Assessment of Physical Function

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@MrDisability

Why Is This Important to Do?

- Final common pathway
  - reflects impact of disease, co-morbidity and aging
- Useful focus of therapy
- Important from regulators perspective
  - FDA key outcomes – feel, function, survive
- What older people want in life

Self-reported Function

Activities of Daily Living

Self-care

- Bathing
- Dressing
- Transferring from bed to chair
- Toileting
- Grooming
- Feeding oneself

Instrumental

- Using the telephone
- Preparing meals
- Managing household finances
- Taking medications
- Doing laundry
- Doing housework
- Shopping
- Managing transportation

Mobility

- Walking from room to room
- Climbing a flight of stairs
- Walking outside one’s home

Disability Assessments are Highly Variable

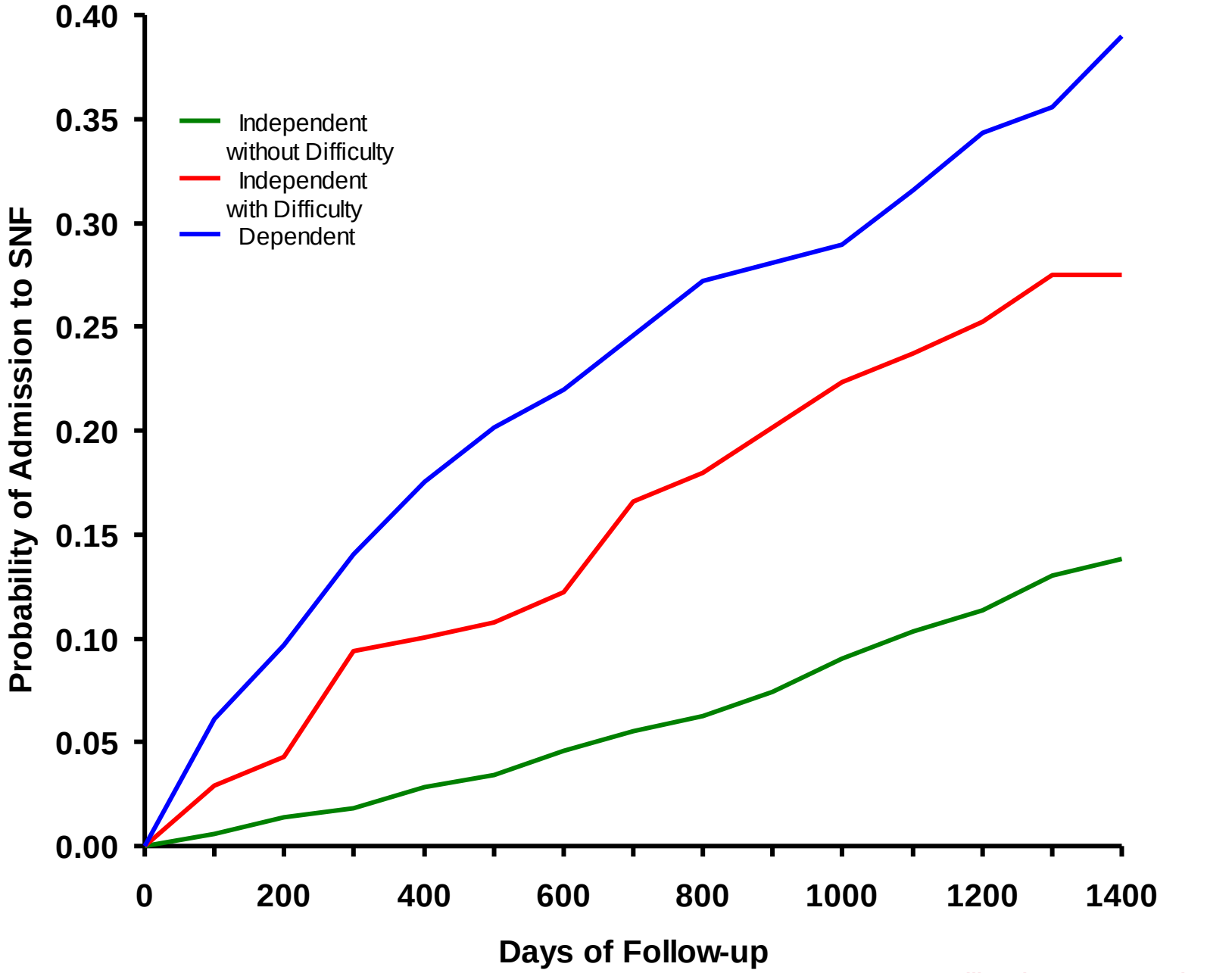
- Inclusion of different tasks: BADLs, IADLs, mobility
- Difficulty with task vs. help with task
- Help from another person vs. special equipment
- Needs help vs. gets help
- Help may or may not include supervision
- Inclusion of a preamble
  - because of a health or physical problem, …
- Frame of reference
  - at the present time, during the past month, since the last interview

