Frailty and Physical Therapy: Assessment and Evidence-Based Therapy Interventions for the Frail Individual

Course Description

- Frailty is a common condition, but rarely found in a patient diagnosis listing. The purpose of this course is to instruct therapists in identifying individuals who demonstrate the characteristics of frailty and utilize evidence-based assessments and interventions to address their impairments and functional limitations.

Objectives

1. Participants will be able to define frailty and recall the 5 indicators of frailty.
2. Participants will be able to describe the relationship between frailty and falling.
3. Participants will be able to describe evaluation considerations with the frail population.
4. Participants will be able to utilize screening and outcome measures to assess need for referral and functional performance.
5. Participants will be able to describe and utilize an evidence-based exercise program to reduce falls risk and improve physical function with the frail population.

What is Frailty?
What is Frailty?

• Lewis and Bottomley (2008): “Compromises in cognition, sensorimotor input and integration, polypharmacy, dehydration, and malnutrition are components of frailty...leading to a progressive loss of function and physiological homeostasis.”

• Fried et al. (2001): “An age-related loss of physiologic reserve...even minor stressors can result in disproportionate functional consequences”

Disability = loss of function
Frailty = instability and risk of loss of function

Faber et al. 2006

Frailty Cycle

Fried et al. 2001; Lang et al 2009

Multi-System Involvement

• System Dysregulation
  – Neuromuscular, endocrine, immune
• Low-Level Inflammation
• Sarcopenia
• Osteopenia

Topinkova 2008
Risk Factors for Frailty

- Prevalence increased with age
- Female gender
- African-American
- Less education
- Lower socioeconomic status
- Poorer self-rated health
- Having co-morbidities
- Having disease

General Prevention

- Adequate Diet
- Regular Exercise
- Regular Monitoring
- Infection Prevention
- Anticipation of Stressful Events
- Rapid Reconditioning

5 Indicators of Frailty

- An individual can be considered frail if they exhibit 3 out of 5 indicators:
  1. Unintentional weight loss
  2. Weakness
  3. Exhaustion
  4. Slowness
  5. Low physical activity

Frailty Questionnaire

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Frailty Continuum

Robust → Pre-Frail → Frail

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Impact of Falls

- Financial impact
  - Direct medical costs of $19 billion per year for Community Dwelling Adults
- Physical Injury
  - Fracture, laceration, need for hospital care
- Death
  - 5th leading cause of death
- Psychological/Social Implications
  - Admission to LTC, fear of falling, anxiety, loss of self-confidence

Top 5 Relative Risk Factors for Falls

1. Lower extremity weakness
2. History of falls
3. Gait deficits
4. Balance deficits
5. Use of an assistive device

Fried et al. 2001; Guilley et al. 2005
AGS 2001; Carroll et al. 2005; Dener et al 2005, Neuls 2011
Top 5 Relative Risk Factors for Falls

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Considerations With Evaluating an Older Client

- Environment is essential
  - Quiet, non-competing
  - Lighting
  - Furniture
  - Flooring
  - Decoration
  - Room for movement
- Timing
- Level of performance

Bonder and Bello-Has 2009

Considerations With Evaluating an Older Client

- Patient history
  - Why PT? Why Now? What goals?
  - How did this happen? Has it happened before?
  - Past medical history
  - Medication usage
  - Social history
  - Pain assessment
  - Falls history

Bonder and Bello-Has 2009
**Why PT? Why Now? What Goals?**

- Why did they choose to come to physical therapy?
  - Good past experiences; recommendation from a physician or friend
  - Provides the main problem the patient is having
- Why did they come to physical therapy now?
  - Change in their ability to perform essential or desired tasks, increased pain
- What are their expectations or goals of therapy?
  - Lets you know functionally what they want to be able to do or how they want to feel

**How did this happen? Has it happened before?**

- Was there a traumatic event?
- Was there a significant pathological event?
- Is this a chronic health issue?
- Is this new and unfamiliar to the client?
- What helped them the last time this happened?

