Aging Gracefully Through Cultural Competence:
Frailty

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Aging Gracefully Through Cultural Competence: Frailty

• Objectives:
  – Explain Frailty
  – Describe Frailty scales, and their potential role in prevention, diagnosis and management
  – Discuss the relationship between Frailty and race/ethnicity, gender and/or culture
What is Frailty?
Frailty

• An increasingly recognized *geriatric syndrome*
• Age-related and *precipitous decline* in function and reserve across multiple physiologic systems
• Decreased homeostasis *in the face of stress*
• *Hyper-inflammable* state
• Predictive of poor outcomes
• Opportunity to prevent and intervene
Frailty Prevalence

~Equal to Alzheimer’s Disease in prevalence

– The overall weighted prevalence of frailty is 10.7% (95% CI = 10.5 -10.9) in community dwelling elders 65+ in 21 studies; 61,500 participants
  • 20-30% in those ages 75+
  • 40% in those aged 90
  • Stages of frailty (intermediate)
  • Not everyone becomes frail

How Did We Come to Think About Frailty as a New Syndrome?
Rapidly Aging Society

Number of people age 65 and over, by age group, selected years 1900–2006 and projected 2010–2050

Note: Data for 2010–2050 are projections of the population.
Reference population: These data refer to the resident population.
Wide Variations in Health
Usual Heterogeneity in Health of Older Adults

- Few health problems, active and robust
- Some health problems
- Multiple medical problems

End-of-Life/Frailty

Independent  ➔  Dependent
Healthspan Matters

Life expectancy at ages 65 and 85, by sex, selected years 1900-2001

Reference population: These data refer to the resident population.
Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System.
Frailty and “Normal Aging”

- Is there a way to identify the subset of older adults at high risk of the adverse health outcomes clinically associated with “frailty” – and distinguish frailty from usual aging?

Linda P. Fried and colleagues, 2001
Hypothesized Cycle of Frailty

- Chronic Undernutrition [Inadequate intake of protein and energy; micronutrient deficiencies]
- Neuroendocrine Dysregulation
- Anorexia of aging
- ↓ Total Energy Expenditure
- ↓ Activity
- ↓ Walking Speed
- Disability
- Dependency
- ↓ Resting Metabolic Rate
- ↓ Strength & Power
- ↓ VO\textsubscript{max}
- Loss of muscle mass (Sarcopenia)
- Negative Energy Balance
- Negative Nitrogen Balance
- Aging: Senescent musculoskeletal changes
- Weight Loss
- Disease


The Gerontological Society of America
The Cardiovascular Health Study

• Prospective, observational study of men & women 65+
  – 65-101, mean 72.7; 57% female, 42% male
• Original cohort (5201) from 4 US communities
• Additional cohort (687) African American men and women recruited
• Both cohorts received identical baseline evaluations and follow-up annual examination and surveillance for outcomes including incident disease, hospitalizations, falls, disability and mortality
• Frailty was defined as a clinical syndrome in which three or more of the previous criteria were present
Operationalizing a Phenotype of Frailty

Characteristics of Frailty

- Shrinking: Weight Loss (unintentional)
  - Sarcopenia (loss of muscle mass)
- Weakness
- Poor endurance; Exhaustion
- Slowness
- Low Activity

Cardiovascular Health Study Measure

- Baseline: >10 lbs lost unintentionally in prior year
  - Grip strength: lowest 20%
  - “Exhaustion” by self report
  - Walking time/15 feet
  - Kcals/week

Frail = 3 of the following findings
Pre-frail = 1 or 2 of the following findings
Frailty in Older Adults: Evidence for a Phenotype

- Overall prevalence was 7%, 4 year incidence 7.2%, increased with age (intermediate, 45%; non-frail, 48%)
- More prevalent in women
- Associated with being African American, having lower education and income, poorer health, and having higher rates of comorbid diseases and disability
- Overlap, but not concordance with, comorbidity and disability
- This phenotype independently predicted falls, worsening mobility or ADL disability, hospitalization and death
Survival curve estimates (unadjusted) over 72 months of follow-up by frailty status at baseline: Frail (3 or more criteria present); Intermediate (1 or 2 criteria present); Not frail (0 criteria present).