Some Considerations

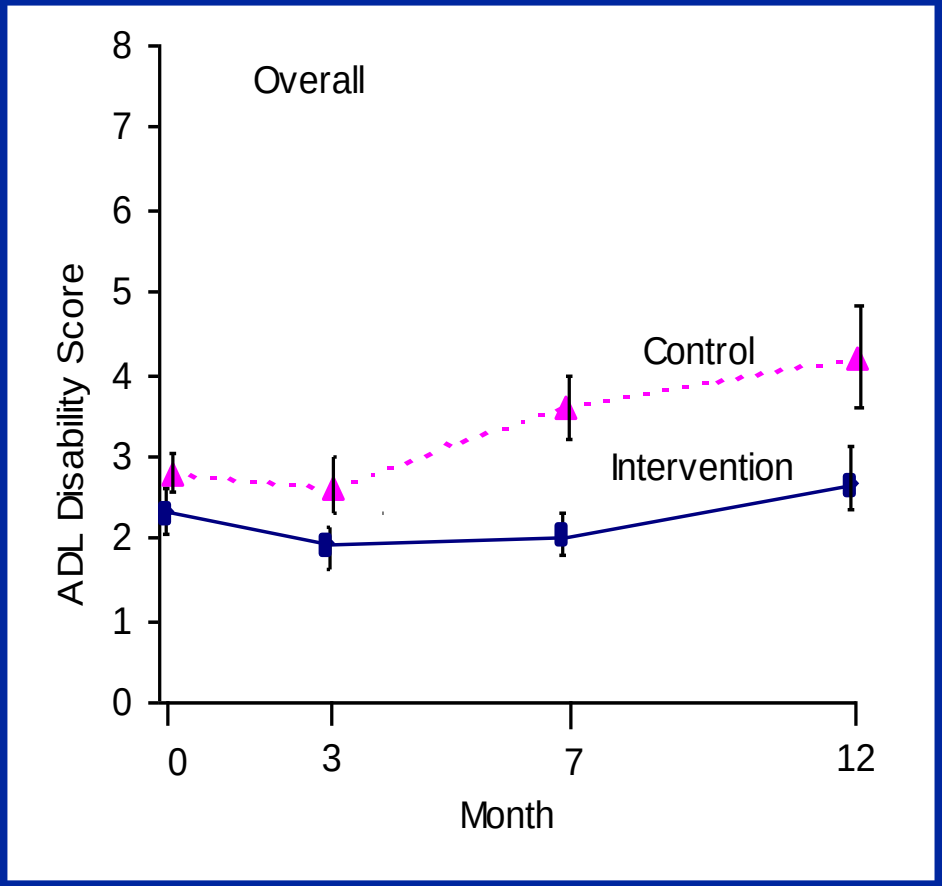
- Goal of the assessment
  - detecting change over time
  - discriminating among individuals at a single point in time
- Can questions be administered and answered reliably?
  - especially to proxy respondents
- Specific questions should be provided in published reports

Topics for Discussion

- Difficulty vs. dependence
- Frame of reference
- Reducing ceiling effects



Gill et al, Ann Intern Med, 1998



No. of Participants	**188**	**182**	**181**	**178**
% Reduction	**--**	**17**	**46**	**40**
p-value	**--**	**0.40**	**0.004**	**0.007**

