



## Using the Frailty Index in Research

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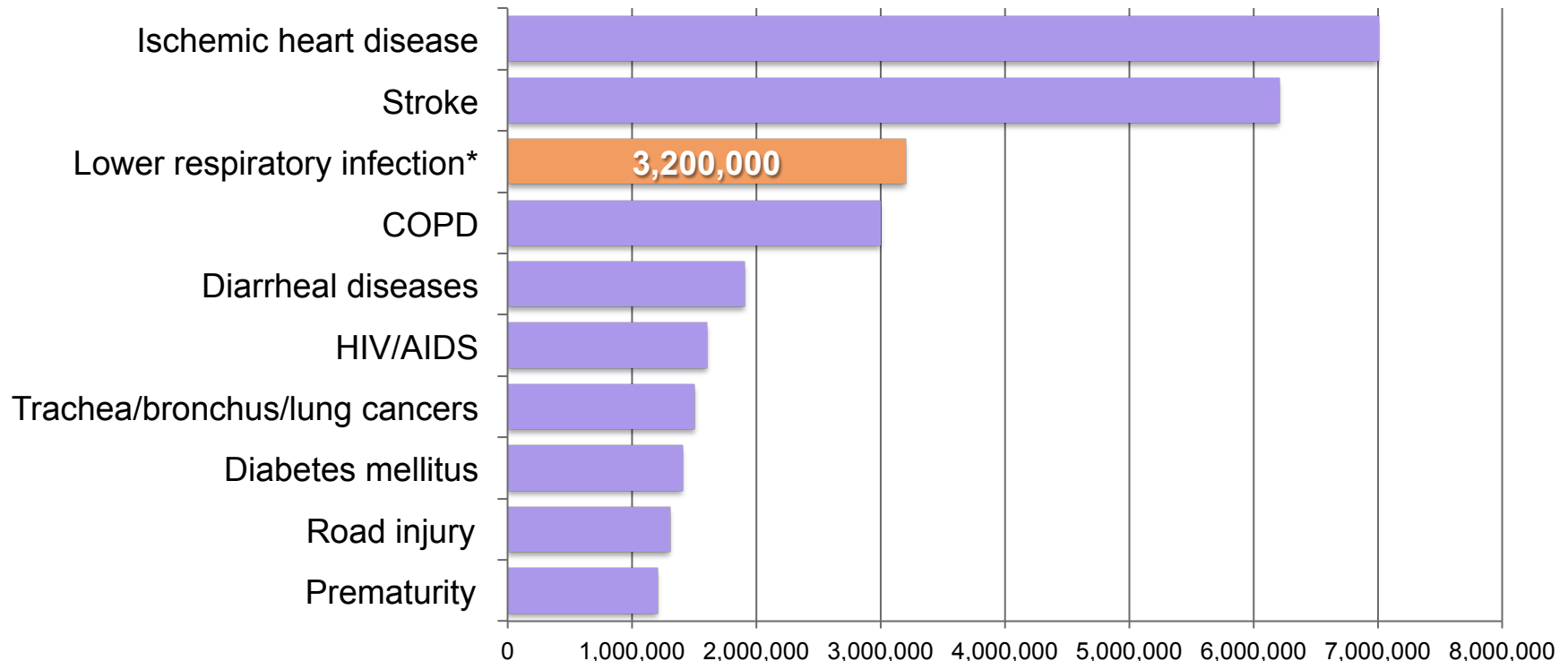
- Vaccines discussed are the standard of care for older adults.

# Learning Objectives

1. Understand how the Frailty Index reliably measures frailty and can be applied across the spectrum of basic, clinical, health service and epidemiologic research studies.
2. Use an application of the Frailty Index in a clinical trial of influenza vaccination in older adults, as an example of the Frailty Index application to randomized clinical interventions.
3. Use an application of the Frail Scale to determine the effectiveness of the 48/5 care intervention, as an example of the Frail Scale application in clinical studies with a pragmatic design.

# Lower respiratory tract infections, including pneumonia: 3<sup>rd</sup> leading cause of death worldwide

## The 10 Leading Causes of Death in the World, 2011<sup>1</sup>



COPD = chronic obstructive pulmonary disease

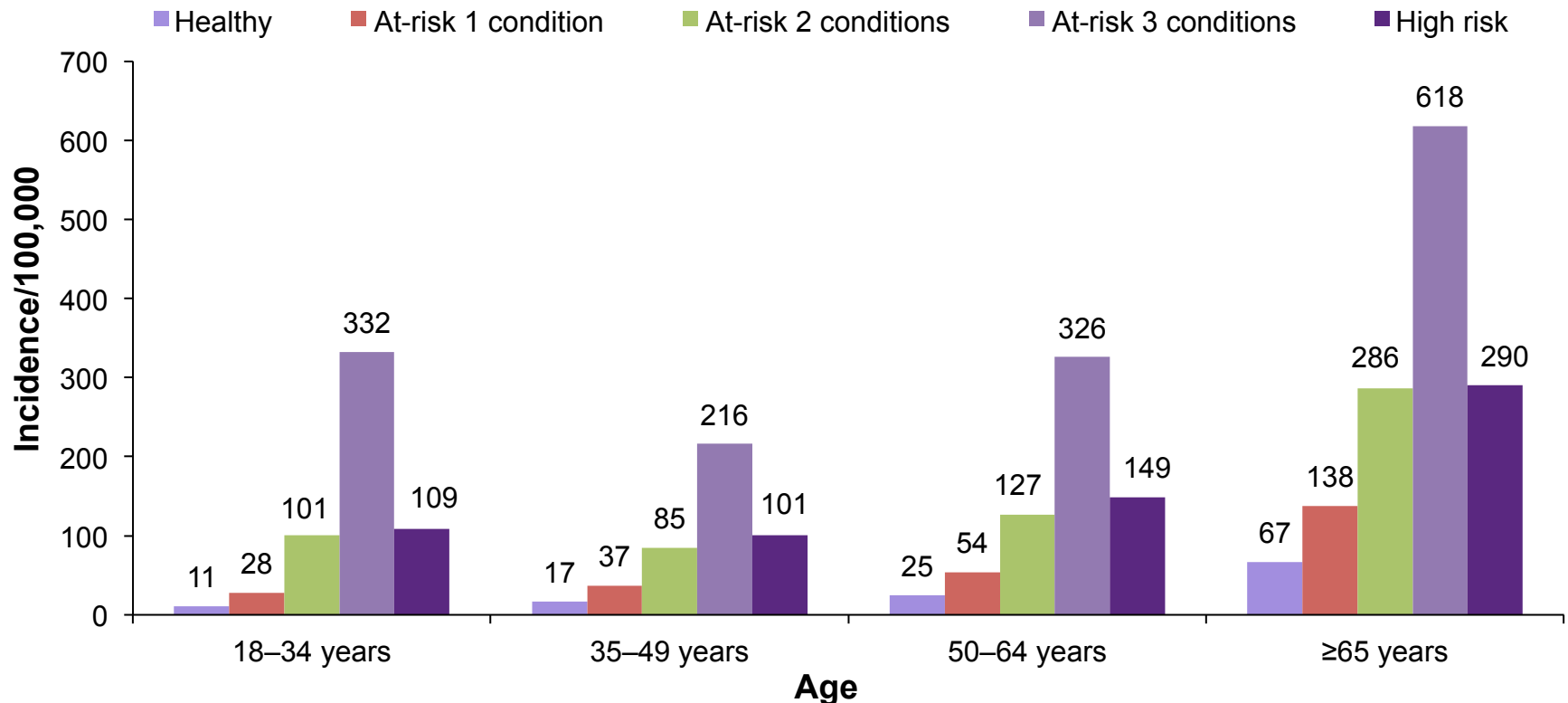
\* Pneumococcal pneumonia is the leading known cause of lower respiratory tract infection mortality.<sup>2</sup>

1. WHO. Media Centre Fact Sheets. <http://www.who.int/mediacentre/factsheets/fs310/en/index.html>. Updated July 2013. Accessed December 18, 2013.

2. Lozano R et al. *Lancet*. 2012;380(9859):2095-2128.

# Multiple underlying medical conditions further increase pneumococcal pneumonia risk in adults<sup>1</sup>

**Estimated annual incidence of pneumococcal pneumonia in the United States in adults, by number of comorbidities**

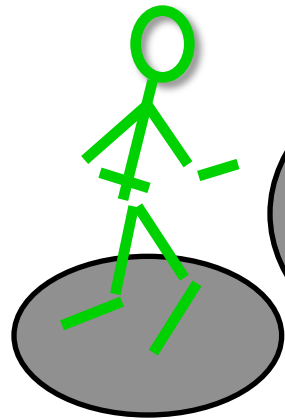


**Persons with  $\geq 2$  at-risk conditions accounted for 9%–32% of all at-risk adults, depending on age**

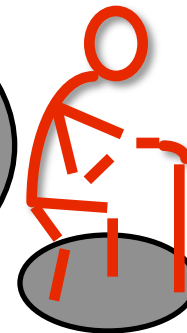
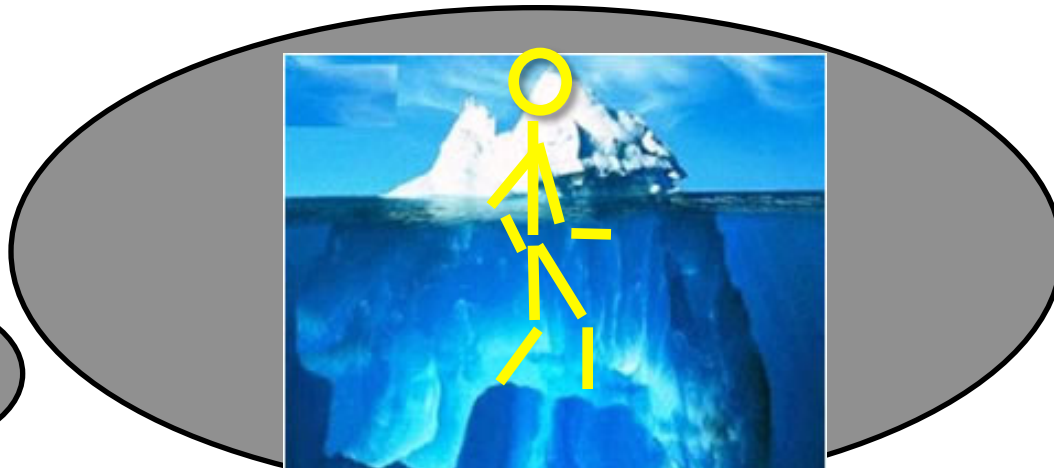
Note: At-risk—immunocompetent with  $\geq 1$  selected chronic condition, including alcoholism, asthma, chronic heart disease, chronic liver disease, chronic lung disease, diabetes, neuromuscular/seizure disorders, and smoking. High risk – Immunocompromised including Rheumatoid arthritis, lupus, Crohn's disease.

