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Academy

# Translating Evidence into Practice: Manual Wheelchairs
# Otto Bock Academy

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# Defining Evidence Based Practice

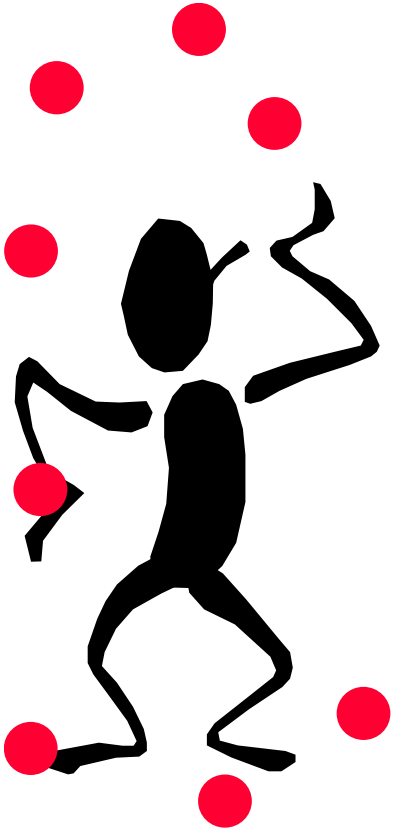
"It's about integrating individual clinical expertise and the best external evidence!"

- Sackett, et al. 1996

# Objectives

- Identify at least 2 recent clinical studies related to manual wheelchairs
- List at least three resources where we can easily get access to clinical research.
- Understand the basics of literature review
- Apply research findings to clinical examples

# How do I get it all done?



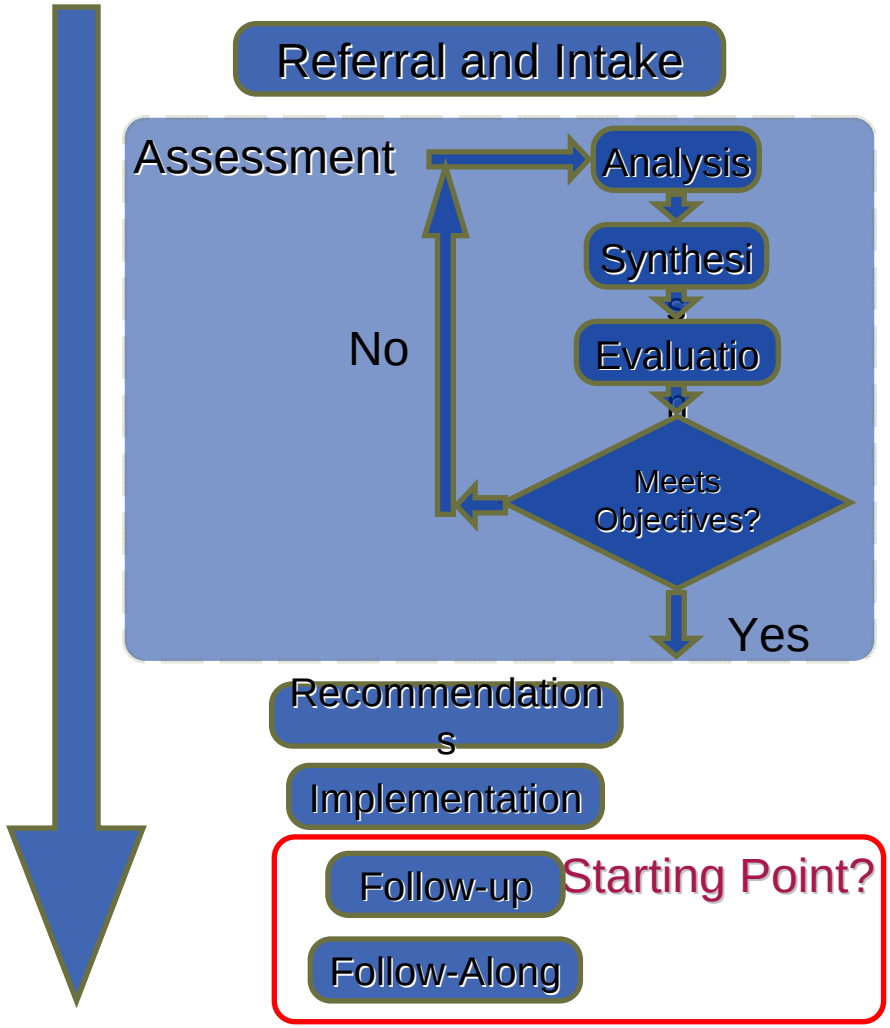
# Evidence-Based Practice

What do you want to cover?