The Gerontological Society of America
Frailty is Distinct from Comorbidity and Disability

Disability: ≥ 1 ADL**
(n=67)

Comorbidity*
(n=2131)

5.7% (n=21)

21.5% (n=79)

46.2% (n=170)

26.6% (n=98)

Frailty+
Pathway of Frailty

Biological Mechanisms

Altered Physiological Systems (IL-6, CRP ^)

Disease

Syndrome of Frailty

Weakness
Slowed Performance
Exhaustion
Low physical activity
Weight Loss

Outcomes

Falls
Disability
Dependency
Death

Other Ways to Think About Frailty
Numerous Frailty Models

• Several models (and measures) of frailty have been developed using combinations of three different constructs:
  – Biological* (CHS/Fried)
  – Deficit Accumulation
  – Functional
The Numerous Frail Scales

• Scales are an important first step in identifying high risk persons for prevention and treatment measures
  – Substantial differences in content validity, feasibility on clinical settings, and predictive ability
  – Tradeoff between achieving the most accurate risk prediction vs. selecting a tool that allows for best timing and targeting of an intervention

• Few scales are culturally competent
Frailty Index (FI)

• Rockwood’s approach from the CSHA (Canadian Study on Health and Aging) is based on the concept that deficit accumulation – a combination of symptoms, disease, conditions, and disability – can predict frailty
  – Sum of >70 items used to construct the FI
  – Includes self rated health, function, cognition, and psychosocial risk factors
  – Cumbersome, difficult for research

Rockwood K. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005
Frailty Index

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 “slopped 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.
## Study of Osteoporotic Fractures (SOF)

<table>
<thead>
<tr>
<th>Component</th>
<th>Question or Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Loss</td>
<td>5% or more in the previous year (1 point)</td>
</tr>
<tr>
<td>Chair Stands</td>
<td>Inability to complete 5 consecutive chair rises (1 point)</td>
</tr>
<tr>
<td>Energy Level</td>
<td>Energy level in the previous 4 weeks (none or a little of the time= 1 point)</td>
</tr>
</tbody>
</table>

Frail = 2-3 points  
Pre-frail = 1 point  
Robust = 1 point
FRAIL Scale

• Brief frailty tool to identify African Americans at risk of frailty, disability and mortality for early interventions
• Simple measure that combines functional, deficit accumulation and biological frailty models
• Interview questions with minimal administration time
• Validated in the African American Health cohort to predict adverse health outcomes – disability and mortality
## Frail Scale

<table>
<thead>
<tr>
<th>Component</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue</td>
<td>How much time during the previous 4 weeks did you feel tired? (all of the time, most of the time = 1 points)</td>
</tr>
<tr>
<td>Resistance</td>
<td>Do you have any difficulty walking up 10 steps alone without resting and without aids? (yes = 1 point)</td>
</tr>
<tr>
<td>Ambulation</td>
<td>Do you have any difficulty walking several hundred years alone with without aids? (yes = 1 point)</td>
</tr>
<tr>
<td>Illness</td>
<td>How many illnesses do you have out of a list of 11 total? (5 or more = 1 point)</td>
</tr>
<tr>
<td>Loss of Weight</td>
<td>Have you had weight loss of 5% or more? (yes = 1 point)</td>
</tr>
</tbody>
</table>

Frail Scale scores range from 0-5, one point for each component, 0=best to 5=worst
Robust = 0 points
Pre-Frail = 0-1 points
Frail = 3-5 points
Prevalence and Incidence of Frailty

What About Differences in Frailty among ethnic/racial groups?

– African-Americans have a high prevalence of frailty >50%
– Hispanics have an 8-20% prevalence
Prevalence and Incidence of Frailty

Are These Differences in Frailty among Ethnic/Racial groups reliable?

– Important to develop cultural/ethnic/racial sensitive measures
Prevalence and Incidence of Frailty Based on CHS and WHAS Studies (Fried criteria)

– Overall prevalence 65+ US = 7-12%
– Women more likely than men to be frail
– Mexican-Americans 7% similar to Whites
– Wide variation in 10 European countries, with north-south health risk gradient (Switzerland 6% vs. Spain 27%)
– Higher in Latin American and Caribbean cities (30-48% in women; 21-35% in men)
– African-Americans 2x more likely to be frail than Whites
Association of Race with Frailty: The Cardiovascular Health Study

- **Purpose:** To assess the independent contribution of race to frailty among African Americans
- **Methods:** 786 AA, 4491 white CHS participants, controlling for age, sex, comorbidity, socioeconomic factors, and race – estimated the odds ratio (OR) of frailty
- **Results:** AA 8.7%M, 15% W were frail vs White 4.6%M, 6.8% W. In adjusted models, non-obese AA 4x OR frailty. Increased frailty less pronounced among those who were obese or disabled, and greater among the young-old than old-old.