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**Past Medical History/Symptoms/Medications**

- How can their PMH affect their current condition or affect their rehabilitation potential? What needs to be monitored?
  - Cardiac/Pulm issues, Diabetes, neuro-muscular conditions, infections, osteoporosis, cancer
- What interventions require precautions or are contra-indicated?
  - SWD, E-stim, US, Mobilization/Manipulations
- Do they have any red or yellow flags that may be cause for referral?
- Polypharmacy
  - Drug interactions or magnification of side effects

**Social History**

- Where do they live?
  - Home, apartment, ALF, LTC, group home
  - Stairs, ramps, elevators
- Who do they live with? Can and will they be able to assist the patient upon discharge?
- Use of community services
  - Home health, day services, Meals on Wheels, therapies, hospice
- Do they still work?
- Alcohol, smoking, and exercise?
Screening Assessments

Falls Assessment

- Have they fallen in the last month, 6 mos, year?
- How did they fall? What were they doing? How did they feel before the fall?
  - Cardiac syncope, orthostatic hypotension, neurally mediated syncope, medication side-effects, vision, mechanical, vestibular conditions, confusion
- Were they injured as a result?

SPLATT

- Symptoms
- Previous history
- Location
- Activity
- Time
- Trauma

Screening Assessments

- Mini-Mental State Examination (MMSE)
- Montreal Cognitive Assessment (MOCA)
- Geriatric Depression Scale (GDS)
- Nutrition Screening Initiative
Mini Mental State Examination

- Screening tool for cognitive impairment
- 5-10 minutes to administer
- 11 items, maximum score 30
- Tasks include: orientation, concentration, serial subtraction, immediate and delayed memory, and following a 3 step command
- <24 = cognitive impairment

Farrell 2004

Montreal Cognitive Assessment (MOCA)

- Rapid Screen (~10 min)
- Assesses: attention, concentration, executive function, memory, language, visuoconstructional, conceptual thinking, calculations, orientation
- Scoring: ≥26/30 considered normal


Geriatric Depression Scale

- Screening tool for depression
- 10 minutes to administer
- 15 yes/no questions, max score 15
- >5-6% = major depression
- Sensitivity 91%, Specificity 81% in Community-Dwelling Adults (CDA)

Nutrition Screening Initiative

- National effort to identify older adults at risk for malnutrition
- 10 yes/no questions
- Scores 3-5 indicate moderate risk
- 6 or more indicate a high risk
- Limited reliability and validity testing has been performed

Impairment Level Testing

- Range of Motion
- Strength
- Sensory Systems
  - Vision
  - Light touch
  - Proprioception
  - Vibration
  - Vestibular
- Flexibility
- Pain

Functional Testing

- Physical Performance Test
- Berg Balance Scale
- 6 Minute Walk Test
- Gait Speed
Physical Performance Test

- 7 or 9 item version, modified version
- Assesses ADLs, gross motor activities, balance, walking, and fine motor control
- Identifies frail adults, measures change, and identifies fall risk
- Reliability 93-99%
- Sensitivity ~80%
- Specificity 71%

Farrell 2004

Berg Balance Scale

- 14 item assessment, max score 56
- Test-retest reliability ICC: 0.98
- Sensitivity/Specificity vary depending on cut off score
  - 45: 53-64% / 90-92%
  - 49: 84% / 78%
  - When combined with Gait Speed sensitivity = 91%
- Scores ≤48 indicate use of an assistive device

Farrell 2004; Shumway-Cook 1999; Steffan 2002

Berg Balance Scale and Elderly

- Variable Sensitivity/Specificity
- Lower scorers most impaired, but have lower fall frequency
- Small changes = large increase in risk
- Stroke: <49 independently predicts 2 or more falls in 6 mos.
- BBS alone is not useful to predict falls

Nuels 2011

6 Minute Walk Test

- Measure of mobility and endurance
- Test-retest reliability ICC 0.95
- Monitor Pre/Post vitals and symptoms

Steffan 2000
Gait Speed

- Walking speed is a functional vital sign
  - Determines functional status, discharge location, and need for rehabilitation
- 10M walk test at a comfortable pace
- Minimum gait speed to cross street is 0.5 m/sec, signaled street safely is 1.22 m/sec

Van Loo 2003; Robinett 1988; Langlois 1997; Steffan 2002
Gait Speed

- Gait Speed and Survival (Studenski et al. 2011)
  - Survival ↑ as gait speed ↑
- Gait Speed and Older Adults (Ramos 2011)
  - 0.10 ↑ associated with ↓ rehab/med-surg visits and hospital costs
  - High intensity, high dose ↑ habitual gait speed
  - ↑ speed predicts survival over 8 years
  - ↓ relative risk by 58%, absolute risk by 17.7%