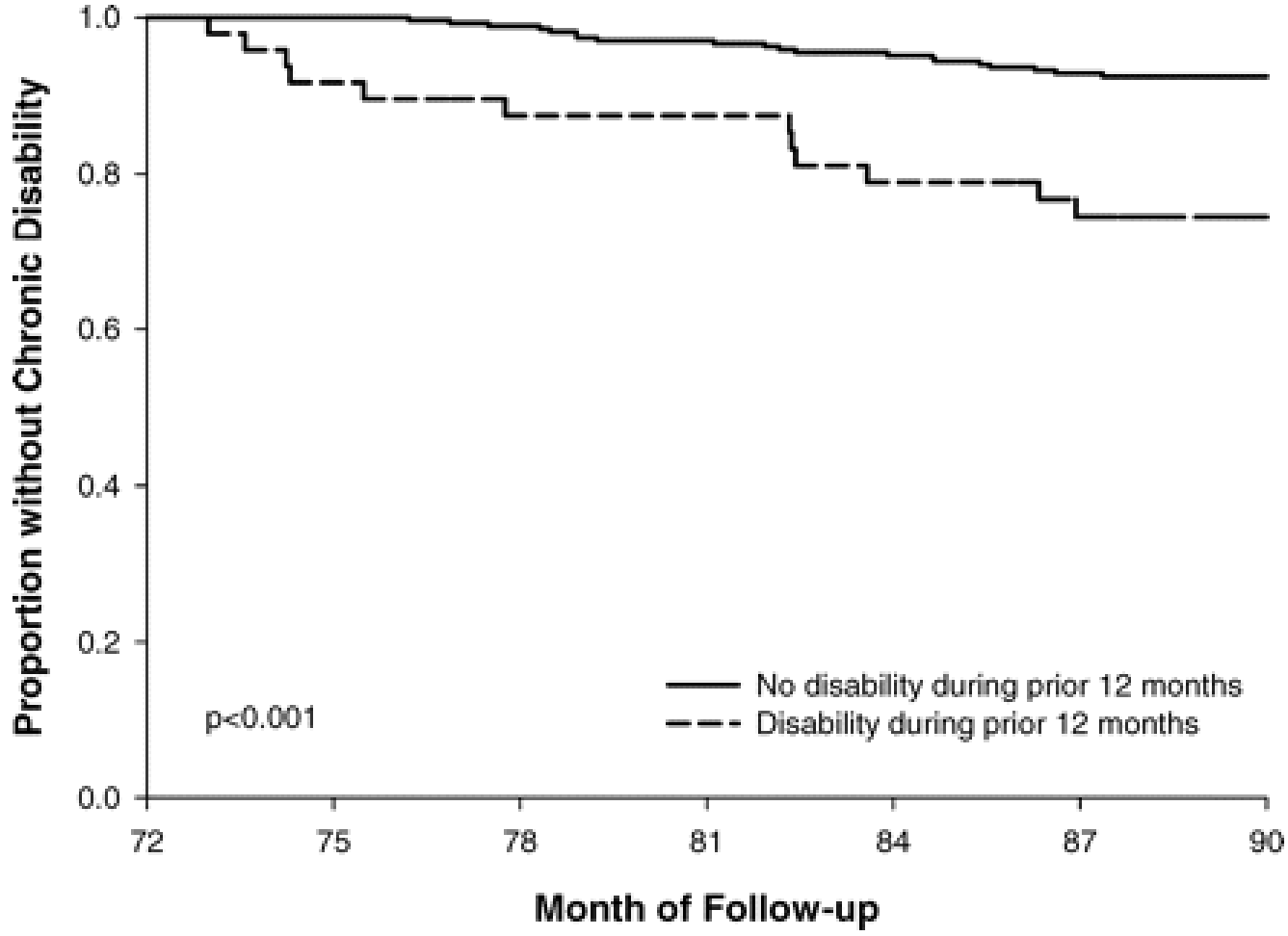
Gill et al, N Engl J Med, 2002

Frame of Reference

Interval prior to 72-month assessment	Number of participants nondisabled at start of interval	Ascertainment of disability at 72-month assessment					
		At present time		At any time during interval		Total	
		No.	%	No.	%	No.	%
1 month	89	6	6.7	1	1.1	7	7.9
3 months	133	13	9.8	7	5.3	20	15.0
6 months	261	36	13.8	16	6.1	52	19.9
12 months	373	53	14.2	48	12.9	101	27.1