# Background

- Assistive Technology Service Delivery Process
- Outcome Measures versus EBP
- CPT Codes

The role of EBP in the Service Delivery Process!




Cook and Polgar, 2008
DiGiovine, Cooper, and Hobson, 2007

# PMR CPT Codes

- PT Evaluation: 97001
- PT Re-evaluation: 97002
- OT Evaluation: 97003
- OT Re-evaluation: 97004
- Assistive Technology Assessment: 97755
- Physical Performance Test or Measure: 97750

# PMR CPT Codes

- Wheelchair Management and Training: 97542
- Self-care/home mgmt. training: 97535
- Therapeutic Activities: 97530
- Therapeutic Procedures:97112
- Community work re-entry: 97537
- Check out for orthotics/prosthetics: 97762

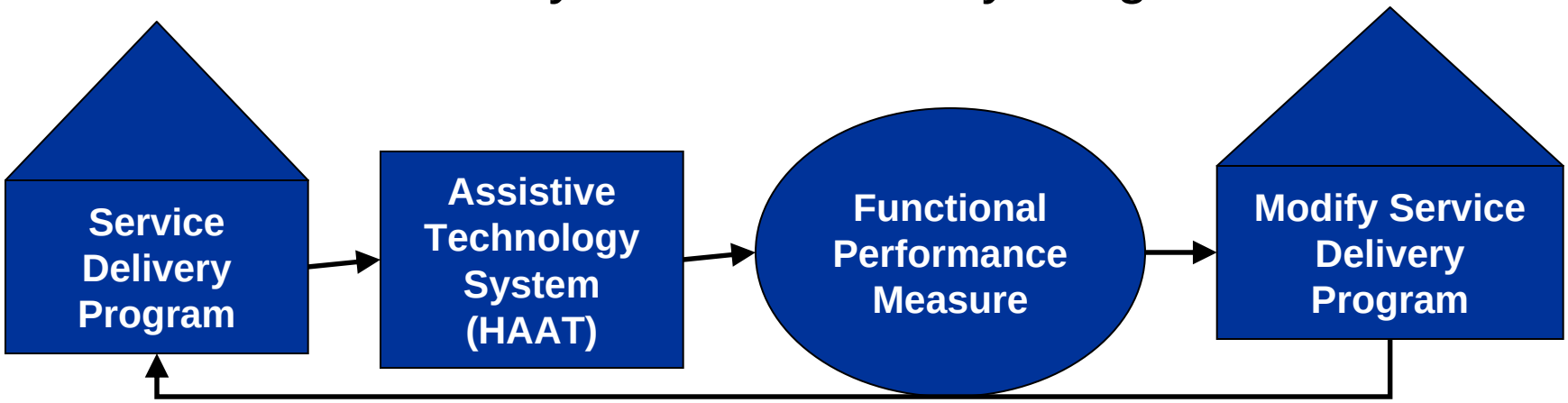
***Be aware of use of modifiers***

# Outcome Measures vs Evidence-Based Practice

- Outcome Measures are applied at the service delivery program (system) level
- Evidence-Based Practice is applied at the individual level