<table>
<thead>
<tr>
<th>Gait Speed</th>
<th>Comfortable Speed</th>
<th>Maximal Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men 60’s</td>
<td>1.36 m/sec</td>
<td>1.93 m/sec</td>
</tr>
<tr>
<td>Men 70’s</td>
<td>1.33 m/sec</td>
<td>2.08 m/sec</td>
</tr>
<tr>
<td>Women 60’s</td>
<td>1.3 m/sec</td>
<td>1.77 m/sec</td>
</tr>
<tr>
<td>Women 70’s</td>
<td>1.27 m/sec</td>
<td>1.75 m/sec</td>
</tr>
</tbody>
</table>

Conversion

- 6MWT
  - 1 m = 3.3 ft
  - 400’ x 1 m/3.3’ = 121 m
- Gait Speed
  - 10 m/15 s = .67 m/s

Website: http://www.onlineconversion.com/length_common.htm

Intervention with Frail Elders
<table>
<thead>
<tr>
<th>Exercise and Physical Function</th>
<th>Intervention Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Balance</td>
<td>• Falls prevention</td>
</tr>
<tr>
<td>– 30 repetitions of forward reaching exercises, 10 minutes of center of mass movement on a balance board, 5 minutes of tandem stance</td>
<td>– Gait training</td>
</tr>
<tr>
<td>– Significant improvements in one leg standing test, functional reach, and the Functional Balance scale</td>
<td>– Resistance training</td>
</tr>
<tr>
<td>• Gait</td>
<td>– Balance training</td>
</tr>
<tr>
<td>– 10 minutes of continuous walking, 10 return trips of stair climbing/descending, 5 minutes of tandem walking, and 5 minutes of walking sideways</td>
<td>– Flexibility</td>
</tr>
<tr>
<td>– Significant improvements in TUG, stair descending test, and Functional Balance scale</td>
<td></td>
</tr>
<tr>
<td>• Control Group</td>
<td></td>
</tr>
<tr>
<td>– No significant improvements</td>
<td></td>
</tr>
</tbody>
</table>

Shimada et al, 2003

<table>
<thead>
<tr>
<th>Randomised controlled trial of a general practice programme of home based exercise to prevent falls in elderly women</th>
</tr>
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<tbody>
<tr>
<td>• Homebound frail women 80+</td>
</tr>
<tr>
<td>• Performed 3x/wk</td>
</tr>
<tr>
<td>• Strength (8-10 reps up to 2 x 10)</td>
</tr>
<tr>
<td>– Knee ext, knee flex, hip abd, plantar flexion, and dorsiflexion</td>
</tr>
<tr>
<td>• Balance</td>
</tr>
<tr>
<td>– knee bends, backwards walking, walking and turning around, sideways walking, tandem stance, tandem walk, one leg stand, heel walking, toe walking, heel toe walking backwards, sit to stand, and stair walking with varying levels of upper extremity support</td>
</tr>
<tr>
<td>• Ambulation (30 minutes)</td>
</tr>
</tbody>
</table>


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<tr>
<th>Randomised controlled trial of a general practice programme of home based exercise to prevent falls in elderly women</th>
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<tbody>
<tr>
<td>• Falls rate was reduced by 33% after 1 year</td>
</tr>
<tr>
<td>• Continued to demonstrate decreased risk after 2 years</td>
</tr>
</tbody>
</table>

Impact of a Multifactorial Fall Prevention Program upon Falls of Older Frail Adults Attending an Adult Health Day Care Center

- 72 frail older adults vs. Control group (41-95 y.o)
- Outcomes: 5x Sit to stand, TUG, # of falls
- 60 minute exercise program, 3x/wk, 3 mos
- Education in home risk factors

Diener and Mitchell 2005

Impact of a Multifactorial Fall Prevention Program upon Falls of Older Frail Adults Attending an Adult Health Day Care Center

- Warm-Up (stretches, AROM)
- Conditioning Exercises
  - Walking or recumbent biking x 15 minutes
- Strengthening
  - 2 x 10 reps hip flex, hip ext, hip abd, knee ext, shoulder press ups, and elbow flex
- Balance
  - static stance with narrow base of support, increased amplitude and velocity of sway, stance on compliant surfaces

