STANDARDIZED ASSESSMENT TO PLAN POST-HOSPITAL BRAIN INJURY REHABILITATION

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LEARNING OBJECTIVES

• Discuss the value of using a standardized assessment to facilitate rehabilitation planning
• Describe methods for collaborating with patients and families to set end goals and step goals
MPAI-4 DEVELOPMENT COLLABORATORS

- Muriel Lezak, PhD (co-developer)
- Anne Moessner, RN, MSN
- Miriam Kragness, PhD
- Irwin Altman, PhD
- Shannon Swick, MA
- Randall Evans, PhD
- Karen Finlay, PhD
- Ann Kent
- Devan Parrott
- Thomas Murphy
- Mary Pat Murphy
- Vicki Eicher
- Jim Dever
- Brian Danaher, PhD
- John Seeley, PhD
- Jeff Gau, PhD
- Jacob Kean, PhD
• Outcome measures aren’t just for measuring outcome
• A standardized assessment can be useful in rehabilitation planning
  ... and for measuring outcome
VALUE OF A STANDARDIZED ASSESSMENT

• Assures a typical range of problems are addressed
• Gives the big picture
• Facilitates prioritizing and sequencing goals
• Provides a common “language” for the provider team and participants to identify strengths, limitations, and goals
• Facilitates communication between team members and participants regarding progress
• Provides a quantitative metric for assessing outcomes for individuals and program
**MAYO-PORTLAND ADAPTABILITY INVENTORY: MPAI-4**

- Structure for neuropsychological or team outpatient evaluation
- Outcome and program evaluation
- Input from patient and significant other
- Available in English, Spanish, Danish, French, German, Swedish, Portuguese, Hebrew, Dutch
- www.tbims.org/combi/mpai
A COMPREHENSIVE MEASURE: MPAI-4

• Current version is product of over 20 years of research
• 30-items
• Three subscales: Ability, Adjustment, Participation
• Psychometric properties established using classic and modern psychometric techniques
MPAI-4: ABILITY INDEX

- Mobility
- Use of hands
- Audition
- Vision
- Motor speech
- Dizziness
- Verbal Communication
- Nonverbal Communication
- Memory
- Attention/concentration
- Fund of information
- Novel Problem-solving
- Visuospatial abilities
MPAI-4: ADJUSTMENT INDEX

• Anxiety
• Depression
• Irritability, anger, aggression
• Pain/headache
• Fatigue
• Sensitivity to mild symptoms
• Inappropriate social interaction
• Impaired self-awareness
• Family/significant relationships
• Initiation
• Social contact
• Leisure activities
MPAI-4: PARTICIPATION INDEX

- Initiation
- Social contact
- Leisure activities
- Self care
- Residence
- Transportation
- Employment
- Managing Money
MPAI-4 CO-MORBIDITIES

• Alcohol/other substance abuse or dependency
• Legal issues
• Other disabling conditions
"In many respects this is an exciting time for the development of outcomes in rehabilitation, as new techniques have become available that enhance our understanding of how assessments and Patient Reported Outcomes work. They facilitate the construction of fundamental measurement from such scales, a type of measurement previously found largely only in the natural sciences."

CLASSICAL TEST THEORY (CTT) VS. ITEM-RESPONSE THEORY (IRT)

• Classical test theory generally produces ordinal scales
  – Higher scores indicate “more”
  – But not how much more
  – Intervals between levels are not equal
• In contrast, in Item-Response Theory
  – the probability of a specific response to a specific item in relationship to the probability of a specific response to other items allows the calculation of the metric distance between items

MEASUREMENT METHODOLOGY: CLASSICAL VS. RASCH

- Analysis of measure is at item level not the scale level
- Identifies items ordinally related to each other and to people as described by a linear construct
- Each item represents a level on the construct
- Misfitting or redundant items are discarded
- Quantitative relationship among items can be translated to a parametric equivalent measure
ITEM RESPONSE THEORY & RASCH ANALYSIS

• Each item contributes strongly to measurement by defining a level of the construct
  – Allows for the development relatively short scales that cover the range of the construct with minimal floor/ceiling effects
  – OR extremely precise scales using Computerized Adaptive Testing and access to a large number of items defining small changes in the level of the construct