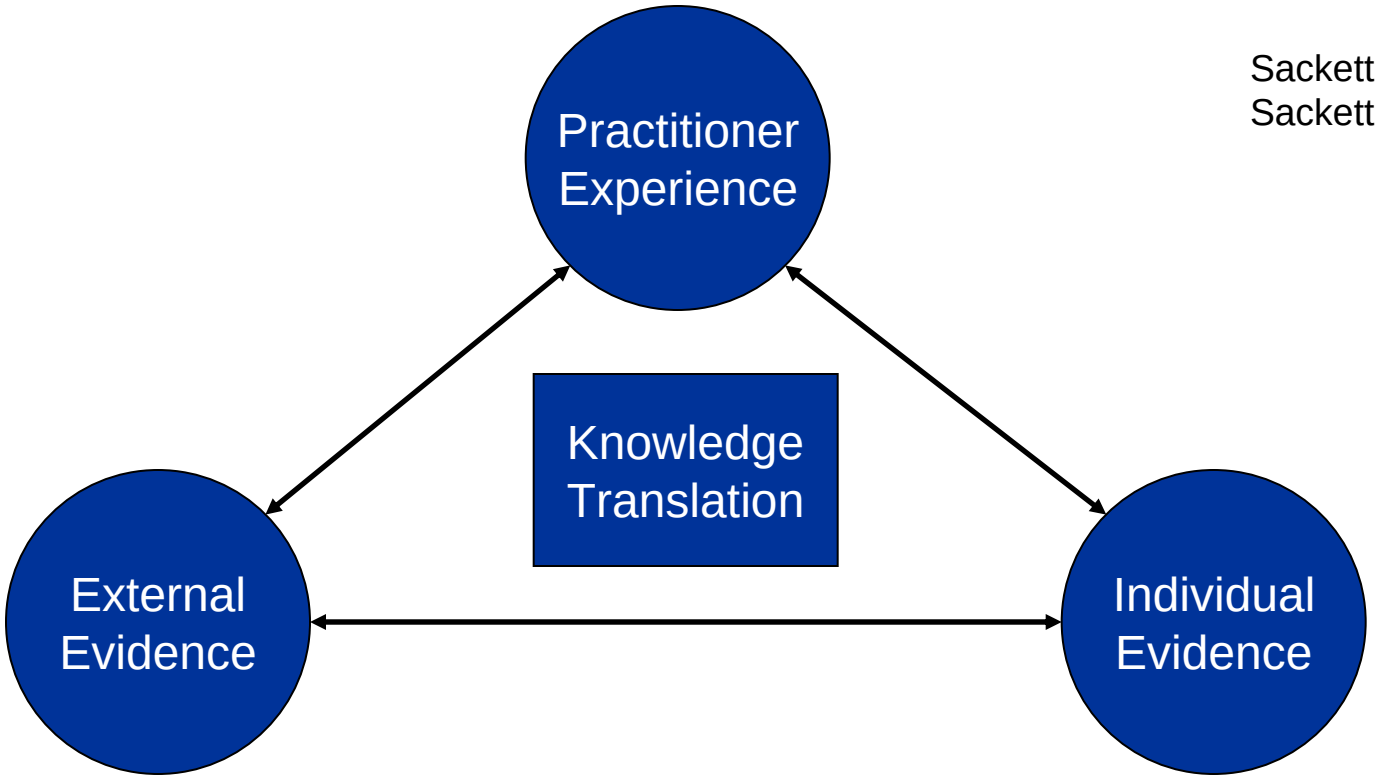
# Quantitative Tools for Outcome Measurement

- Outcome measures evaluate the end result of the assistive technology implementation. (Cook & Polgar, 2008)
  - Functional Performance Measures ←
  - User Satisfaction Measures
  - Quality-of-Life Measures
- Utilize to modify Service Delivery Program



# EBP: More than Literature Review

Sackett et al., 1996
Sackett et al., 1997




**Assistive Technology** - Devices, services, strategies and practices that are conceived and applied to increase, maintain or improve functional capabilities of individuals with disabilities.