# *Promoting independence - Preventing disability*

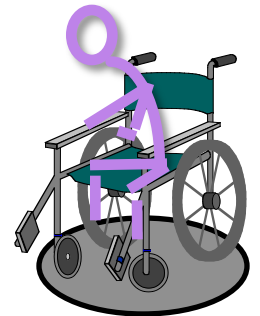
Chronic diseases that increase risk for complications of influenza are very common in older adults.



Successful Aging



Frail Seniors



Seniors in LTC

# Differences in frailty measures

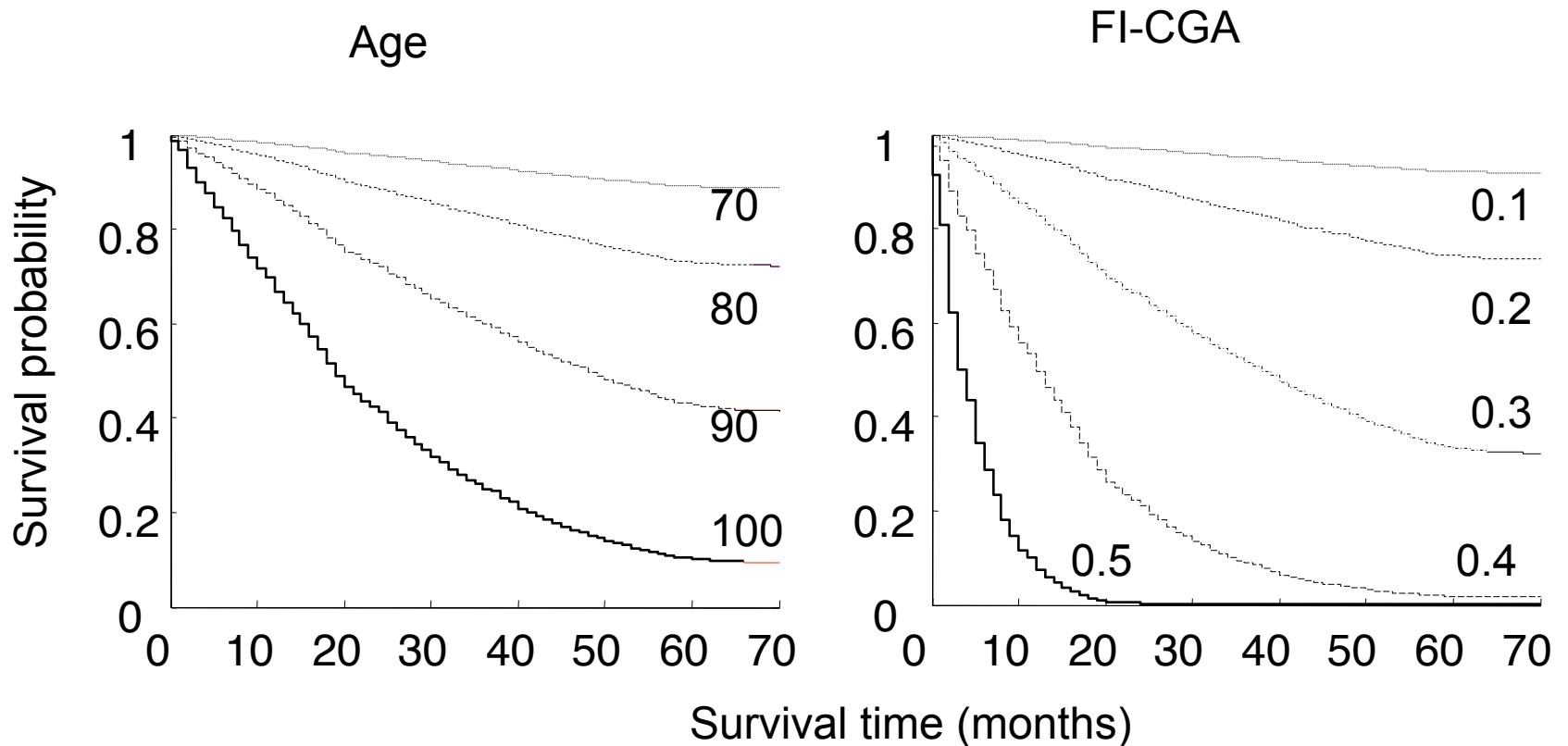
## **Fried Frailty Criteria (5-item)**

- unintentional weight loss
- exhaustion
- muscle weakness
- slowness while walking
- low levels of activity

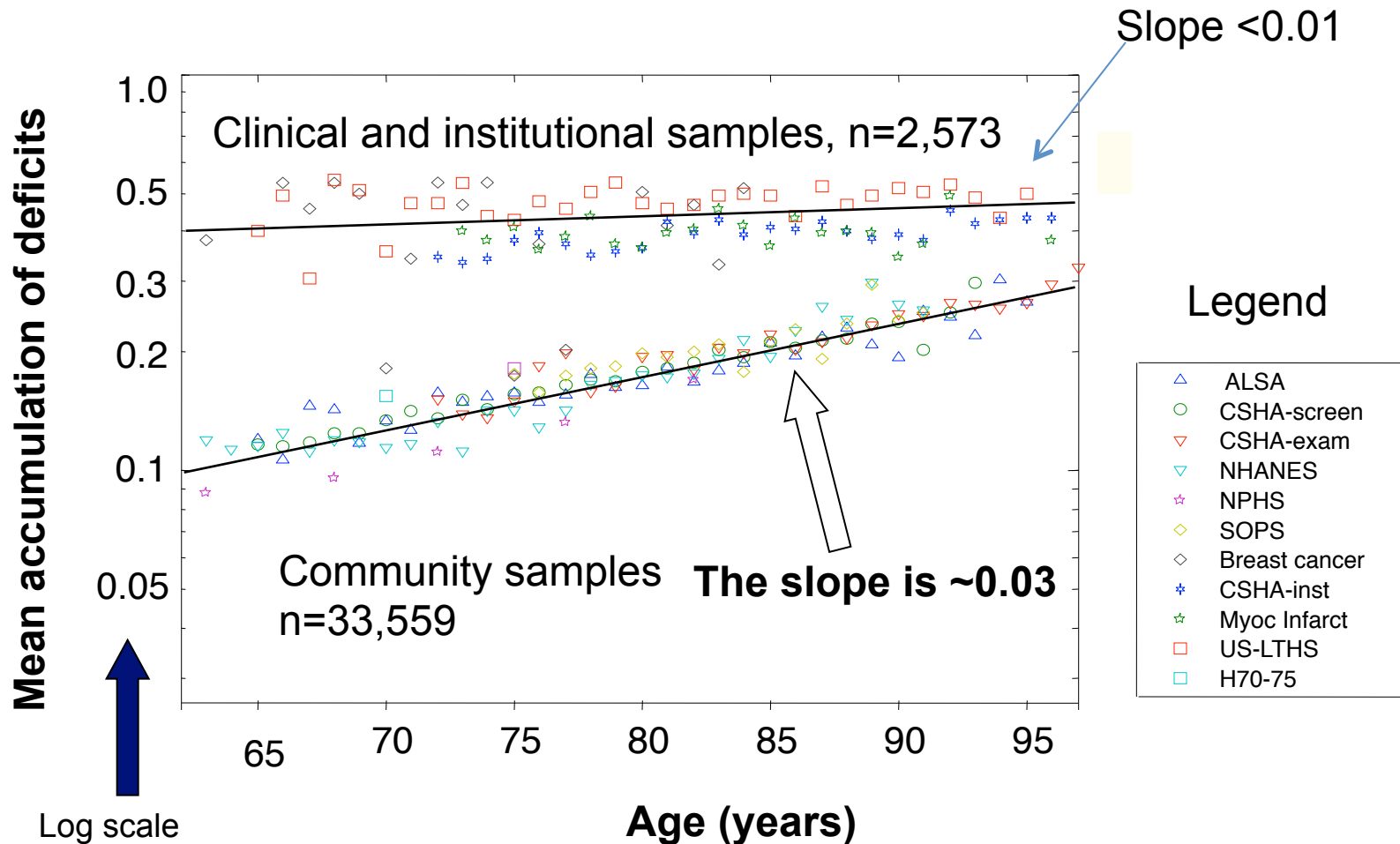
## **Rockwood Frailty Index (40-item)**

- demographics/social
- cognition/emotion/motivation/
- communication – speech, vision, hearing
- nutrition/sleep/elimination
- mobility/balance/falls
- ADL/IADL
- medical problems/medications

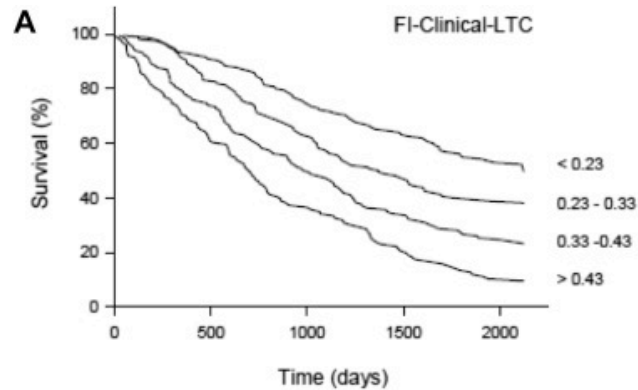
# Frailty Index based on a Comprehensive Geriatric Assessment better stratifies 70-month survival than does age



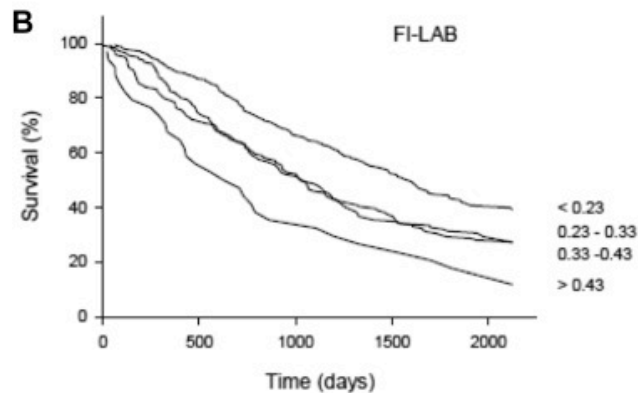
Deficits accumulate characteristically, both *between* groups (community vs. institution/ clinical) and *within* groups\*