Gill et al, J Gerontol Med Sci, 2008

Adjusted HR: 2.5



Gill et al, J Gerontol Med Sci, 2008

To Reduce Ceiling Effects

Women's Health and Aging Study II

- task modification

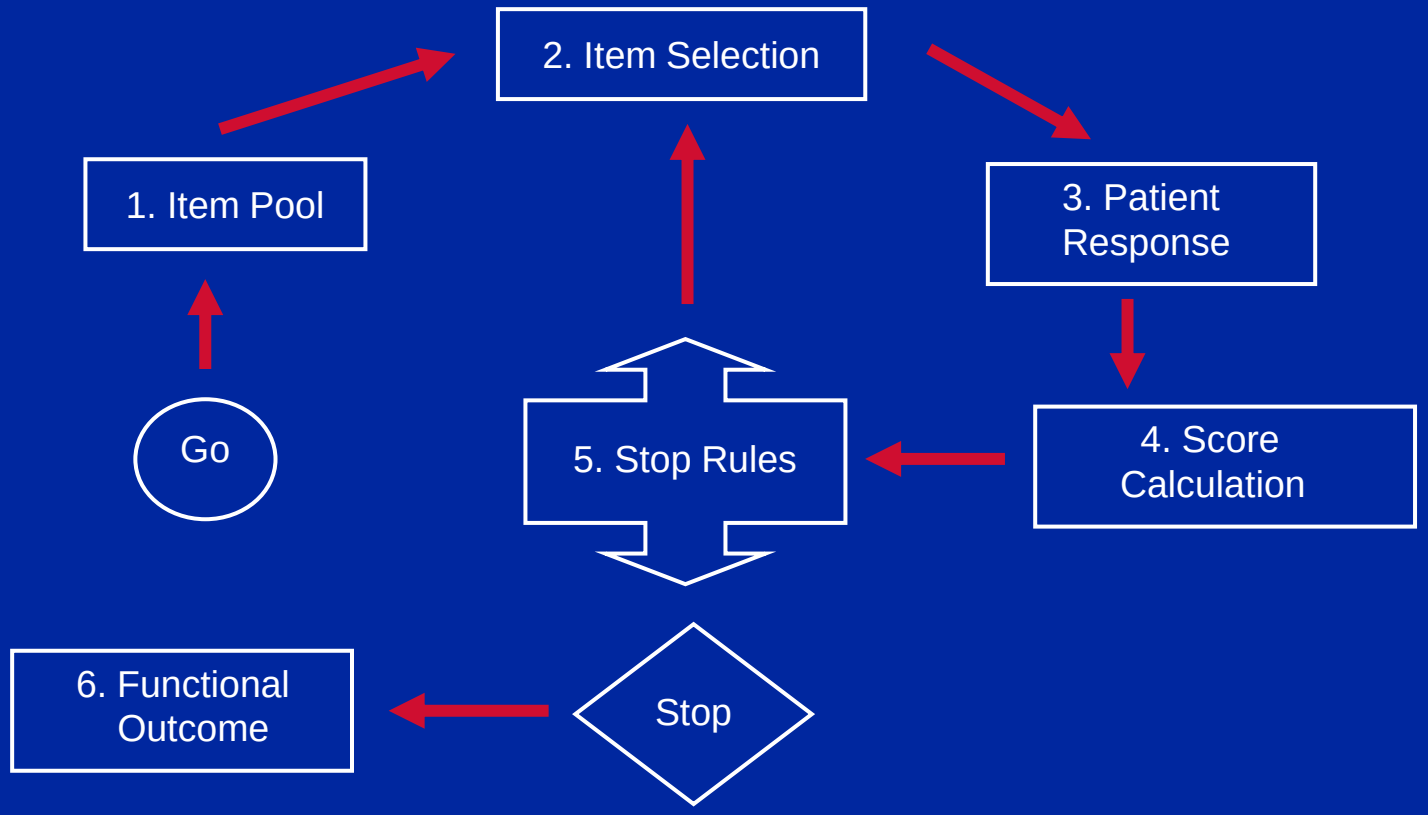
Health ABC Study

- ease of performance
- inclusion of more demanding tasks

Contemporary Measurement Technology

- Designed to address competing considerations
  - conceptual breadth vs. depth of measurement
  - feasibility vs. precision
  - ceiling and floor effects
- Item response theory (IRT)
  - create hierarchically ordered item banks
- Computer adaptive testing (CAT)
  - algorithm selects items directly tailored to the person
  - shortens or lengthens test to achieve desired precision or preassigned item stopping rule

Basic Computer Adaptive Testing Logic



Jette AM, Haley SM, J Rehabil Med, 2005

Physical Function

Please respond to each item by marking one box per row.

