Practical Usage of the Clinical Practice Guidelines for Preservation of Upper Limb Function
Laura McClure, PhD, MPT, ATP
School of Health and Rehabilitation Sciences
Department of Rehabilitation Science and Technology
Human Engineering Research Laboratories

Objectives
• Upper limb dysfunction and SCI/full time wheelchair users
• Overview of the CPG: Preservation of Upper Limb Function
• Clinical Use of the CPG
• Implementation Strategies
• Discussion

Motivation
• Full time wheelchair users are at high risk for upper limb dysfunction
  – Spinal Cord Injury (SCI)
  – Brain Injury
  – Amputations
• Upper limb dysfunction can negatively affect quality of life and independence

Preservation of Upper Limb Function
• Loss of upper limb function affects mobility and independence.
• Upper limb pain/dysfunction may be functionally and economically equivalent to a spinal cord injury (SCI) of a higher neurological level.
• Upper limb pain is common:
  – Carpal tunnel syndrome (CTS) - 49% - 73%

Background
• Once pain and/or injury occurs, treatment is often ineffective
  • Preservation is important

Causes of Pain
• Cause – cumulative mechanical stress
  – Activities of daily living (i.e. dressing and bathing)
  – Transfers
  – Overhead activities
  – Wheelchair propulsion
• Shoulder is designed for mobility, not load-bearing

Impact of Pain

- Major reason for functional decline
- Loss of function affects independence
- ↓ quality of life
- ↑ financial burden
- 26% need additional help with ADLs
- 28% report independence limitations
- Upper limb dysfunction may be economically and functionally equivalent to a SCI of a higher level


Clinical Practice Guideline

- Published in 2005
- Available for FREE at www.pva.org
- Consumer guide also available


Clinical Practice Guideline Development

- Definition: “systematically developed statements to assist practitioners and patients in making decisions about appropriate healthcare in specific circumstances.”
- Developed by a group of experts on upper limb preservation
- Recommendations are based on research findings and the strength of the research


Clinical Practice Guideline Content

- Developed to provide guidelines to clinicians on:
  - Prevention of pain
  - Preservation of function
- Topics Included:
  - Transfer Techniques
  - Wheelchair Propulsion
  - Wheelchair Set-Up and Section
  - Exercise

Burns (2005), Gotez (2005)

Clinical Practice Guidelines

- However...
  - Passive implementation does not work!
  - A strict and structure implementation is needed to see change

Transfers
- Manual wheelchair users perform 14-18 transfers per day
- During an independent, sitting pivot transfer a significant amount of weight is supported by the upper limb
- 65% of W/C users with shoulder dysfunction reported pain interfered with transfer performance.
- 8.1% of falls are related to transfers

Transfer Recommendations
- Alternate which arm leads
  - Horizontal reaction forces are highest in the trailing arm
- Avoid a position of impingement
  - Forward flexion/internal rotation/abduction
- Perform a level transfer when possible
  - Limb on the higher surface perform more work
- Use a handgrip when possible
  - Keeps the carpal tunnel in a neural position

Manual Wheelchair Propulsion
- Manual wheelchair users push 2500 time per day
- Stroke cycle is less than a second
- Higher forces are placed on the shoulder during propulsion
- 16 minutes of propulsion may be equivalent to 8 hours of high frequency factory work

Manual Wheelchair Propulsion Recommendations
- Decrease the amount of force used
  - High forces correlate with shoulder and wrist injuries
- Decrease the number of strokes
  - Reduces propulsion frequency
  - Prevention of repetitive strain injuries
- Use long, smooth strokes
  - Minimize the amount of force used

Wheelchair Set Up and Selection
- The wheelchair is used for all functional mobility
- Components are critical to independence and participation

Manual Wheelchair Set Up Recommendations
- Elbow flexion between 100-120 deg.
  - > 120 deg., the individual must place his/her arms in a position of extreme abduction
  - <100 deg., the amount of the pushrim which can be contacted is reduced and a higher stroke frequency
Manual Wheelchair Set Up Recommendations

- Move rear axle as anterior as possible without a compromise in stability
  - Reduces rolling resistance
  - Reduces propulsive forces
  - Allows for better contact with the pushrim
  - Affect the frequency of wheelchair propulsion

Brubaker (1986), Boninger (2000)

Manual Wheelchair Selection Recommendations

- Light as possible
  - Reduce rolling resistance = reduced propulsion forces
  - Weight correlates with increased peak forces
  - Increase speed and distance traveled
  - Decrease oxygen cost


Manual Wheelchair Selection Recommendations

- Chair needs to be adjustable to achieve all recommendations
  - Depot and lightweight wheelchairs do not provide adequate adjustability
  - Ultra-light wheelchair are needed for an active user!