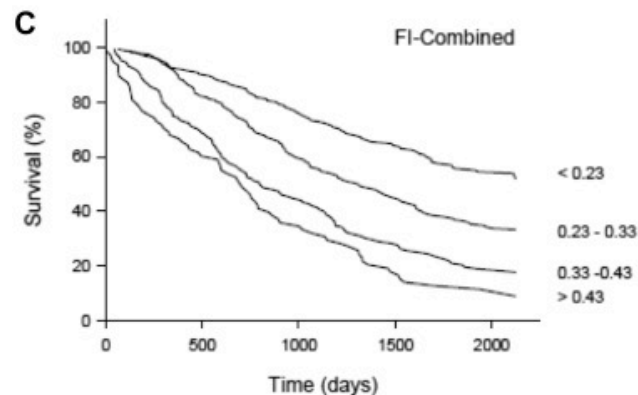
# Kaplan Meier curves for grades of Frailty Index



(A) FI-Clinical\_LTC

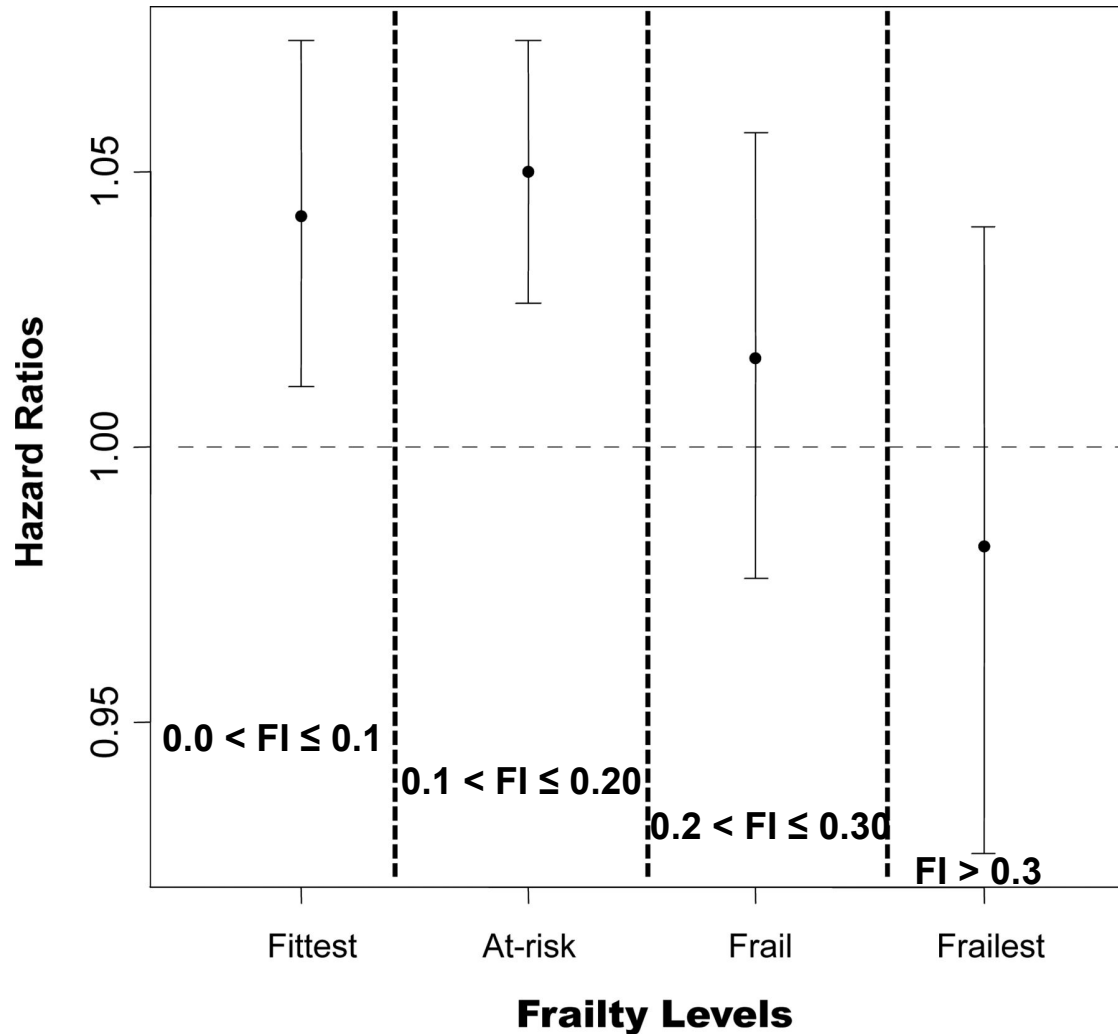


(B) FI-LAB



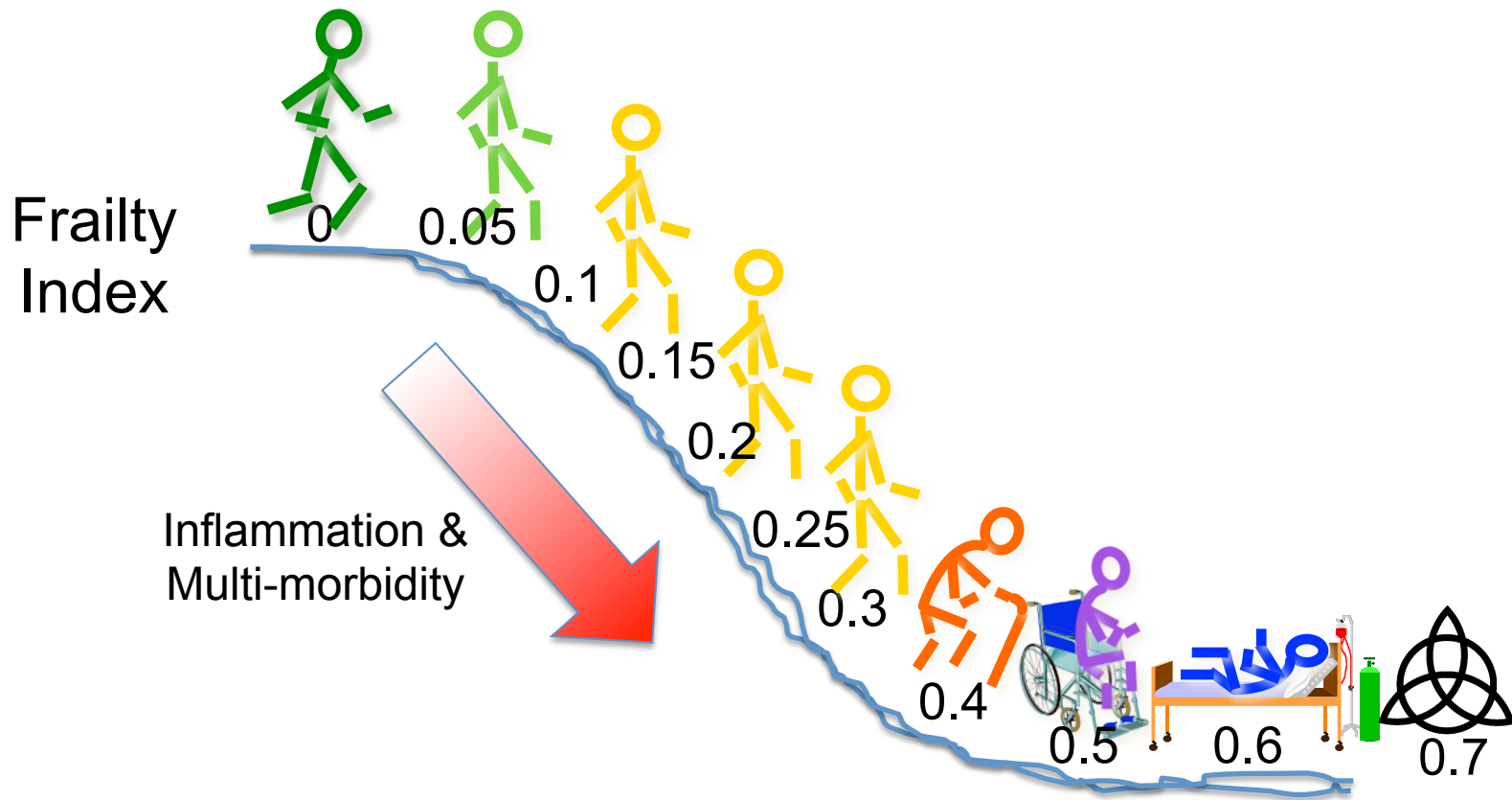
(C) FI-Combined.

# Social Vulnerability Index



For each level of frailty, survival curves were generated for a categorised SVI, controlling for age, health deficit count, smoking and alcohol use.

# Effects of and Susceptibility to LRTI with Aging

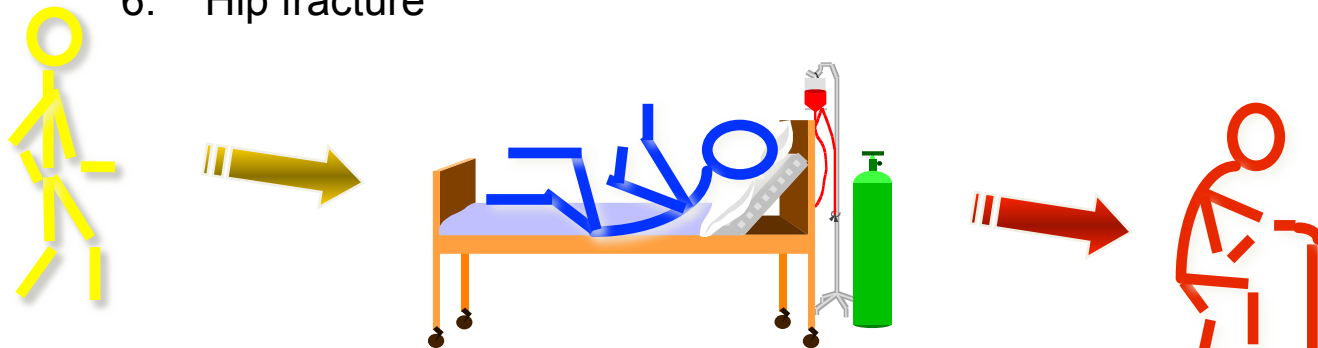


# Vaccine Preventable Disability

## *Catastrophic disability*

- Defined as a loss of independence in  $\geq 3$  ADL
- 72% who experience catastrophic disability have been hospitalized
- Leading causes of catastrophic disability
  1. Strokes
  2. CHF
  3. Pneumonia and influenza
  4. Ischemic heart disease
  5. Cancer
  6. Hip fracture

PCIRN SOS:  
Frailty, Influenza Vaccination and  
Hospitalization due to Influenza.



