Neuro-Rehabilitation Toolbox

California Physical Therapy Association
Annual Conference 2011
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Roadmap

- Introductions
- Framework for classifying tests and measures
- Tests and measures by clinical setting
- Patient case
- Wrap-up

Learning Objectives

At the completion of this presentation, participants will be able to:
- Describe influence of disablement models of the selection of tests/measures
- Compare and contrast Nagi and ICF models of disablement
- Describe the characteristics of good tests and measures
- Select good tests/measures based on your conceptual model of clinical practice, outcome goals, patient characteristics, and clinical setting
- Develop basic familiarity with commonly used, valid, reliable and sensitive measures of body function and structure, activity, and participation

Framework

- We are here to talk about neuro-rehabilitation tests and measures (outcome measures, OM)
- What tests you select depend on your objectives
- Your objectives depend on what you choose to examine and what you choose to treat
- What you choose to examine/treat depends on your conceptual model of clinical practice

Conceptual Framework For Clinical Practice

1. Model of PT Practice
   - APTA model defines PT practice
2. Model of Disablement
   - Describes how a patient becomes disabled
3. Hypothesis-Oriented Clinical Practice
   - Describes PT clinical reasoning
4. Theory of Motor Control
   - Describes leading theories of how movement is controlled

(Shumway-Cook and Woollacott 2007)
Disablement Model

- How a person became disabled
- A conceptual explanation of the process and underlying mechanisms by which disease, injury or birth defect impacts a person’s ability to function (perform their expected role in society).

Hypothesis-Oriented Clinical Practice

- Clinical reasoning
  - Chart driven (novice clinical reasoning)
    - Follow chart-driven examination from Q1 → Qn
  - Hypothesis-oriented (expert clinical reasoning)
    - Make an observation, then formulate an hypothesis about its cause
    - Evaluate the hypothesis (cause) by conducting a test

Limitations of Nagi Model

- Nagi is a unidimensional (pathology-based) and unidirectional model of disability only
- Does not account for impairments and functional limitations not due to pathology
  - Functional limitations due to lifestyle (obesity, diabetes)
  - Disability due to environmental barriers or personal factors

Theory

What is done with a theory that fails to account for experimental observations (data) or has too many limitations?

It is replaced by a new theory that does account for the data.
International Classification of Functioning, Disability and Health (ICF)

- The World Health Organization (WHO) authorized the International Classification of Functioning, Disability and Health (ICF) in 2001.
- Goes beyond disability to include functioning, health and disability
- Includes non-pathological causes of functional limitations and impairments
- Context variables: potentially have effect on all levels of model
- It is accepted by more than 200 countries as the international standard to describe and measure health and disability.

Conclusion

- Nagi is a unidimensional (pathology-based) and unidirectional model of disability
- ICF is multidimensional (bio-psycho-social) and multidirectional model of human health
  - Affords opportunity to formulate multiple alternative hypotheses about the cause of the functional limitation

Hypothesis Testing

(Characteristics of “Good” Tests and Measures)

- Requires valid, reliable, and sensitive measures
  - Validity
    - Measures what it purports to measure
  - Reliability
    - Proper use of the instrument produces stable outcomes (Inter- and intra-rater reliability)
  - Sensitivity / Responsiveness
    - Capable of detecting change (MDC, MCID)
    - Ceiling and floor effects

Minimum Detectable Change (MDC)

- **Reliable change or smallest real difference**
  (Ottenbacher 1988)  
  \[ \text{MDC} = \text{SEM} \times Z \times \sqrt{2} \]

- Smallest change in score that likely reflects **true change** rather than measurement error
  (Stafford 1996)

Minimal Clinically Important Difference (MCID)

- Magnitude of change required to produce a **meaningful** improvement in performance
- Smallest difference in a measure that is considered worthwhile or important
- MCID scores have limited generalizability, so they should be used **only** with patients having characteristics similar to those of the subjects for which MCID were reported (Haley 2006)
Continuum of Change

Responsiveness

• Ceiling effects
  – Level above which variance in performance is no longer measured
    • FIM does not detect improvement in ambulation beyond 150'
• Floor effects
  – Level below which performance cannot be measured
    • HiMAT is incapable of assessing improvement in ambulation < 20m

Evidence-based Practice (EBP)

• Outcome measures are a critical part of EBP
• Recent evidence suggests that the use of OMs in clinical practice is limited (Jette 2009, Kay TM, 2001, Huijbregts 2002)
• Selecting the most appropriate OM enhances clinical practice by:
  – Identifying and quantifying body function and structure limitations
  – Formulating the evaluation, diagnosis, and prognosis
  – Informing the plan of care
  – Helping to evaluate the effectiveness of physical therapy interventions

Barriers to Use of OM

• Time constraints
• Difficult for patients to complete
• Lack of equipment
• Knowledge regarding OMs (Jette 2009, Van Reenen 2008, Kay 2001)
  – How to select and apply the best OM (Huijbregts 2002)