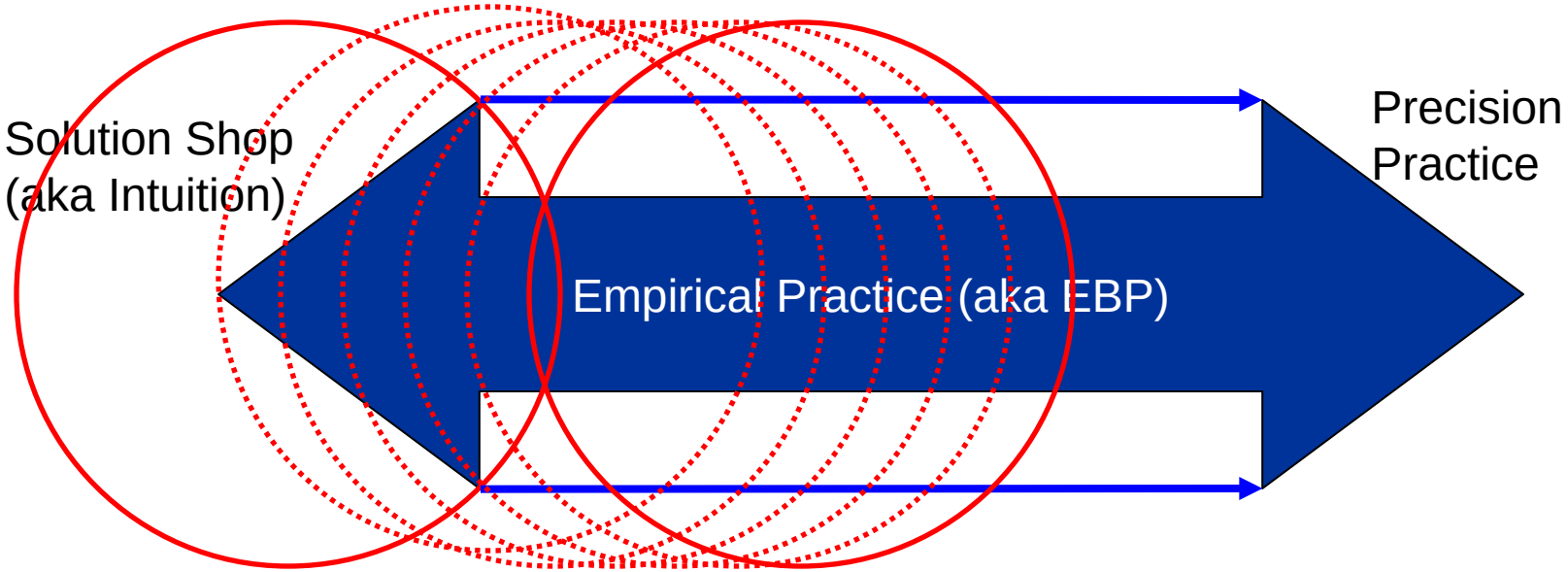
**Rehabilitation Technology** - Tools, instrumentations and devices for rehabilitation rather than being a part of the person's daily life and functional activities.

# Continuum of Practice


Christensen CM, Grossman JH, and Hwang J (2009)

# Continuum of Practice

Continuum of Practice: Strive to move to the right of the continuum




Christensen CM, Grossman JH, and Hwang J (2009)

# The Process

- Identification of the problem
- Creation of a hypothesis
- Testing of a hypothesis
- Review results
- Determine Conclusions

# Facets of EBP

- The  proficiency and judgment that individual clinicians acquire through **clinical experience** and clinical practice.
- Published **research** papers in peer reviewed journals (Archives of Physical Medicine)
- Published Magazine articles (PT Magazine)
- Proceedings of Conferences (ISS)
- Text books

# Why is EBP Relevant?

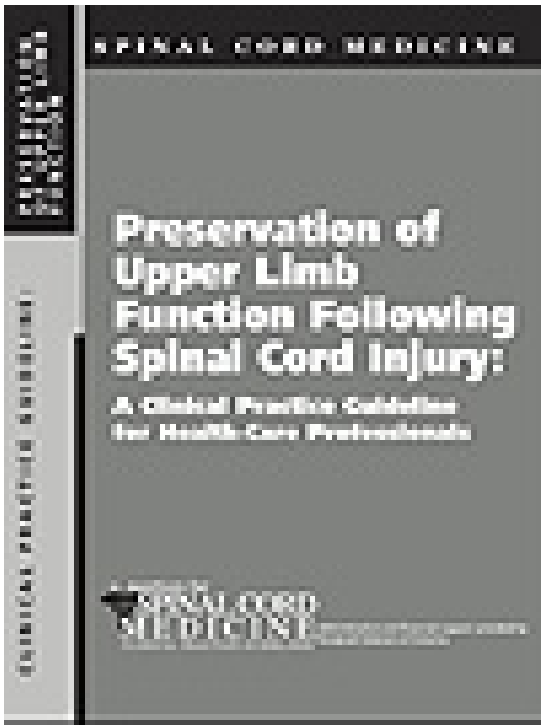
- Knowledge is constantly changing
  - It keeps us up to date
  - It improves client outcomes
- Skills and knowledge deteriorate over time
  - Keeps us all on the same playing field
  - This is the basis for training of the “next generation”
- Justifies subjective clinical findings to help access funding and reimbursement for appropriate treatment and equipment
- Good business practice
- Important for our professions!