Ferrucci et al. *JAMA* 277:728, 1997  
Barker et al. *Arch Int Med* 158:645, 1998  
Falsey et al. *N Engl J Med*. 2005;352:1749

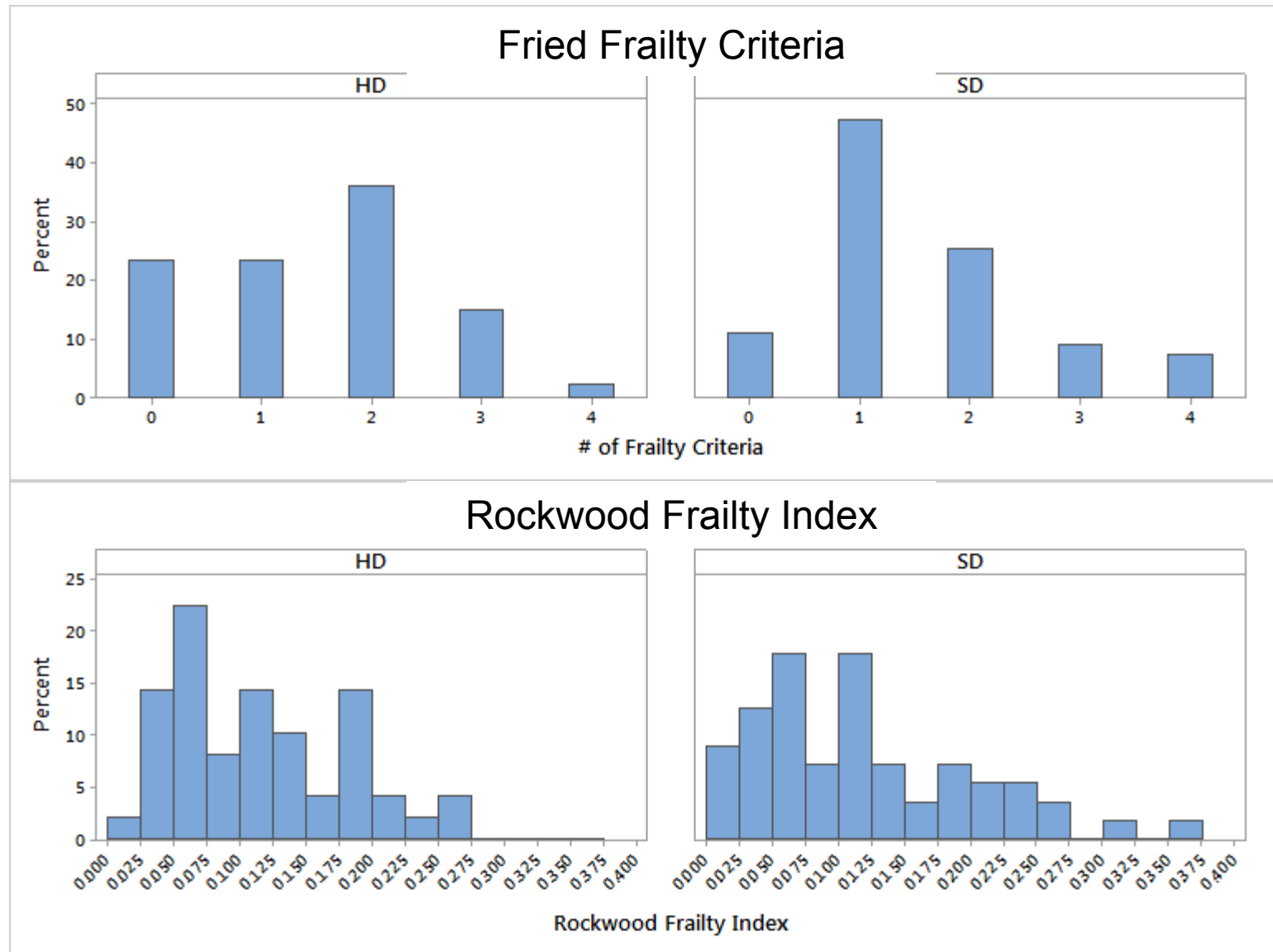
# Frailty Index: Take Home Message

- Deficits can include physical, cognitive, functional, biomarker, psychological and social deficits
- The more deficits included in the FI, the more reliable the measure of frailty
- Number of accumulated deficits is finite (FI < 0.7)
- It doesn't matter *which* deficits you have, it's ***how many*** deficits you have out of the total list  
**NO** weighting of the variable is necessary

# Frailty Index: Use in a clinical trial

- Randomized trial of High-Dose vs. Standard Dose inactivated influenza vaccine
- 150 community-dwelling adults age 65 years and older
  - Characterization of the study population
  - How does this compare with known risk factors for influenza?
  - Did the randomization work?
  - Does the FI predict outcomes of vaccination?
  - Do we need immunologic biomarkers to establish risk at the point of care?