# Frailty Prevalence in Various Countries (CHS Criteria)

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of patients: 7510</th>
<th>Frailty Prevalence</th>
<th>Source*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>8.6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>12.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>11.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>12.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td>5.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>15.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>23.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>27.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greece</td>
<td>14.7%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Santos-Eggimann et al, 2009*
# Frailty Prevalence in Various Countries (CHS Criteria)

<table>
<thead>
<tr>
<th>Country</th>
<th>Frailty Prevalence (M/W)</th>
<th>Number of Patients 65+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbados</td>
<td>21%/30%</td>
<td>1446</td>
</tr>
<tr>
<td>Cuba</td>
<td>26%/47%</td>
<td>1726</td>
</tr>
<tr>
<td>Mexico</td>
<td>30%/45%</td>
<td>1063</td>
</tr>
<tr>
<td>Chile</td>
<td>32%/48%</td>
<td>1220</td>
</tr>
<tr>
<td>Brazil</td>
<td>35%/44%</td>
<td>1879</td>
</tr>
</tbody>
</table>

Alvarado, et al. 2008
Mexican Americans and Frailty: Part 1

- **Objectives**: To directly compare frailty incidence of older Mexican American (MA) and European American (EA) adults
- **Design**: Longitudinal, observational cohort study of 600 participants (300 MA, 300 EA) including socioeconomically diverse neighborhoods in San Antonio, TX
- **Measurements**: Over 9 years (baseline and 3 follow ups) CHS criteria, including SES, and comorbidities
- **Results**: No ethnic difference in incidence of frailty even though baseline SES was significantly lower in MAs and EAs
- **Conclusion**: Supports the Hispanic Paradox, suggesting that MAs who live to older ages are less likely than EAs to become frail

Mexican Americans and Frailty: Part 2

• To examine predictors of mortality in aging MAs and EAs
• Design: Longitudinal, observational cohort study of 700 participants (390 MA, 355 EA) including socioeconomically diverse neighborhoods in San Antonio, TX who completed 8 yrs. of follow up. Ethnicity classified by validated algorithm.
• Measurements: Mortality over 9 years (baseline and 3 follow ups) CHS criteria, including SES, and comorbidities
• Results: Adjusted ethnic risk for mortality was higher in MA, but after adjusting for SES, the ethnic HR was no longer significant
• Conclusion: Contrary to the Hispanic paradox, MAs were at greater risk of mortality than EAs – SES differences largely explained this ethnic disparity

Frailty and American Indians: The Native Elder Care Study

- Relationship between grip strength and frailty
- American Indians possess many of the risk factors for weaker grip (disability and chronic disease)
- This study (age 55+, 500 participants) compared grip strength from a sample of American Indians (from the Native Elder Care Study) to normative values to identify correlates

Results:
- Lower grip strength compared with same sex and age normative values
- Weaker handgrip for men correlated with increased age and poorer lower body functioning

Handgrip strength among older American Indians: The Native Elder Care Study (Goins R, et al, Age Ageing 2011)
Prevalence and Incidence of Frailty

• One interpretation of variability:
  – “Geographic variation in frailty prevalence in European countries persisted after adjusting for age and gender, suggesting cultural characteristics influencing the perception of health and/or interpretation of the frailty questions.”

Xue, Clinics in Geriatric Medicine, 2011
Behavioral Precursors to the Development of Frailty

• Clinical Frailty: interplay between internal physiological capacity and external challenges
  – Behavioral adaptation made in response to declining reserve
  – Ability to maintain “life space” – size of the spatial area people move through in their daily life – less likely to become frail
  – Maintaining performance requires both internal adaptations (e.g., cane) and external (social support)
Theoretical Model of Association of Life Space with Clinical Frailty

**Environmental Supports:**
Family Ties, Social Networks

**Environmental Challenges:**
Built environment; social disorganization; area deprivation

**Individual Challenges:**
age-related changes, disease burden, behav. health issues

**Individual Supports:**
Assistive Devices, other strategies

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Adapted from Xue, Clin Geriatr Med 2011
Pathway of Frailty

Biological Mechanisms

Altered Physiological Systems (IL-6, CRP ^)

Syndrome of Frailty
- Weakness
- Slowed Performance
- Exhaustion
- Low physical activity
- Weight Loss

Outcomes
- Falls
- Disability
- Dependency
- Death

Pathogenesis of Frailty

• Clinical manifestations of frailty are thought to be due to an interrelated and self-perpetuating cycle of negative energy balance, generalized weakness, diminished strength, reduced exertional tolerance and sarcopenia.