		Without any difficulty	With a little difficulty	With some difficulty	With much difficulty	Unable to do
PFA8	Are you able to move a chair from one room to another?.....	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
PFA9	Are you able to bend down and pick up clothing from the floor?.....	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
PFA10	Are you able to stand for one hour?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
PFA11	Are you able to do chores such as vacuuming or yard work?.....	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
PFA12	Are you able to push open a heavy door? ...	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1

PF-10

The following questions are about activities you might do in a typical day. Does your health now limit you in those activities? Is so, how?

		Yes, a lot limited	Yes, a little limited	No, not limited at all
1a	Vigorous activities such as running lifting heavy objects, participating in strenuous sports			
1b	Moderate activities such as moving a table, pushing a vacuum cleaner, bowling, playing golf			
1c	Lifting or carrying groceries			
1d	Climbing several flights of stairs			
1e	Climbing one flight of stairs			
1f	Bending, kneeling, stooping			
1g	Walking more than a mile			
1h	Walking several hundred yards			
1i	Walking one hundred yards			
1j	Bathing or dressing yourself			

Physical Performance Measure

Assessment in which an individual is asked to perform a specific task and is evaluated in an objective, standardized manner using predetermined criteria, which may include counting of repetitions or timing of the activity as appropriate.

Performance vs. Self-Report Measures of Physical Functioning

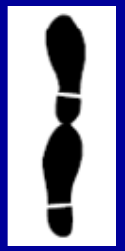
Advantages

- Face validity clear for task being performed
- Reproducibility
- Sensitivity to change
- In persons with poor cognitive functioning
- Culture, language and education

