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Functional Capacity and Disability

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Domains of Functioning

- Physical
- Cognitive
- Psychological
- Sensory
- Social
Lecture Outline

1. Measurement of disability
2. Importance of physical function
3. Magnitude of problem
4. Risk Factors for disability
5. Pathway to disability
6. Consequences of Disability
7. Compression of Morbidity From Disability
General Categories of Instruments Used to Assess Physical Functioning

1. Self-care activities of daily living
   i.e. Bathing, eating, dressing, transferring, toileting

2. Maintenance of independence in the community: instrumental activities of daily living
   i.e. shopping, meal preparation, housework

3. Other measures of usual functioning
   i.e. Walking ¼ mile, climbing stairs

4. Physical activity/exercise/recreation
   i.e. Frequency of activities i.e. gardening

5. Performance measures of functioning

Objective Performance Measure of Physical Functioning

Assessment instrument 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.
## Prevalence of Difficulty With Selected Tasks—1993

<table>
<thead>
<tr>
<th>Difficulty</th>
<th>65+</th>
<th>80+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty seeing words in newspaper</td>
<td>16.8%</td>
<td>29.3%</td>
</tr>
<tr>
<td>Difficulty lifting and carrying 10lbs</td>
<td>26.6%</td>
<td>43.1%</td>
</tr>
<tr>
<td>Difficulty Climbing 1 flight of stairs</td>
<td>31.0%</td>
<td>45.3%</td>
</tr>
<tr>
<td>Difficulty walking ¼ mile</td>
<td>31.5%</td>
<td>50.1%</td>
</tr>
</tbody>
</table>

Table 3. Age-Adjusted Percent Prevalence of Any Reported Difficulty, Need for Help, and Walking Device Use by Race/Ethnicity and Gender, Ages 60 and Older: NHANES III 1988-1994

<table>
<thead>
<tr>
<th>Activity</th>
<th>NHW Men</th>
<th>NHB</th>
<th>MA</th>
<th>NHW Men</th>
<th>NHB</th>
<th>MA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking quarter mile</td>
<td>22.8</td>
<td>32.9</td>
<td>27.0</td>
<td>30.2</td>
<td>43.0</td>
<td>39.2</td>
</tr>
<tr>
<td>Walking 10 steps</td>
<td>19.1</td>
<td>32.2</td>
<td>29.0</td>
<td>28.7</td>
<td>46.7</td>
<td>45.4</td>
</tr>
<tr>
<td>Stooping/crouching</td>
<td>40.0</td>
<td>38.4</td>
<td>41.7</td>
<td>49.5</td>
<td>49.9</td>
<td>52.6</td>
</tr>
<tr>
<td>Lifting 10 lbs</td>
<td>13.1</td>
<td>24.2</td>
<td>23.9</td>
<td>29.3</td>
<td>39.5</td>
<td>44.8</td>
</tr>
<tr>
<td>Up from an armless chair</td>
<td>17.0</td>
<td>19.1</td>
<td>18.3</td>
<td>22.1</td>
<td>29.1</td>
<td>34.2</td>
</tr>
<tr>
<td>Doing chores</td>
<td>14.8</td>
<td>24.2</td>
<td>17.9</td>
<td>27.8</td>
<td>36.7</td>
<td>36.3</td>
</tr>
<tr>
<td>Preparing meals</td>
<td>7.8</td>
<td>15.0</td>
<td>12.2</td>
<td>10.4</td>
<td>19.5</td>
<td>16.5</td>
</tr>
<tr>
<td>Managing money</td>
<td>4.9</td>
<td>10.3</td>
<td>7.8</td>
<td>5.3</td>
<td>12.0</td>
<td>10.8</td>
</tr>
<tr>
<td>Walking, no stairs</td>
<td>6.8</td>
<td>11.0</td>
<td>10.1</td>
<td>8.6</td>
<td>17.1</td>
<td>15.7</td>
</tr>
<tr>
<td>Getting out of bed</td>
<td>13.3</td>
<td>15.2</td>
<td>16.3</td>
<td>15.4</td>
<td>19.9</td>
<td>26.0</td>
</tr>
<tr>
<td>Feeding self</td>
<td>4.2</td>
<td>5.9</td>
<td>7.0</td>
<td>4.9</td>
<td>6.0</td>
<td>7.9</td>
</tr>
<tr>
<td>Dressing self</td>
<td>8.0</td>
<td>11.2</td>
<td>10.6</td>
<td>10.1</td>
<td>12.7</td>
<td>15.5</td>
</tr>
<tr>
<td>Help with personal care</td>
<td>5.7</td>
<td>6.5</td>
<td>9.5</td>
<td>6.7</td>
<td>12.3</td>
<td>10.9</td>
</tr>
<tr>
<td>Help with routine care</td>
<td>10.9</td>
<td>15.2</td>
<td>12.2</td>
<td>16.1</td>
<td>26.7</td>
<td>21.8</td>
</tr>
<tr>
<td>Use devices to aid walking</td>
<td>10.5</td>
<td>16.7</td>
<td>14.4</td>
<td>12.1</td>
<td>21.7</td>
<td>14.8</td>
</tr>
</tbody>
</table>