# How EBP is already used….

- Simple applications we don't recognize:
  - Heart rate/blood pressure
  - Goniometric measurement
  - Letter of justification
- Higher tech applications:
  - Ultrasound protocols
  - Manual wheelchair propulsion analysis
  - Pressure imaging

# Clinical Practice Guidelines

- Published in 2005
- A consortium of professionals including practitioners, researchers, and educators
- Consolidates research findings and relates them directly to clinical practice
  - Supports recommendations for evaluation, training and equipment selection from the clinical practice guidelines.
  - Provides comprehensive, quantitative propulsion data.
- 35 recommendations in 6 specific categories



# One Recent Review on Manual Wheelchairs Found

- Over 100 new references to published research since completion of the clinical practice guidelines
- Countless other non peer reviewed articles in industry publications and conference proceedings

# Categories Reviewed

- Ergonomics
- Equipment Selection, Training and Environmental Adaptations
- Exercise
- Other Topics for Consideration – new updates to the literature.

Just A Snapshot of What was Found!

# Ergonomics

- Minimize the frequency of repetitive upper limb tasks
- Minimize the force to complete upper limb tasks
- Minimize extreme or potentially injurious positions at all joints
  - Avoid extreme positions at the wrist
  - Avoid positioning of the hand above the shoulder
  - Avoid potentially injurious or extreme positions at he shoulder, include internal rotation and abduction.

# New literature

Minimize the frequency of repetitive upper limb tasks

- Van Drongelen, S.,L.H. Van der Woude, et al. (2005). “Mechanical load on the upper extremty during wheelchair activities.” Arch Phys Med Rehabil 86 (6):1214-20.
- Van Drongelen,S.,L.H. van der Woude, et al. (2005) “Glenohumeral contact forces and muscle forces evaluated in wheelchair-related activities of daily living in able-bodied subjects versus subjects with paraplegia and tetraplegia. Arch Phys Med Rehabil 86 (7):1434-40

# New literature

Minimize the force to complete upper extremity tasks.

- Collinger,J.L.,M.L. Boninger, et al. (2008). “Shoulder Biomechanccs during the push phase of wheelchair propulsion: a multisite study of persons with paraplegia.” Arch Phys Med Rehabil 89 (4): 667-76

- Derosches, G.R. Aissaui, et al. (2008) “The effect of resultant force at the push rim on shoulder kinetics during manual wheelchair propulsion: a simulation study.” IEEE Trans Biomed Eng 55 (4): 1423-31.

# Equipment Selection

- With high risk patients evaluate and discuss the pros and cons of changing to a power wheelchair system as a way to repetitive injuries
- Provide manual wheelchair users with SCI a high strength fully customizable manual wheelchair made of the lightest possible material. (sub headings)

# Equipment Selection

- Position the rear axle so that when the hand is placed at top dead center position on the push rim, the angle between the upper arm and the forearm is between 100 and 120 degrees.
- Adjust the rear axle as far forward as possible without compromising the stability of the user.

# New Literature

Adjust the rear axle as far forward as possible without compromising the stability of the user.

- Gutierrez, PT; Mulroy, PhD, PT et al. *Effect of Fore-Aft Seat Position on Shoulder Demands During Wheelchair Propulsion: Part 2. An Electromyographic Analysis.* **Journal of Spinal Cord Medicine** 28(3), 2005; 222-9.