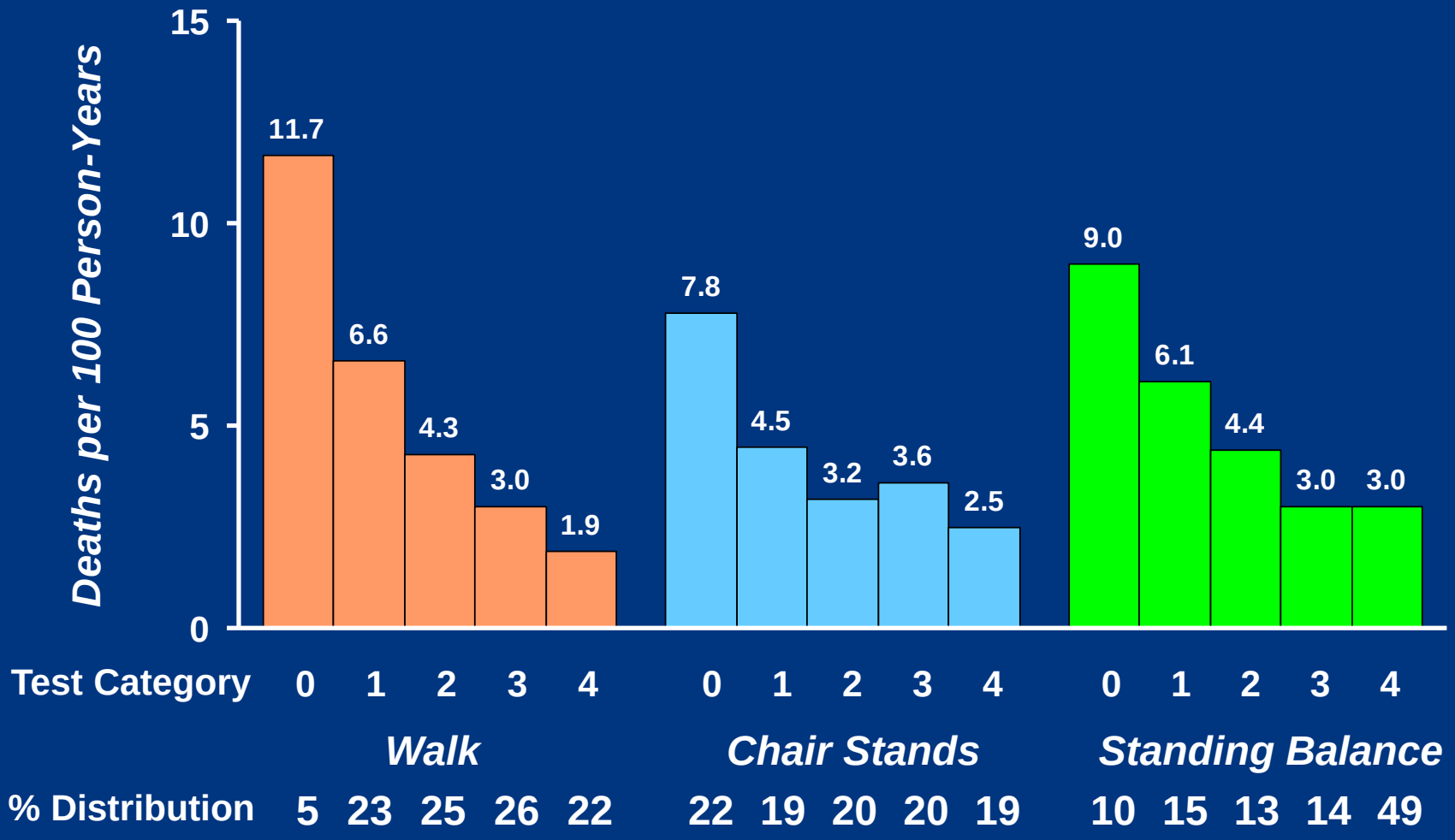
Disdvantages

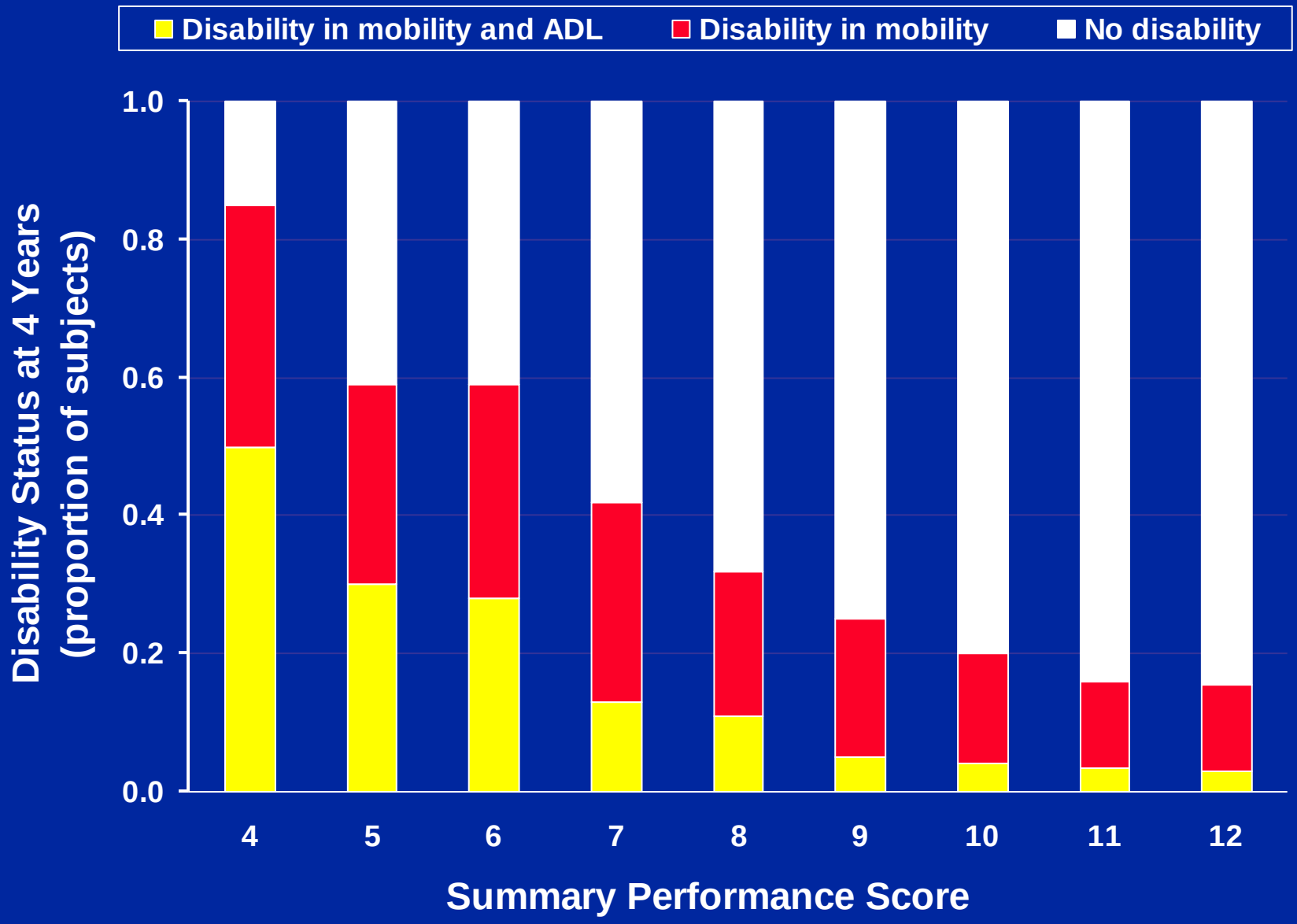
- Time to perform
- Special training of examiners
- Adequate space required
- Potential injuries
- Simple tests may not reflect performance on complex tasks or adaptation to environment in daily life