\*a=Non-Hispanic white significantly different from non-Hispanic black, P<.01.
\*b=Non-Hispanic white significantly different from Mexican-American, P<.01.
\*c=Non-Hispanic black significantly different from Mexican-American, P<.01.

Ostchega et al. JAGS 48:1132-1135 2000
Percent of women and men aged 70 and older who have difficulty (upper segment) or inability (lower segment) performing activities of daily living, according to 5-year age groups, 1995. Kramarow et al. Health and Aging Chartbook, National Center for Health Statistics, 1999.
Sociodemographic Factors Related to Disability

- Age
- Gender
- Socioeconomic status
Why Women Have a Higher Prevalence of Disability

• Women have a higher incidence of disability
• Women survive longer with their disability
• Men with disability are more likely to recover
Risk Factors for Disability

- Low physical activity
- Smoking
- High and low body mass index, weight loss
- Heavy and no alcohol consumption
- Cognitive impairment
- Vision impairment
- High medication use
- Depression
- Poor self-rated health
- Reduced social contacts

Diseases Associated with Disability – Acute and Chronic

- Heart disease
  - Myocardial infarction
  - Angina
  - Congestive Heart Failure
- Stroke
- Osteoarthritis
- Hip Fracture
- Diabetes
- Intermittent Claudication
- Chronic Obstructive Pulmonary Disease
- Cancer
- Visual Impairment
- Depression
- Cognitive Impairment
Theoretical Models of the Pathway from Disease to Disability

1. Disease → Impairment → Disability → Handicap
   WHO

2. Disease → Impairment → Functional Limitations → Disability
   Nagi
   Institute of Medicine
A Model of the Disablement Process

Pathology

Disease, injury, congenital/development condition

Impairments

Dysfunction and structural abnormalities in specific body systems (musculoskeletal, cardiovascular, etc.)

Functional Limitations

Restrictions in basic physical and mental actions (ambulate, reach, grasp, climb stairs, speak, see standard print)

Disability

Difficulty doing activities of daily life (personal care, household management, job, hobbies)

Women’s Health and Aging Study

- Causes and course of physical disability
- One-third most disabled women age 65 and older living in the community
- Difficulty with tasks in 2 or more functional domains
  - Self-care tasks
  - Mobility tasks
  - Higher functioning tasks
  - Upper Extremity Tasks
- Text and tables of baseline monograph (*Health and Social Characteristics of Older Women with Disability*) available at:
  www.nih.gov/nia/edb/whasbook/title.htm
Severe Walking Difficulty
WHAS

Customary walking speed
0.4 m/s or less
and
unable to walk 1/4 mile
Rate of Incident Severe Walking Disability According to Balance and Strength, WHAS

- Rate/100 person years
- Balance Categories: Poorest, Middle, Best
- Knee Extension Strength Tertiles: Poorest, Middle, Best
Proportion of Subjects with Functional Limitations in 1991-93 According to Grip Strength Tertiles 25 Years Earlier

(3,218 Initially Healthy 45- to 68-year-old Men, Honolulu)

Functional Limitations

Walking Speed \( \leq 0.4 \text{ m/s} \)

Unable to Rise from a Chair

**Proportion of Subjects with Disability in 1991-93 According to Grip Strength Tertiles 25 Years Earlier**

(3,218 Initially Healthy 45- to 68-year-old Men, Honolulu)

Self-reported Difficulty

- Doing Heavy Household Work
- Walking 1/2 mile
- Walking Up 10 Step
- Dressing
- Toileting

Grip Strength Tertiles
- **Highest**
- **Middle**
- **Lowest**

Data Source: Rantanen et al., *JAMA* 1999;281:558-560.
Established Populations for the Epidemiologic Study of the Elderly (EPESE)

Timed 8 foot walk

Single chair rise
Timed multiple (5) chair rises

Timed standing balance (up to 10 seconds)

Side-by-side stand
Semi-tandem stand
Tandem stand
Disability Status at Four Years According to Baseline Summary Performance Score Among Those Non-Disabled at Baseline

Disability Rates According to Summary Performance Score: Observed Rates in Hispanic EPESE Compared to Predicted Rates from EPESE Models.