Tests and Measures by Practice setting

• Acute Care
• In-Patient and Out-Patient
• Home Health
• Skilled Nursing Facility
• Entry Level Education

Tests and Measures by Practice setting

StrokEDGE Taskforce 2011
Patient Case 1/4

**Patient Case**

We referred to inpatient PT. Dx Stroke (L, MCA occlusion). Uncomplicated acute care stay (4d)

**Facility-Specific Issues**
- FIM
- 60 min initial exam, note due same day
- All standard PT equip available

**Patient History**
68 yo African-American male, overweight, HT, hyper-lipidemia, sedentary, 20 pack-year Hx of smoking

**Patient Goals**
Return to work as accountant

**Systems Review**
- Cardiopulmonary: WFL
- Integumentary: WNL

**Musculoskeletal**
- Gross symmetry
- Gross AROM
- Gross strength

- Depressed R shoulder, trunk flexed R
- L UE & LE WFL: R UE & LE impaired
- L UE & LE WFL: R UE & LE impaired

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Patient Case 2/4

**Systems Review (Cont)**

**Neuromuscular**

<table>
<thead>
<tr>
<th>Balance</th>
<th>(I) static sitting w/ midline shift, unable to maintain unsupported standing, able to stand using small base Q cane w/ Min Assit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gait</td>
<td>Amb x 10', level surface, w/ Q cane &amp; Min Assit w/ gait deviation in stance and swing</td>
</tr>
<tr>
<td>Transfers/Transitions</td>
<td>Bed mob &amp; transfers w/ Mod Assit</td>
</tr>
<tr>
<td>Motor Function</td>
<td>No (I) ment R UE</td>
</tr>
<tr>
<td>Sensory Function</td>
<td>Impaired R touch R UE/LE</td>
</tr>
<tr>
<td>Other</td>
<td>Orientation: A&amp;O x 4</td>
</tr>
<tr>
<td>Communication</td>
<td>Able to speak clearly</td>
</tr>
<tr>
<td>Behavioral responses</td>
<td>Appropriate to situation</td>
</tr>
<tr>
<td>Learning barriers</td>
<td>None identified</td>
</tr>
<tr>
<td>Educational needs</td>
<td>Disease process, home safety, fall prevention</td>
</tr>
</tbody>
</table>

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Patient Case 3/4

**Outcome Measure Selection**

<table>
<thead>
<tr>
<th>Overall function</th>
<th>FIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance</td>
<td>Berg balance scale (BBS)</td>
</tr>
<tr>
<td>Gait</td>
<td>10MWT</td>
</tr>
<tr>
<td>Fear of falling</td>
<td>Activity-specific balance confidence scale (ABC)</td>
</tr>
<tr>
<td>L UE</td>
<td>Seen by OT (Fugl-Meyer Motor Action Research Arm Test)</td>
</tr>
</tbody>
</table>

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Analysis of Results 4/4

<table>
<thead>
<tr>
<th>Intake</th>
<th>D/C</th>
<th>MDC</th>
<th>MCID</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIM</td>
<td>68/126</td>
<td>92/126</td>
<td>+24</td>
</tr>
<tr>
<td>BBS</td>
<td>35/56</td>
<td>45/56</td>
<td>+10 pts</td>
</tr>
<tr>
<td>10MWT</td>
<td>0.21 m/s (≤0.4 house amb)</td>
<td>0.56 m/s (old comm amb: 4-4.8m/s)</td>
<td>&lt;0.35 m/s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Intake</th>
<th>D/C</th>
<th>MDC</th>
<th>MCID</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABC</td>
<td>51/100</td>
<td>67/100</td>
<td>+16 pts (24%)</td>
<td>6.15% P0</td>
</tr>
<tr>
<td>10 MWT</td>
<td>0.58 m/s</td>
<td>0.74 m/s</td>
<td>0.16 m/s</td>
<td>0.08 m/s</td>
</tr>
</tbody>
</table>

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Take Home Message

- If you are already consistently using standardized outcome measures in your clinical practice, hopefully this presentation has assisted you in deciding if the measures you use are optimal.

- If you are not already using standardized outcome measures, then hopefully this presentation has motivated you to get on board!
Review Learning Objectives

• Describe how Nagi and ICF models permit different hypotheses
• Describe the 3 characteristics of good tests/measures
• For your clinical setting, cite two examples of good tests/measures of:
  – Body function/structure
  – Activity
  – Participation

References

• Berenato M, Fortman LG. Applying concepts of responsiveness to patient management in neurologic physical therapy. JNPT 2011;35(2):75–81.
• Haley SM, Grega MA, Pinhasi MR. Interpreting change scores of tests and measures used in physical therapy. Phys Ther. 2000;80(7):735–744.