Short Physical Performance Battery (SPPB)

- Timed standing balance (up to 10 seconds)
  - Side-by-side stand 
  - Semi-tandem stand 
  - Tandem stand 
- Timed 4-meter walk
- Timed multiple (5) chair rises

Death Rates According to Individual Performance Tests—Age and Sex Adjusted



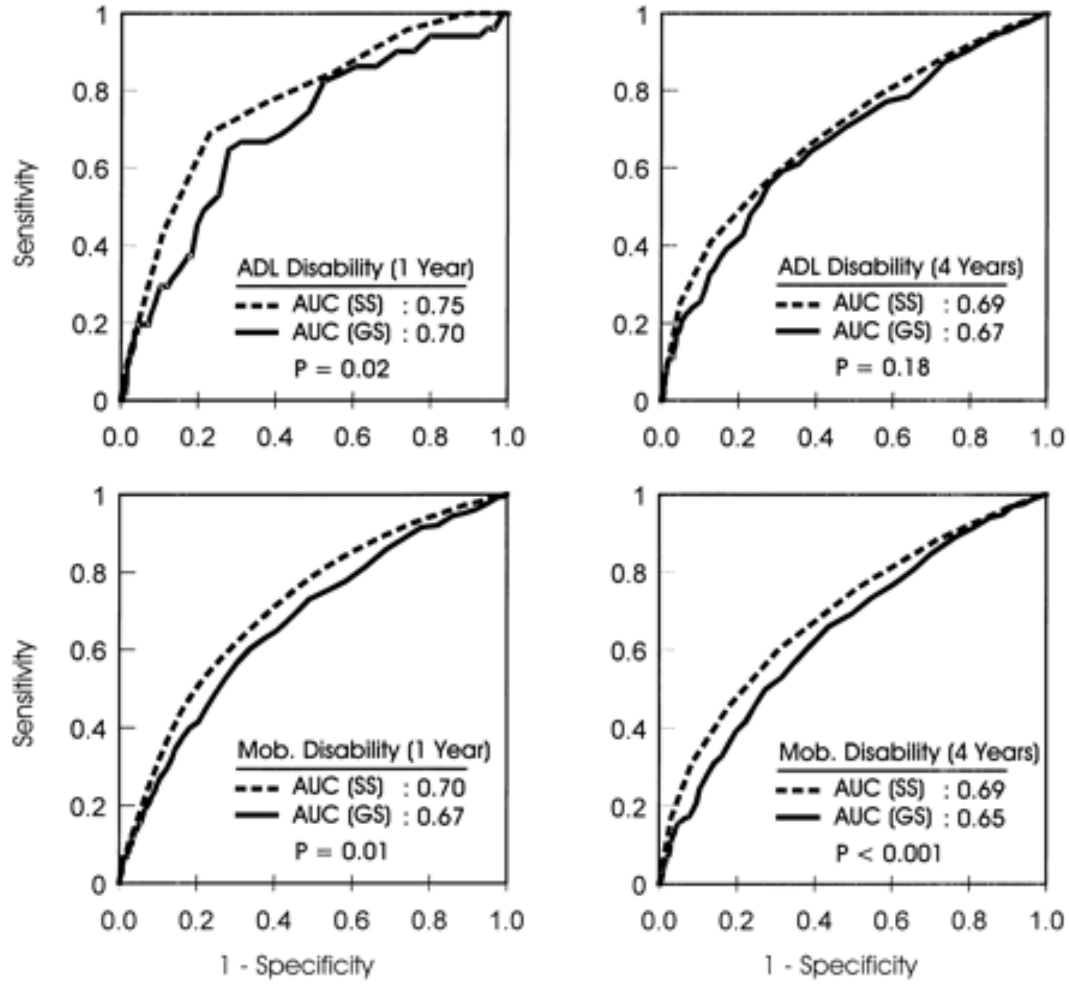


Guralnik et al, NEJM, 1995

Smart Phone App for SPPB

- Full text of assessor’s instructions to participant
- Skip patterns built in
- Use of button on phone to start and stop timing
- Data entered automatically
- Wireless upload to research data base or electronic medical record