# Frailty status in subjects randomized to HD vs. SD vaccine



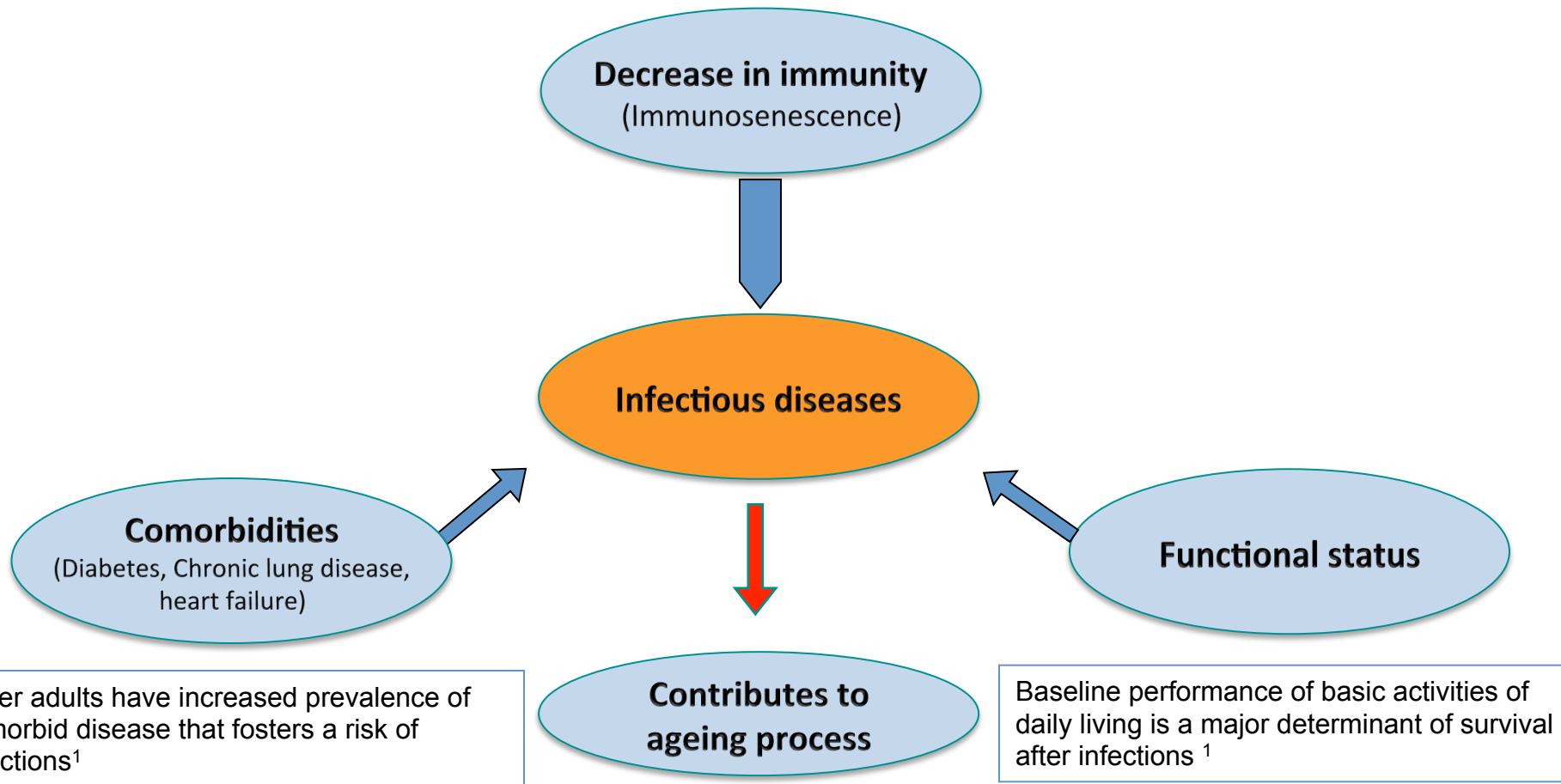
HD vs. SD,  $p=0.8$

# Influenza and Pneumonia: Predictors of Hospitalization and Death

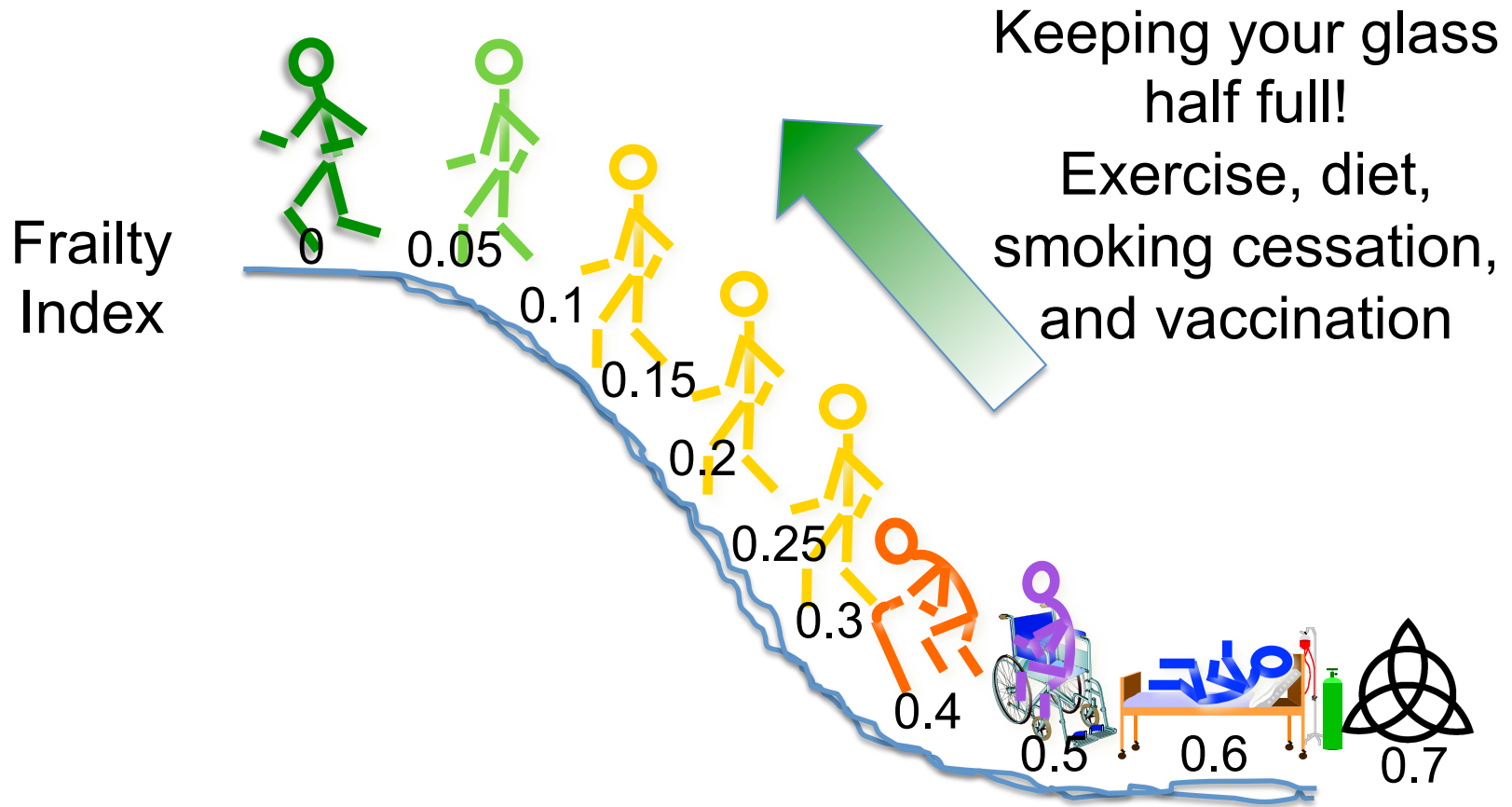
*Hospitalization due to influenza and pneumonia, and death to any cause*

Age, years	Score		
<70	0	Age	
70-74	14		
75-79	28		
80-89	42		
≥90	56		
Male	9	OP Visits	
Outpatient visits in previous year			
0	0		
1-6	11		
7-12	22		
≥13	33	Hospitalization	
Previous hospitalization for pneumonia or influenza	63		
Comorbidity			
Pulmonary disease	18		Pulmonary
Heart disease	6		
Renal disease/transplant	12	Dementia/Stroke	
Dementia or stroke	22		
Nonhematological and hematological cancer	48	Cancer	

# 65+ population has higher susceptibility to infectious diseases



# Adding Life to Years



# Frail Scale: Application to implementation of the 48/5 care pathway

- Pragmatic Design: Patients 65+ years admitted to hospital through the Emergency Dept with Frail Scale score of 4-7
- Directed to intervention vs. control care units (n=30/group) based on bed availability
- Care team developed “their 48/5 pathway” and interprofessional collaborative practice statements to change practice
- Patients or their surrogates gave written informed consent to participation in the study
- Research assistant collected all study data – not the unit staff

# 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. seasonal.



3. **Managing Well** – People whose health 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 III** – Approaching the end of life. This category applies to people with a life expectancy < 6 months, who are not otherwise evidently frail.

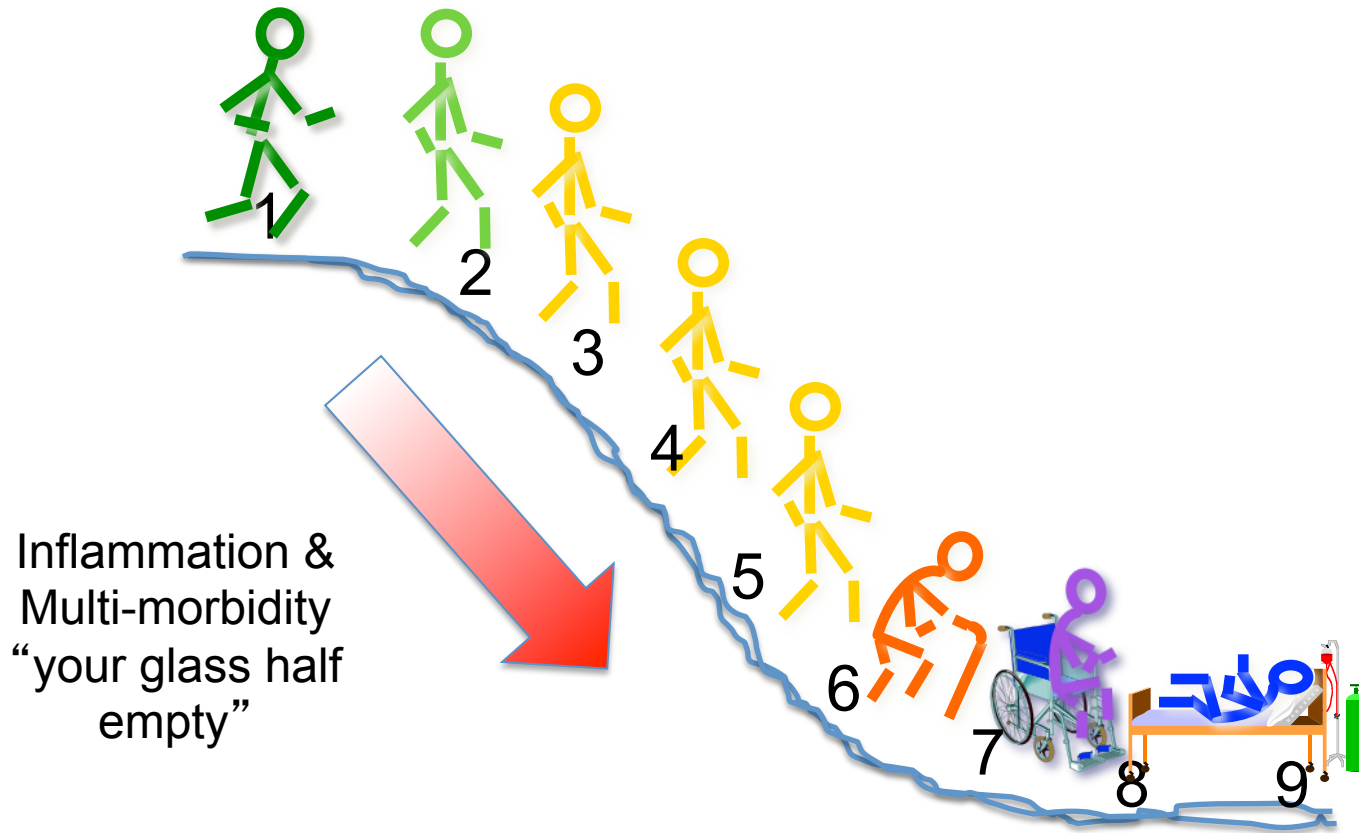
## Where dementia is present, the degree of frailty usually corresponds to the degree of dementia:

- **Mild dementia** – includes forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.
- **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.
- **Severe dementia** – they cannot do personal care without help.

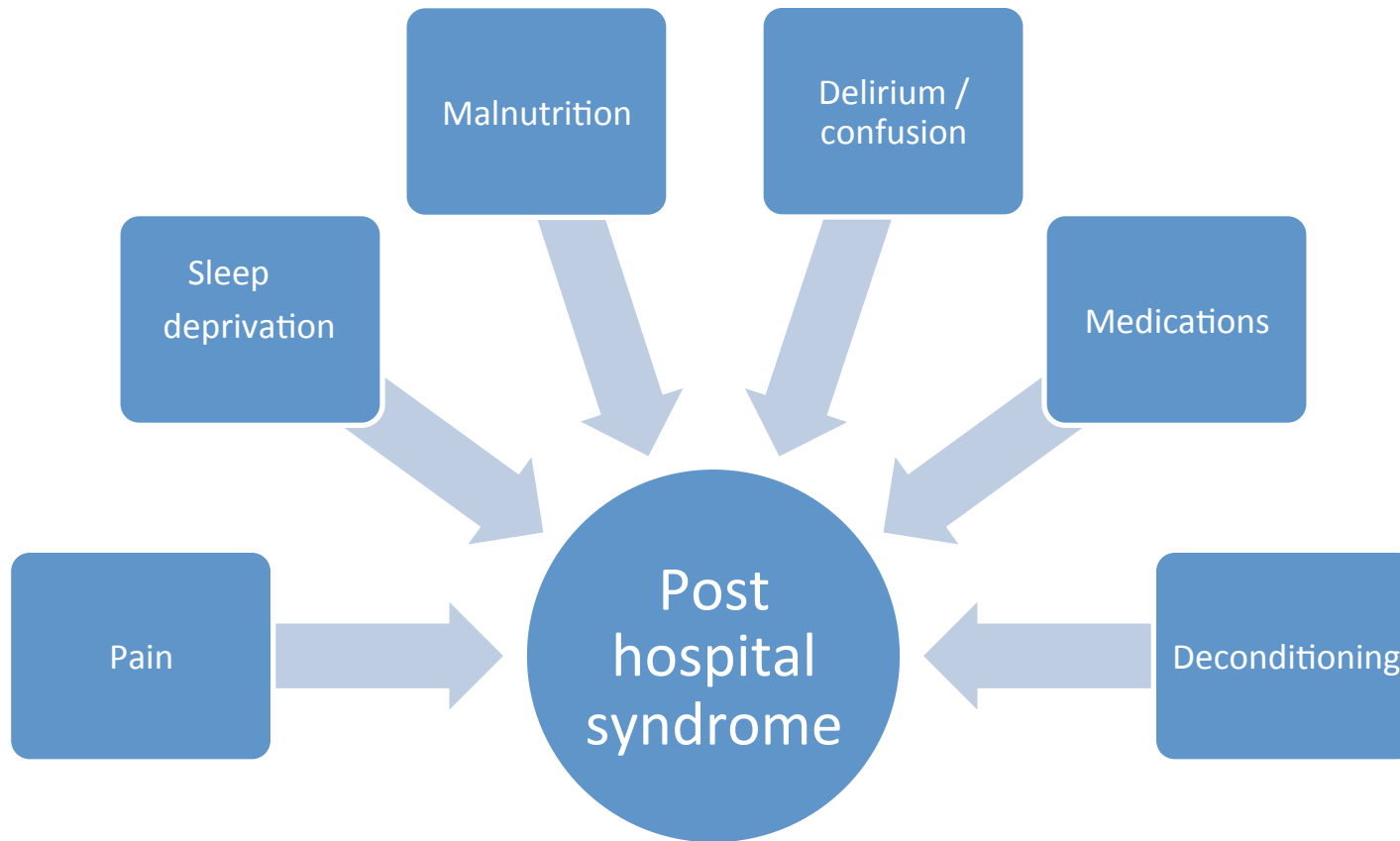
*K. Rockwood et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489–495*