Consequences of Disability Among Older Persons

- Quality of Life
- Dependency
- Nursing home admission
- Falls
- Hospitalization
- Death
Nursing Home Admission Rates According to Performance Test Summary Score
Age and Sex Adjusted

Summary Performance Score (SPS) and Risk of Subsequent Hospitalization among Non-disabled EPESE Participants

Relative risk of being hospitalized

Death Rates According to Individual Performance Tests
Age and Sex Adjusted

Deaths per 100 Person-Years

Test Category | Walk | Chair Stands | Standing Balance

- 0 | 11.7 | 7.8 | 9.0
- 1 | 6.6 | 4.5 | 4.3
- 2 | 4.3 | 3.2 | 3.0
- 3 | 3.0 | 3.6 | 3.0
- 4 | 1.9 | 2.5 | 3.0

Deaths per 100 Person-Years:

- 0: 0
- 1: 6.1
- 2: 4.4
- 3: 3.0
- 4: 3.0

Test Category:
- Walk
- Chair Stands
- Standing Balance
Death Rates According to Performance Test Summary Score

Age and Sex Adjusted

Compression of Morbidity Scenario

Current

Future

Time 1

Time 2

Time 3

Disability-Free Life Expectancy

Total Life Expectancy

Years of life free of disability
(Active life expectancy)

Years disabled
(Disabled life expectancy)

Courtesy of Jack Guralnik, National Institute on Aging
Scenarios for Change in Population Burden of Disability from 1990 to 2040

<table>
<thead>
<tr>
<th>Year</th>
<th>Disability-Free Life Expectancy</th>
<th>Life Expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>78.8 years</td>
<td></td>
</tr>
<tr>
<td>2040</td>
<td>82.8 years</td>
<td></td>
</tr>
</tbody>
</table>

Scenario 1: Stable Population Morbidity

- 2040: 82.8 years

Scenario 2: Compression of Morbidity

- 2040: 82.8 years

Scenario 3: Expansion of Morbidity

- 2040: 82.8 years

Years of life free of disability (Active life expectancy) vs. Years disabled (Disabled life expectancy)

Courtesy of Jack Guralnik, National Institute on Aging
Total Life Expectancy, Active Life Expectancy and Disabled Life Expectancy

Piedmont Health Survey of the Elderly; Women, Age 65

<table>
<thead>
<tr>
<th></th>
<th>Low Education</th>
<th>High Education</th>
<th>Total Life Expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>White Women</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Education</td>
<td>15.2</td>
<td>18.0</td>
<td>17.8</td>
</tr>
<tr>
<td>High Education</td>
<td>15.6</td>
<td>19.5</td>
<td>21.0</td>
</tr>
<tr>
<td><strong>Black Women</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Education</td>
<td>15.6</td>
<td>19.5</td>
<td>18.3</td>
</tr>
<tr>
<td>High Education</td>
<td>15.6</td>
<td>19.5</td>
<td>22.8</td>
</tr>
</tbody>
</table>

Total Life Expectancy, Active Life Expectancy, and Disabled Life Expectancy

EPESE

<table>
<thead>
<tr>
<th>Smoking</th>
<th>Physical Activity</th>
<th>Total Life Expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>High</td>
<td>18.7</td>
</tr>
<tr>
<td></td>
<td>16.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14.2</td>
<td></td>
</tr>
<tr>
<td>Ever</td>
<td>Moderate</td>
<td>11.8</td>
</tr>
<tr>
<td></td>
<td>10.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.0</td>
<td></td>
</tr>
</tbody>
</table>

Number of Chronically Disabled Americans Age 65 and Over
(In Millions)

Based on declining disability rate since 1982

If disability rate did not change since 1982


Source: National Long Term Care Survey 1982-1994 (Kenneth Manton, Ph.D.)
Factors Influencing the Decline in Disability Rates

- Education
- Declines in the prevalence of several chronic diseases
- Changes in nutrition and public hygiene
- Improved health promotion and medical therapy

Disability Prevalence in the Years Prior to Death

Data Source: EPESE 1981-1990
Functional Recovery

ADLs: 20-50% over 2 – 6 years
Mobility: 20-50% over 2 – 6 years
Performance (Lower body): 10-38% over 4 years (decreased with increasing age)
Conclusions

• Interview and performance measures of physical function
• Disability addresses ability to function in community and home
• Disability is highly prevalent in older population
• Socioeconomic, behavioral, and disease factors all impact risk of disability
• Pathway from pathology to disability
• Disability increases risk of adverse outcomes
• While disability rates have decreased somewhat, numbers of disabled older persons are still rising