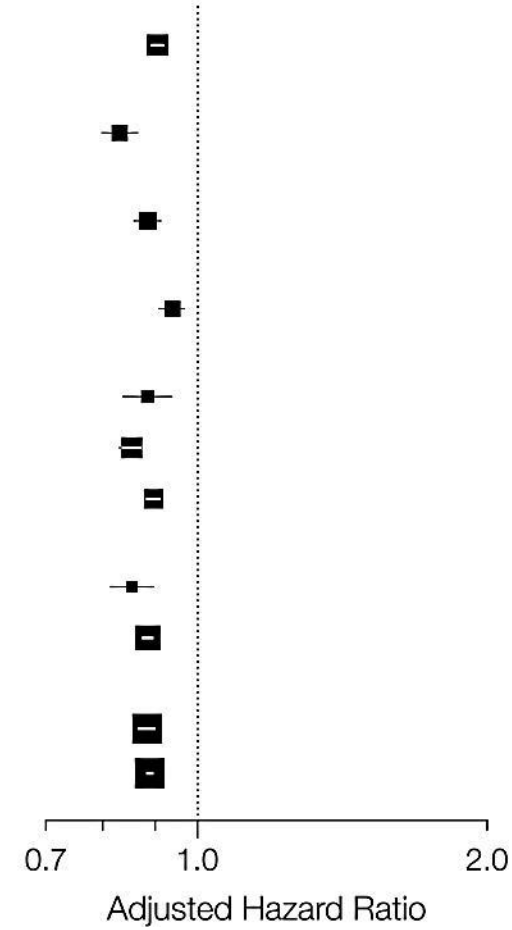
ROC Curves for Prediction of Disability according to Summary Performance Score and Gait Speed



Guralnik et al, J Gerontol Med Sci, 2000

Age-Adjusted Hazard Ratio for Death per 0.1-m/s Higher Gait Speed

	No. of Deaths	Total Sample Size
Cardiovascular Health Study,[22] 1991	3851	5801
Established Populations for the Epidemiologies Study of the Elderly,[23] 1985	1955	2128
Health, Aging, and Body Composition Study,[11,12] 2009, 2005	848	3048
Hispanic Established Populations for Epidemiological Study of the Elderly,[13] 1999	972	1905
Invecciare in Chianti,[17] 2000	187	972
Osteoporotic Fractures in Men,[20] 2005	1073	5833
Third National Health and Nutrition Examination Study,[21] 2004	2837	3958
Predicting Elderly Performance,[28] 2003	293	491
Study of Osteoporotic Fractures,[26] 1990	5512	10349
Pooled (random effects)		
Pooled (shared frailty model)		



Studenski, S. et al. JAMA 2011;305:50-58

Outcomes over 1 Year According to Gait Speed

Gait speed (m/sec)	Decline in Global Health	New Difficulty in Personal Care
	percent	
< 0.6	35.6	68.8
0.6–1.0	11.3	27.6
> 1.0	6.0	11.9

Studenski et al, JAGS, 2003

6-Minute / 400-m Walk

- Demonstrate one lap
- Begin timing when subject takes their first step
- Follow subject at close distance
- End test as subject’s first foot crosses line

Criteria for Responsiveness

Performance Measure	Meaningful Change	Criterion
4-m gait speed	Small	0.05 m/sec
	Substantial	0.10 m/sec
SPPB	Small	0.5 points
	Substantial	1 point
6-min walk	Small	20 m
	Substantial	50 m

Perera et al, JAGS, 2006

Examples of Other Physical Performance Tests

Upper Extremity	Lower Extremity	Mixed
Grip strength	Climb stairs	Lifting 10 lb
Write sentence	Turn in full circle	Bend over and pick up penny
Pick up small object		
Button shirt		
Pegboard test		