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Geriatric Medicine Research, Dalhousie University, Halifax, Canada

# Your glass... half empty



# Hospitalization is a potent predictor of disability, vulnerability in older adults<sup>1</sup>



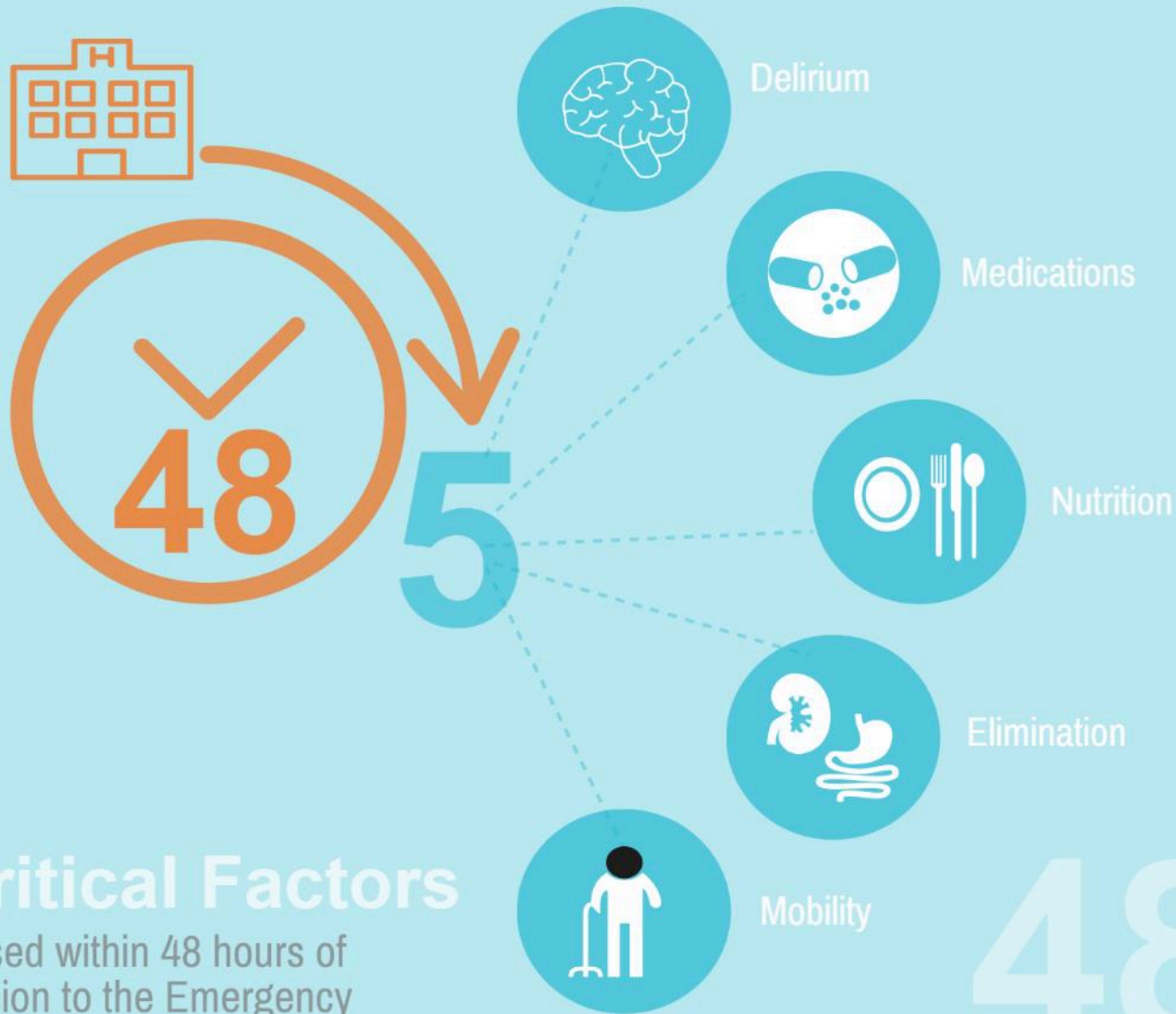
Hospitalization on its own confers a 60-fold odds of developing a new disability<sup>2</sup>  
At discharge, 35% are more disabled and 1/2 never recover<sup>3</sup>

# Functional Decline as Predictor of Hospital Outcomes

## Outcomes at 12-months post-discharge

- Discharged with new or additional ADL disability
  - 41.3% died,
  - 28.6% alive but not recovered to baseline
  - 30.1% were at baseline function
- Discharged at baseline function
  - 17.8% died
  - 15.2% alive but worse than baseline function
  - 67% were at their baseline function
- Recovery by 1 month was associated with long-term outcomes
  - Age, cardiovascular disease, dementia, cancer, low albumin, and greater number of dependencies in instrumental ADLs independently predicted failure to recover.

# 48/5 Care Pathway



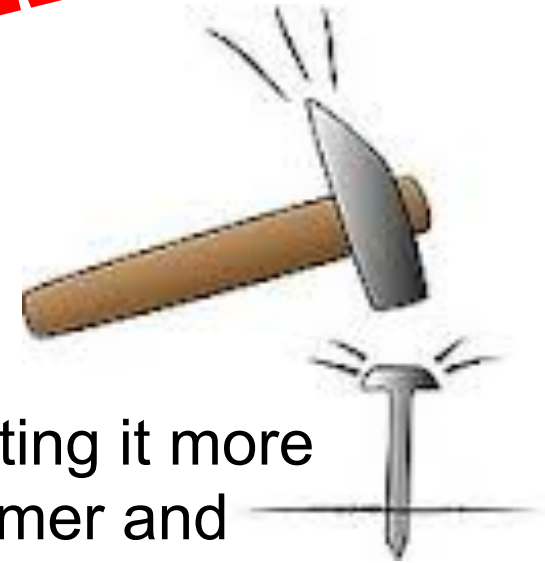
## 5 Critical Factors

Assessed within 48 hours of admission to the Emergency Department

When translation of “best” into practice fails...



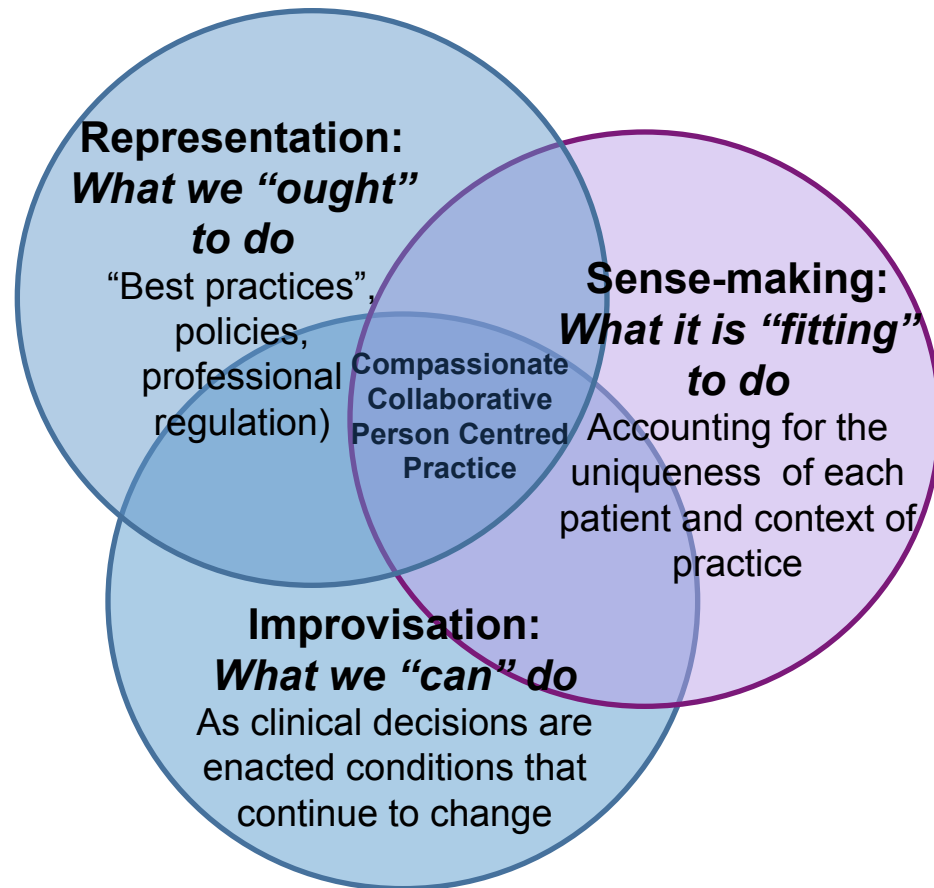
**The case for Development Evaluation**



...we respond by improving the evidence (getting it more right) or the translation strategy (like the hammer and the nail) ... it's a bit like trying the same thing again expecting different results

To make sense of compassionate, collaborative, person-centred care we need to develop an understanding of practice that reflects its complexity ...

Three interdependent, iterative processes...