# Equipment Selection Studies

On utilization of power assist:

- Most results showed a decrease in fatigue and/or increase in functional activity outside the home
- Did not address the transportation component that may arise for some users

# Equipment Selection Studies

On specific equipment selection:

- Sawatzky, Bonita J. et al. The ergonomics of different tyres and tyre pressure during wheelchair propulsion. Ergonomics, 2004, Vol 47, no. 14,1475-1483.
- Richter, W. M and P. W. Axelson. Low-impact wheelchair propulsion: Achievable and acceptable. Journal of Rehabilitation Research and Development. 42(3 Suppl 1): 21-34.
- Koontz, A.M., Y. Yang, et al. Investigation of the performance of an ergonomic handrim as a pain relieving intervention for manual wheelchair users. Assistive Technology, 2006 18(2):123-43

# Training

- Use long smooth strokes that limit high impacts on the push rim.
- Allow the hand to drift down naturally keeping it below the push rim when not in actual contact with that part of the wheelchair.
- Promote and appropriate seated posture and stabilization relative to balance and stability needs.

# New Info


- Bonniger, M.L., B.G. Impink, et al. (2004). “Relation between median and ulnar nerve function and wrist kinematics during wheelchair propulsion.” Arch Phys Med Rehabil 85 (7): 1141-5
- Fay, B.T., M.L. Bonniger, et al. (2004). “Manual wheelchair pushrim dynamics in people with multiple sclerosis.” Arch Phys Med Rehabil 85 (6):935-42

# Education for the Clinician


- Coolen,A.L., R.L.Kirby, et al. (2004). “Wheelchair skills training program for clinicans: a randomized controlled trial with occupational therapy students.” Arch Phys Med Rehab 85 (7):1160-7
- Cowan, R. E., M.L. Bonniger, et. Al. (2007) . Preliminary Outcomes of the Smart Wheel Users’ group Database: a Proposed Framework for Clinicians to Objectively Evaluate Manual Wheelchair Propulsion.” Arch Phys Med Rehabil 898 (2): 260-8.

# Exercise

- Incorporate flexibility exercises into an overall fitness program sufficient to maintain normal glenohumeral motion and pectoral muscle mobility
- Incorporate resistance training as an integral part of an adult fitness program. The training should be individualized and progressive, should be of sufficient intensity to enhance strength and muscular endurance, and should provide stimulus to exercise all the major muscle groups to pain-free fatigue

# Other Related Topics

- There are other areas we should  be paying close attention to:
  - Environment
  - Wheelchair Skills Training
- There are topics outside the seating and positioning realm that are relevant:
  - Gait/Walking Speed

# Environment

- Hurd, W. J., M. M. Morrow, et al. (2008). "Wheelchair propulsion demands during outdoor community ambulation." J Electromyogr Kinesiol
  - Wheelchair propulsion effort increases
    - As rolling resistance increases (Smooth level concrete vs aggregate)
    - As inclination angle increases (Smooth level sidewalk versus sloped sidewalk)
- Hurd, W. J., M. M. Morrow, et al. (2008). "Influence of Varying Level Terrain on Wheelchair Propulsion Biomechanics." Am J Phys Med Rehabil
  - The rolling resistance of level surface terrain significantly impacts wheelchair propulsion biomechanics
  - Aggregate Concrete, Smooth Concrete, Tile, Carpet