• Metrics based on relative probability of item response is a parametric, interval-level measure

• The interval level measure supports precise and reliable differentiation among persons measured
EXAMPLE: U.S. COLLEGE BASKETBALL

CTT (Rankings)

1. Kansas
2. Kentucky
3. Virginia
4. Indiana
5. Butler

IRT (Vegas odds)

• 3:2 Kansas over Kentucky
• 2:1 Kansas over Virginia
• 5:2 Kansas over Indiana
• 7:4 Kansas over Butler
• 4:3 Kentucky over Virginia
• Etc.
• Compute probabilities
• Convert to log scale
EXAMPLE: MPAI-4 ITEMS

CTT (Difficulty ranking)
1. Employment
2. Independent Living
3. Self-cares

IRT (Odds ratios)
• 1000:1 Employment = 0 (Independent work) if Self-care = 4 (severe limitation)
• 100:99 Employment = 3 (unemployed) if Self-cares = 4 (severe)
• 20:1 Employment = 0 if IL = 2 (mild limitations)
• 178:3 IL = 1 if Self-cares = 3
• Etc.
• Compute probabilities
• Convert to log scale
MPAI-4: CONCURRENT AND PREDICTIVE VALIDITY

• Disability Rating Scale, Rancho scale, neuropsychological measures, and MPAI completed by a significant other (Bohac, Malec, & Moessner, 1997; Malec & Thompson, 1994)

• Outcome of Comprehensive Day Rehabilitation Program (Malec, 2001)

• Outcome of Specialized Vocational Services (Malec, Buffington, Moessner, & Degiorgio, 2000)

• Intensity of outpatient rehabilitation required for return to work (Malec & Degiorgio, 2002)
LEVELS OF MEASUREMENT: FOCUSED

- Participation Index
- Represents last and most meaningful challenges for rehabilitation
- Perspectives of person with TBI, SO, staff
  - vs. rater bias
- 3-rater Participation Index correlates highly with Full Scale (r = .76)
- Minimal ceiling effects
Cumulative Distributions of Participation Index
Total Raw Scores by Rater Group and 3-Rater Composite

- 3-rater composite
- People with ABI
- SO
- Staff

Total Raw Score
MPAI-4 DATABASE PROJECT

• Small Business Technology Transfer Program (STTR)
  – Tom Murphy, PI/CEO Inventive Software Solutions, Philadelphia
  – John Seeley, Jeff Gau, Brian Danaher: Oregon Research Institute, Portland
  – Jim Malec: Rehabilitation Hospital of Indiana/IU School of Medicine
MPAI-4 DATABASE PROJECT

- A Web-Enabled Client/Person Served Outcomes Reporting Service for any size provider (HIPAA compliant)
- Each organization’s data is protected and secured
- Allow individual organizations to compare and analyze their internal data to regional or national data
- Developing normative data for post-hospital brain injury
- Can add tools/scales in addition to MPAI-4
### INJURY INFORMATION SAMPLE SCREEN

**Outcomeinfo**

#### Main Menu
- Home
- All Clients
- Reports

#### Clients
- **First Name:** Cheryl
- **Middle Name:** 
- **Last Name:** Dougherty

#### Demographics
- **Exclude from Collaborative**

#### Injury Date Info
- **Injury Date:** 7/24/1987
- **Age at Inj:** 28
- **Age At Inj Cat:** 19-29 Age Cat.

#### Coma Info
- **Coma/LOC (Loss of Consciousness)**

#### Injury Type and Cause
- **Patient Type:**
- **Injury Type:** Anoxia
- **Type of Injury Other:** 
- **Cause Of Injury:** Other
- **Cause of Injury Other:** 
- **Cause of Injury #2:** Other
### Part A. Abilities

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<td>2. Use of Hands</td>
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<td>3. Vision</td>
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<td>7B. Nonverbal</td>
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<td>8. Attention</td>
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<td>9. Memory</td>
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<td>10. Fund of Information</td>
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<td>11. Novel Problem-solving</td>
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### Part B. Adjustment