# Implementation using Developmental Evaluation

## What we did...

- 1) Collaborated with our hospitalists to implement 48/5 – a willing group of physicians
- 2) COACH team did all geriatric screen assessments – no impact on ED workload
- 3) Each unit developed practice statements for “their” 48/5 pathway – engaged frontline staff

## What we learned...

- 1) A willing group of physicians initiated 48/5 when geriatric assessment completed
- 2) ED staff observed mobility benefit and only 3-5 minutes of additional work to complete the screen
- 3) Nursing/allied health implemented “their” 48/5 pathway in **all** patients admitted to that unit

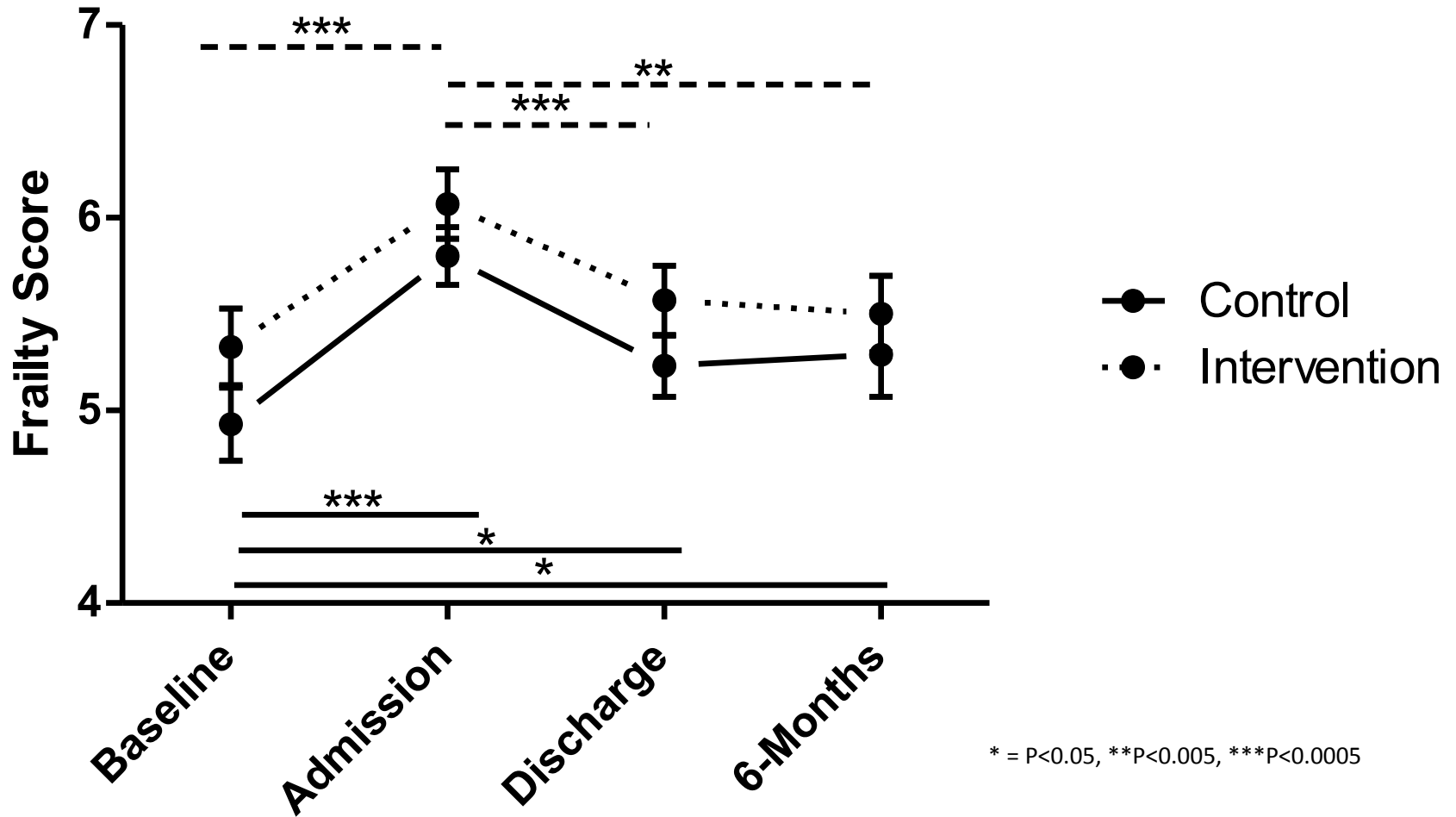
# Baseline Characteristics of All Participants\*

Characteristic	Value
Sex – (%)	
Male	46%
Female	64%
Race or ethnic group – (%)	
Caucasian	97%
Aboriginal	2%
Other	2%
Age	
65-74	33%
75-84	35%
≥85	32%
Marital status – (%)	
Married	62%
Widowed	21.6%
Separated/Divorced	6%
Respondent – (%)	
Participant	82%
Caregiver	18%
Frailty Score†	5.08 ± 0.14

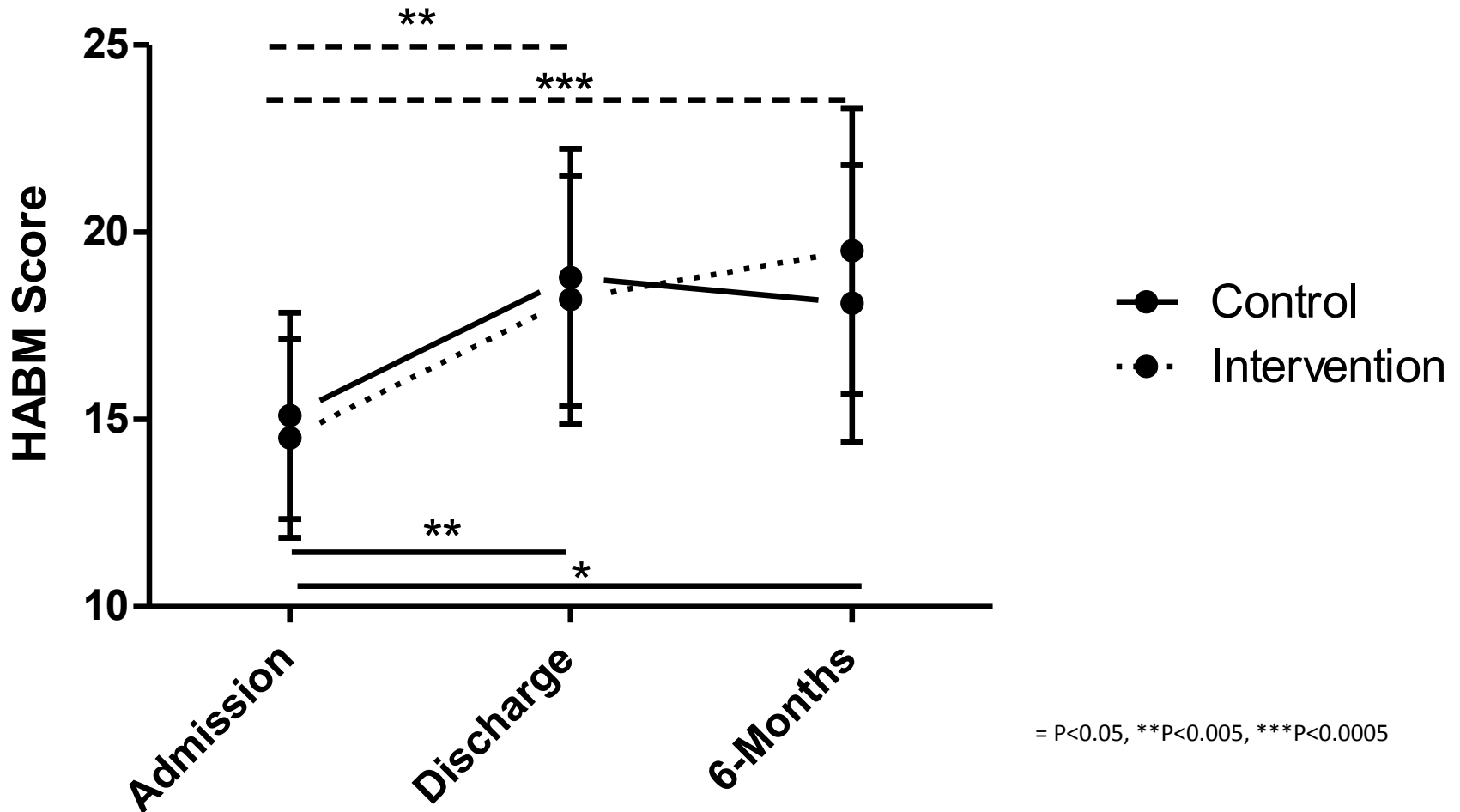
\*No significant difference among the two treatment groups.

†Frailty score derived from assessments using the Clinical Frailty Scale. Mean ± SD.