# Wheelchair Skills Training

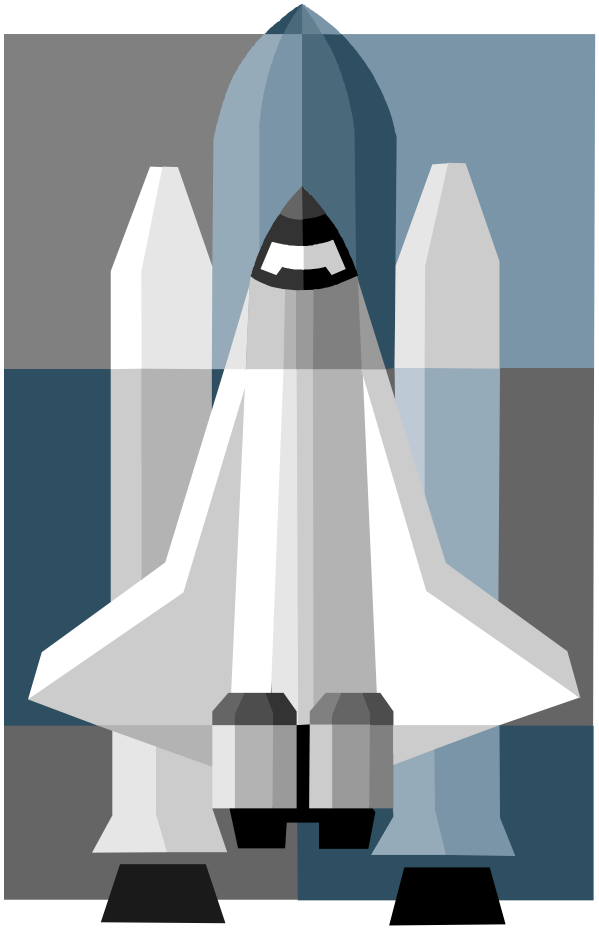

- Kilkens,O.J., A.J. Dallmeijer, et al. (2005). “The longitudinal relation between physical capacity and wheelchair skill performance during inpatient rehabilitation of people with spinal cord injury.” Arc Phys Med Rehabil 86 (8):1575-81.

- Macphee, A.H., R L. Kirby, et al. (2004). “Wheelchair skills training program: A randomized clinical trial of wheelchair users undergoing initial rehabilitation.” Arch Phys Med Rehab 85(1):41-50.

# Gait

- Hoxie RE, Rubenstein LZ. Are older pedestrians allowed enough time to cross intersections safely? J Am Geriatr Soc 1994;42(3):241-4.
  - Older Adults - 0.86+-0.17 m/s (0.41-1.29 m/s)
  - Younger Adults - 1.27+-0.17 m/s (1.04-1.68 m/s
  - 1.22 m/s [2.73 mph] average pedestrian walking speed used for pedestrian clearance applications.
- Robinett CS, Vondran MA. Functional ambulation velocity and distance requirements in rural and urban communities. A clinical report. Phys Ther 1988;68(9):1371-3.
  - Velocity required for safe crossing in seven communities
    - Rural (<10K): 44.5 m/min; 0.74 m/s; 1.66 mph
    - Small Town (10K-40K): 58.5 m/min; 0.975 m/s; 2.18 mph
    - City (<95K): 63.5 m/min; 1.06 m/s; 2.37 mph
    - City (>95K): range 42.5-82.5 m/min; 0.708-1.375 m/s; 1.58-3.07 mph
  - Normal walking velocity as reported by Blessey et. al.
    - Men: 89 m/min; 1.48 m/s; 3.31 mph
    - Women: 74 m/min; 1.28 m/s; 2.75 mph

# Bringing it all Together, the Clinical Application



It’s not rocket science!

# Resources to access literature

- Pubcrawler - Alerting service for PubMed
  - http://pubcrawler.gen.tcd.ie/
- Pubmed
  - http://www.pubmed.gov
- Google Scholar
  - http://scholar.google.com
- NIH Public Access
  - http://publicaccess.nih.gov
  - http://www.pubmedcentral.nih.gov
- Professional Organizations
- Manufacturers' Websites / Journal Clubs / Local and University Libraries

# More Resources

www.herlpitt.org (Human Engineering Research Laboratories)

www.wheelchairnet.org

www.icord.org/scire (Spinal Cord Injury Rehabilitation Evidence)

www.mobilityrerc.catea.org (Rehabilitation Engineering Research Center)

www.RESNA.org (Rehabilitation Engineering and Assistive Technology Society of North America)

www.pva.org (Paralyzed Veterans of America)

www.guideline.gov (National Guideline Clearinghouse)

www.ahrq.gov (Agency for Healthcare Research and Quality)

# Find Creative Ways to Keep Up

- Collaborate:
  - Attend conferences
  - Talk with colleagues
  - Start a journal group
  - Ask manufacturers/suppliers for help
- Review what you can – scan journals and magazines for basic content
- Document, document, document!

# Thank You

Questions?

Come see me in the Expo Hall at the Otto Bock Booth