Assist with bed to chair
Prior stroke	Assist with dressing
Taking Warfarin	Assist with walking
COPD	Complex D/C planning

Harari et al, *Age Ageing*, 2007

POPS study: Intervention

- **Team: consult geriatrician, nurse specialist, OT, PT, SW**
- **Medical comorbidities optimized per EB practice**
- **Preop home interventions**
  - Respiratory, muscle strengthening
  - Nutrition, relaxation, pain management
  - Home OT, PT for most patients
- **Plans and goals disseminated to patient, family, and all providers within 48hr**

Harari et al, *Age Ageing*, 2007

POPS: Results

Outcome	Pre	Post
Pneumonia	20%	4%
Delirium	19%	6%
Pressure sores	19%	4%
Poor pain control	30%	2%
Delayed mobilization	28%	9%
Prolonged catheter	20%	7%
LOS	15.8 +/-13.2	11.5 +/-5.2

Harari et al, *Age Ageing*, 2007

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Conclusions

- **Frailty predicts mortality, complications, and institutional discharge after surgery**
- **Some aspects of frailty may be amenable to preoperative interventions**

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Conclusions

- **Frailty predicts mortality, complications, and institutional discharge after surgery**
- **Some aspects of frailty may be amenable to preoperative interventions**
- **Remaining questions**
  - Should frailty be measured in all older patients?
  - What is the best/efficient assessment?
  - What should the standard intervention be?
  - What is the optimal timing of the intervention?