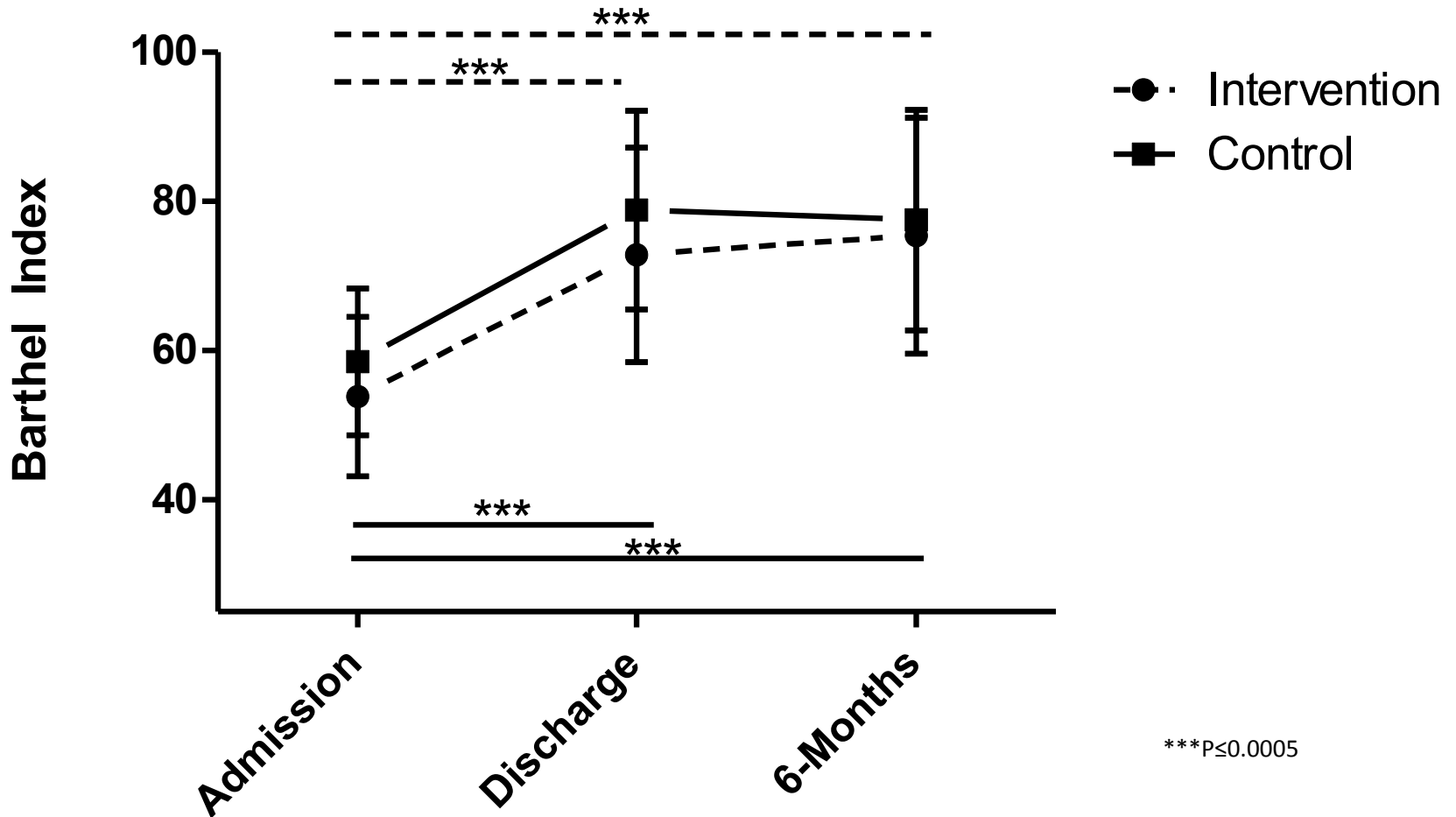
# 48/5 Change in Frailty Score



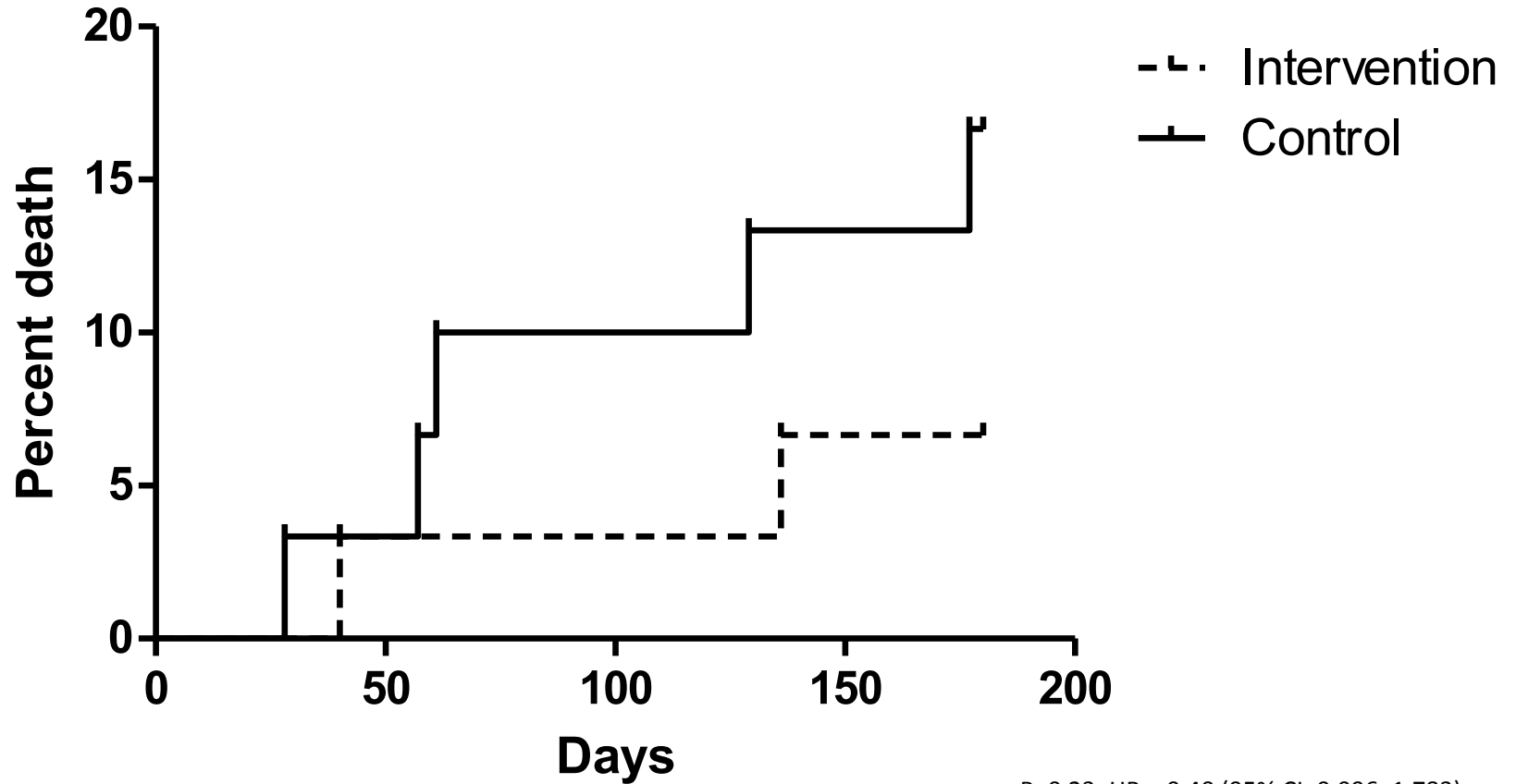
# 48/5 Change in mobility HABAM Score



# 48/5 Change in Barthel Index

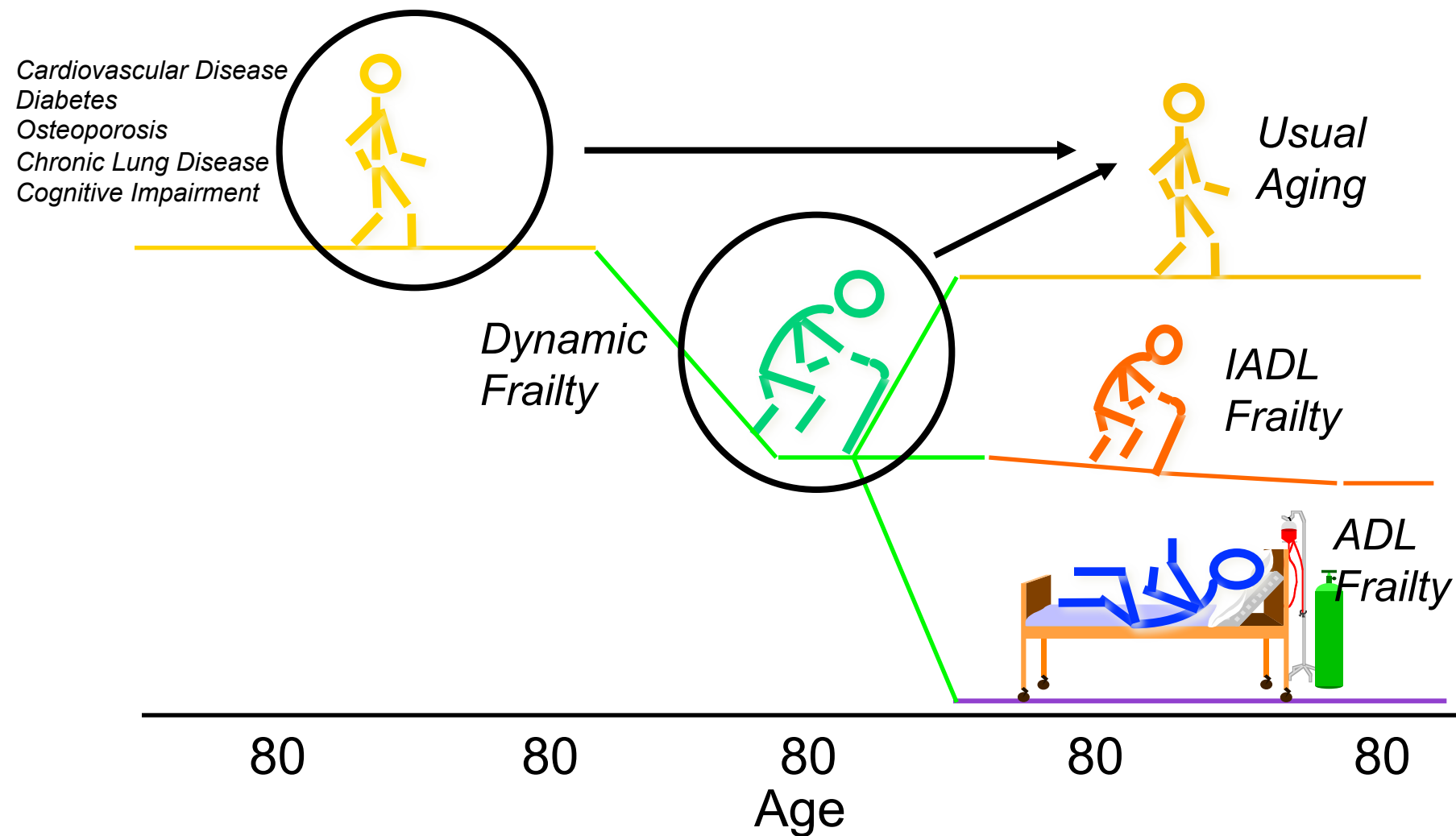


# 48/5 Change in Mortality



P=0.23; HR = 0.40 (95% CI: 0.096, 1.783)

# Our results



# Summary

1. Frailty Index reliably measures frailty and can be applied across the spectrum of basic, clinical, health service and epidemiologic research studies.
2. Frailty Index applied to randomized clinical trials can be used to determine effectiveness of randomization and potentially improve point-of-care decisions for vaccination in older adults.
3. Frail Scale can be used by clinicians and applied to pragmatic trials to determine the effectiveness of care interventions.