Diener and Mitchell 2005

Impact of a Multifactorial Fall Prevention Program upon Falls of Older Frail Adults Attending an Adult Health Day Care Center

- Outcomes:
  - 57% of subjects in the exercise group who were categorized as previous fallers had not experienced a fall over 6 months
  - Statistically significant improvement in TUG scores at 3 months
  - Statistical improvement in home/environmental hazards

Diener and Mitchell 2005

The Effect of Group Exercise on Physical Functioning and Falls in Frail Older People Living in Retirement Villages: A Randomized Controlled Trial

- 551 Frail adults (62-95 y.o)
- Outcomes
  - stepping reaction time, number of accidental falls, 6 minute walk distance, postural sway, leaning balance, simple reaction time, and LE muscle strength
  - 60 min group class 2 x/wk

Lord et al, 2003
The Effect of Group Exercise on Physical Functioning and Falls in Frail Older People Living in Retirement Villages: A Randomized Controlled Trial

- Warm-up (15 min)
  - stretching, chair activities and slow to mod paced walking
- Conditioning (40 min)
  - Strengthening (hip abd and side flexors, knee ext, and ankle DF beginning at 4 repetitions increasing to 30)
  - Balance exercises (tandem stance, heel-toe walking, line walking, single leg balance, altering the base of support, weight transfers, rotating on the spot, lateral movement challenges, and stretching movements away from the center of gravity)
  - Flexibility exercises (seated and standing toe pointing forward and laterally and heel strike exercises moving foot forward and laterally)
- Cool Down

Lord et al, 2003

Effects of exercise programs on falls and mobility in frail and pre-frail older adults: a multicenter randomized controlled trial

- 278 (48% frail, 52% pre-frail) men and women
- Outcomes
  - History of falls, the Performance Oriented Mobility Assessment (POMA), walking speed, 5x sit to stand test, TUG, and the FICSIT-4 balance test, and the Groningen Activity Restriction Scale (GARS)
- Compared walking and balance programs

Faber 2006

The Effect of Group Exercise on Physical Functioning and Falls in Frail Older People Living in Retirement Villages: A Randomized Controlled Trial

- Outcomes
  - Exercise group experienced 22% fewer falls than control groups
  - Significant improvement in the 6 minute walk test, simple reaction time, and choice stepping reaction time

Lord et al, 2003

Effects of exercise programs on falls and mobility in frail and pre-frail older adults: a multicenter randomized controlled trial

- Functional Walking Program
  - Standing up from a chair, reaching/stepping forward/sideward, heel/toe stands, walking with turning, stepping on/over obstacles, staircase walking, tandem foot standing, and single limb standing
- Balance Program
  - Utilized the 7 therapeutic elements of Tai Chi including relaxation, pelvis exercises, sitting foot and ankle exercises, leg strengthening, balance exercises, balance dance, and functional exercises

Faber 2006
Effects of exercise programs on falls and mobility in frail and pre-frail older adults: a multicenter randomized controlled trial

• Outcome:
  - Pre-frail group demonstrated a reduced falls risk, improved POMA scores, and improved physical performance scores in both exercise groups
  - Frail group demonstrated increased risk for falls and no significant changes in physical performance measures

Eccentric Exercise

• 21 frail elderly subjects
• Eccentric
  - Cycle ergometer
• Traditional
  - Leg press, leg ext, and mini-squat with free weights
• Outcomes:
  - Berg Balance Scale, timed stair descent, TUG, muscle biopsy of the vastus lateralis, and knee ext strength

So what does this tell us?

• Outcomes:
  - Both subject groups experienced an increase in strength (eccentric greater than traditional) and TUG times
  - Eccentric training group improved and crossed the 14 second threshold moving them from a high to low risk category
  - Eccentric subjects demonstrated improved Berg scores by 7% and stair descent by 21% compared to 5% and 7% in the traditional group
Variability in the Frail Population

- High vs. Low Functioning Individuals
- Exercise Dosage/Intensity
- Home Programs

Chin 2008

Conclusion

- No single exercise gold standard
- Balance and falls risk are multidimensional, interventions must also be multidimensional
- Current research suggests that a program should be performed 2-3 times a week for a minimum of 3 months