• Underlying molecular, cellular, physiological and functional changes are likely impacted by genetic and environment factors, in combination with epigenetic mechanisms.
Immune System and Frailty

• Abnormal inflammation has a major role in the development of frailty
• Pro-inflammatory, chronic responses is one of the fundamental findings in frailty
  – High levels of cytokines
  – C-reactive protein and TNF-alpha
• Inflammation is associated with catabolism of skeletal muscle, and malnutrition, anorexia, sarcopenia and weight loss
Endocrine Pathways and Frailty

• Aging is associated with changes in hypothalamo-pituitary axis which impacts on metabolism and energy through several hormones:
  – decreased in growth hormone
  – testosterone and estradiol
  – reduction in IGF-1
  – reduction in sex steroid precursors
  – slow rise in cortisol levels

• The impact of these changes with frailty is not understood
Musculo-Skeletal System and Frailty

• Sarcopenia – the progressive and generalized age-related loss of skeletal muscle mass and strength and/or performance – is an important physiologic contributor to frailty
  – The physiologic changes of frailty, especially inflammatory cytokines and lower levels of growth hormone and sex steroids, and higher levels of cortisol, accelerate muscle decline
  – Sarcopenic obesity, associated with fatty muscle infiltration and hyper-inflammatory state, can promote frailty
So What Do We Know About Frailty?

- Common pathway seems to manifest as a decline in physical activity
- Lower energy metabolism
- Decreased skeletal muscle mass and quality
- Altered hormonal and inflammatory functions
  - Chronic inflammation and accumulation of pro-inflammatory cytokines
What Don’t We Know About Frailty?

• **No consensus definition** – despite attempts (e.g. Frailty Operative Definition-Consensus Conference Project)

• **No consensual clinical assessment measure that is culturally competent** (and meaningful and sensitive to change)

• No diagnostic biomarkers or imaging

• No animal model (recent lab mouse model)
Clinical Applications

• How can we use the concept of frailty to improve health outcomes?
  – We encounter frail individuals in a wide variety of stages and settings
  – Some may be able to recover after a stressful event, while others may never regain function
  – An apparent minor insult may result in rapid decline, quickly transitioning from independent to dependent, from ambulatory to immobile
  – An inaccurate identification of a patient as frail may limit appropriate interventions, or may expose an unrecognized frail patient to unrealistic interventions
Clinical Applications

• Frailty risk assessment *by a culturally appropriate screen* is an important step in caring for older patients
  – Currently, the American College of Surgeons recommends frailty screening as a predictor of post-operative complications, length of stay and need for transition to a skilled or assisted living facility
  – As more conditions are studied, the expectation is that frailty will emerge as a core measure for risk assessment
What are some promising interventions to prevent or delay frailty?

- Goals include reduced prevalence and severity of frailty, and improved clinical outcomes aligned with patient and family goals of care.
- Currently no curative treatments for frailty
- Frailty is dynamic (43% of frail moved to increased frailty in 18mo; 23% of frail moved to lesser frailty in 18mo; almost no one transitioned to No frailty)
- Prevention rests on core concepts of exercise, nutrition, and cognitive and social engagement
Interventions

• Physical Activity/Aerobic and Resistance Exercise
  – Exercise is currently the most effective intervention to improve function and quality of life among frail elders
  – Several studies have demonstrated that even the frailest adults can benefit from physical activity that includes resistance training and aerobic activity, to prevent or delay the progression of frailty
  – Physical therapy, and fall reduction programs
Other Interventions

• Nutritional Intervention
  – Appetite stimulants and micronutrient supplements are not recommended
  – Nutritional supplements have not been shown to be beneficial other than small weight gain and small mortality reduction. Increase access and socialization.

• Hormonal Intervention
  – Vitamin D recommended but benefits of supplement in frailty not demonstrated
  – Growth hormone not recommended
Other Interventions

• Other Pharmacologic Approaches
  – Reduce polypharmacy

• Comprehensive Geriatric Assessment and Specialized Clinical Program
  – Evidence growing
  – Specialized units, including Geriatric Evaluation and Management Units, are helpful
The Future

• What are some future directions to prevent or delay frailty?
  – Many unknowns
  – Early stage of knowledge, including role of cognition
  – Importance of fully integrating a culturally competent approach to defining this new, important geriatric syndrome can’t be overstated
THANK YOU

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