Power Wheelchair Recommendations

- Sufficient upper limb support
  - Prevention of shoulder subluxation
- Power tilt-in-space, recline and elevating leg rest
  - Performance of pressure relief activities without placing stress on the upper limb
  - Decreases number of transfers performed


Power Wheelchair Recommendations

- Seat elevator
  - Relationship between overhead activities and shoulder pain
  - Increase number of level or downhill transfers

Arca (2005)

Wheelchair Choice

- Individuals should be educated on the pros and cons of both power and manual wheelchairs
- Manual wheelchair users should be educated on when it may be necessary to switch to a power wheelchair
  - Presence of shoulder or wrist pain
  - All energy is spent getting from one place to another
  - Social activities are limited by the effort required to move around
Wheelchair Choice

<table>
<thead>
<tr>
<th>Pros of Power and Manual Wheelchairs</th>
<th>Cons of Power and Manual Wheelchairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Need for fewer muscular training</td>
<td>Need for regular training</td>
</tr>
<tr>
<td>Can conserve energy / reduce fatigue</td>
<td>Can cause shoulder and arm pain</td>
</tr>
<tr>
<td>Can be transported in car</td>
<td>Increased energy needed for activities of daily living and population over long distances</td>
</tr>
<tr>
<td>Increased cost</td>
<td>Restricted to accessible environments</td>
</tr>
</tbody>
</table>

Clinical Practice Guideline Use

- Effective utilization of CPGs is complex
- Distribution of guidelines without additional education is ineffective
- Structured strategies are need to see changes


Key Theories of Guideline Implementation

- Identification of barriers
- Detailed education materials
- Use of multiple forms of education

Barriers to effective utilization

- Identification of Barriers
  - Time constraints
  - Work overload

Shuval (2007)

Time Constraints

- **Problem:** The CPG is 36 pages long
  - Too long to read when busy
  - Needs to be streamline

- **Solution:** 9 specific modules created to educate clinicians about the guideline
Guideline Modules

- 1a: General Patient Education
- 1b: Bed Positioning Needs
- 1c: Wheelchair Education
- 2a: Transfer Education
- 2b: Transfer Ergonomics
- 2c: Dependent Transfers
- 3a: Wheelchair Propulsion Skills
- 3b: Wheelchair Set-Up
- 4: Exercise

Work Overload

- **Problem:** Information is from a variety of sources
  - Clinicians don’t have time to gather materials
  - Central location is necessary
- **Solution:** Information consolidated in one area

Detailed Education Materials

- Concise and well written is best
  - 67% of clinicians follow well written guidelines
- Vague guidelines are not well followed
  - 36% of clinicians are able to follow guidelines that are vague and open to interpretation


Detailed Education Materials

- **Problem:** CPG are often vague

- **Solution:** Performance criteria developed to objectify the recommendations

Performance Criteria

*Performance Criteria:* Patients will avoid place either hand on a flat surface when a handgrip is present during transfers.

Multiple Forms of Education

- One method doesn’t work
  - Paper based materials are not effective
- Use paper, web, videos, pictures

Use of Multi-Media

**Problem:** The CPG is presented in paper format

**Solution:** Pictures and videos utilized

---

Use of Multi-Media

**Video**

- Transfer Skills
- Wheelchair Propulsion Skills

---

Use of Multi-Media

**Website**

- Paper materials available
- Clinician quiz
- Discussion board
- Links to additional information

---

**Concise Recommendation**

Avoid placing their hands on a flat surface when a handgrip is available:

- Patients can use armrest on wheelchairs, the edge of the mat/table, armrest on chairs, the edge of a tub or bedside commode.
- If no handgrip is available, patients should keep their hands flat.

Be sure to educate patients that it is more important to maintain the proper handgrip when the arm is placed closer to the body compared to reaching for an arm rest further away.

**Performance Criteria:** Patients will avoid placing either hand on a flat surface when a handgrip is present during transfers.

---

**Additional Education Alternatives**

Provide clinicians with education strategies:

- Communication
- Intrinsic feedback
- Role Play
- Knowledge of Results
- Contextual interference
Patient Education

- Patient education materials have been developed to correspond with clinician education materials
- Patient materials utilize multi-faceted implementation strategies
- Clinicians can choose which materials to give patients

Take Home Materials

- Poster
  - Transfer lift
  - Dependent transfer
- Video for home
- All printed materials

Lessons Learned

- Guidelines do not have all the answers
  - Unique situations arise
  - Experts need to be consulted
- Best Practices are not always financed
  - Insurance companies are not always willing to finance best practices defined by guidelines.
  - Example:
    - Ultralight chairs
    - Seat Elevator

Lessons Learned

- Clinicians Loose Interest
  - Refresher courses
  - Visits by local experts
  - Reminders

Conclusion

- Make it interesting
- Make it easy
- Make it worth the time

Acknowledgements

- NIDDR (H133N060019)
Thank you for Attending! Questions?