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<td>13. Anxiety</td>
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<td>14. Depression</td>
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<td>15. Irritability, anger, aggression</td>
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<td>16. Pain and headache</td>
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<td>17. Fatigue</td>
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<td>19. Inappropriate social interaction</td>
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<td>20. Impaired self-awareness</td>
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<td>21. Family/significant relationships</td>
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LINKING THE MPAI-4 TO THE INTERNATIONAL CLASSIFICATION OF FUNCTIONING (ICF)

LINKING THE MPAI-4 TO THE INTERNATIONAL CLASSIFICATION OF FUNCTIONING (ICF)

• Each item links to specific functional areas that may be targeted for intervention
• Linkage is more specific for Ability and Participation than Adjustment
ICF LINKING EXAMPLES: VERBAL COMMUNICATION

- d325 Communicating with - receiving - written messages
- d330 Speaking
- d340 Producing messages in formal sign language
- d345 Writing messages
- d3600 Using telecommunication devices
- d3601 Using writing machines
- d3602 Using communication techniques

- b1670 Reception of language
- b1671 Expression of language
- b1672 Integrative language functions
- d166 Reading
- d170 Writing
- d310 Communicating with - receiving - spoken messages
- d320 Communicating with - receiving - formal sign language messages
ICF LINKING EXAMPLES: RESIDENCE

- d2301 Managing daily routine
- d2302 Completing the daily routine
- d2303 Managing one's own activity level
- d5700 Ensuring one's physical comfort
- d5701 Managing diet and fitness
- d5702 Maintaining one's health
- d6300 Preparing simple meals
- d6301 Preparing complex meals
- d6400 Washing and drying clothes and garments
- d6401 Cleaning cooking area and utensils

- d6402 Cleaning living area
- d6403 Using household appliances
- d6404 Storing daily necessities
- d6405 Disposing of garbage
- d6500 Making and repairing clothes
- d6501 Maintaining dwelling and furnishings
- d6502 Maintaining domestic appliances
- d6503 Maintaining vehicles
- d6504 Maintaining assistive devices
- d6505 Taking care of plants, indoors and outdoors
- d6506 Taking care of animals
ICF LINKING EXAMPLES: ANXIETY, DEPRESSION

- b1520 Appropriateness of emotion
- b1521 Regulation of emotion
- b1522 Range of emotion
MPAI-4 TOTAL STANDARD SCORE BY GROUP AT ADMISSION AND DISCHARGE

- Program Completers
- Precipitous Discharge

T-score

Admission

Discharge
MPAI-4 TOTAL STANDARD SCORE FOR CHRONIC CASES (TIME SINCE INJURY > 1 YEAR) BY GROUP AT ADMISSION AND DISCHARGE

Program Completers-Chronic (n=94) vs Precipitous Discharge-Chronic (n=20)
OUTCOMES BY PROGRAM TYPE AND GOALS

The Pennsylvania Association of Rehabilitation Facilities (PARF)
Eicher V, Murphy MP, Murphy TF, Malec JF. Progress Assessed With The Mayo-Portland Adaptability Inventory in 604 Participants in 4 Types of Post-inpatient Rehabilitation Brain Injury Programs. *Arch Phys Med Rehabil* 2012;93:100-7
MPAI-4 Total Raw Score by Program Type over Time

Assessment 1 vs. 2

T-score

- Intensive Residential
- Residential Supported Living
- Intensive Community
- Community Supported Living
• Average chronicity for all programs > 5 years
  – Greatest for Supported Living Programs
• Stability = Goal of Residential and Supported Living Programs
• Progress = Goal of Intensive Programs
• Goals appropriately adjusted for chronicity and severity of disability
The MPAI-4 and the Client Info System are based on state-of-the-art psychometric and database technologies.

Standardized assessment methods, such as these, support:

- Rehabilitation program evaluation referencing national benchmarks
- Rehabilitation program planning and monitoring in individual cases
- Data for advocacy and policy development
KEY REFERENCES


• Malec J, Lezak M. Manual for the Mayo-Portland Adaptability Inventory. www.tbims.org/combi/mpai


• Malec JF. Comparability of Mayo-Portland Adaptability Inventory ratings by staff, significant others and people with acquired brain injury, Brain Inj 2004;18:563-75.

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