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Evaluating Motor Recovery after Stroke: Application of the Fugl-Meyer Assessment for the Upper Extremity

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Objectives

1) Identify when to utilize valid, reliable outcome measures with the post-stroke population

2) Administer the upper extremity portion of the Fugl-Meyer Assessment in various adult rehabilitation settings

3) Interpret and document the Fugl-Meyer scoring system for the post-stroke upper extremity

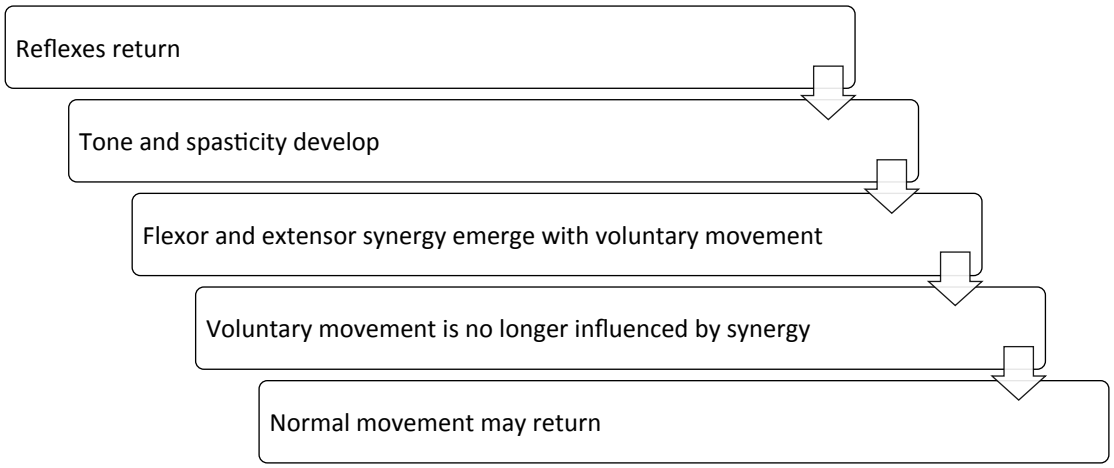
Background

- The Fugl-Meyer Assessment (FMA) was originally developed in 1975
- Total of 226 points assessing joint motion and pain, balance, sensation, upper extremity motor function, and lower extremity motor function
  - The upper extremity motor function section = 66 points max.
- Developed to quantify motor recovery

Background

- Stroke impacts ~795,000 people each year
- Fifth leading cause of death in the United States
- Hemiparesis is the most common deficit following stroke
  - Affects 70%-80% of stroke survivors
- Recovery of motor function follows a predictable pattern
- Motor function returns after in sequence after flaccid paralysis

Upper Extremity Recovery



Development of the Fugl-Meyer Assessment

- Quantifiable method of measuring upper extremity motor function
- Considered to be a "gold standard" outcome measure
  - Commonly used in research/clinical trials
- Fugl-Meyer Assessment (FMA) psychometrics
  - Excellent interrater reliability (r = 0.98-0.995)
  - Excellent construct validity (r = 0.75) for chronic stroke
- Major benefit to using the FMA in clinical practice to quantify motor function and progress

Appropriate Patients: Clinical Perspective

- Cognitive capability of following 1-2 step directions
- Adequate visual function
- Upper extremity movement has emerged
- Postural control in chair

Administering the FMA

Items Needed:

FMA scoring form
Chair without arm rests
Reflex hammer
6-ounce can
Pencil
Piece of paper or index card
Tennis ball
Stopwatch
Blindfold

Administering the FMA

- Pt is positioned seated upright in a chair without armrests
  - Examiner sits across from patient
- Explain the purpose of the FMA
- For each item, FIRST demonstrate the motion and have the patient perform the same motion with his/her UNAFFECTED SIDE
  - Demonstrate using a "mirror image" technique
- Have the patient then complete the motion with his/her AFFECTED SIDE
- Score the movement of ONLY the affected side by comparing the affected and unaffected side

Scoring the FMA

- The first item (Reflexes) is the only binary item of the FMA
- All other items are scored with a 0, 1, or 2

  0 = cannot perform or cannot achieve the starting position

  1 = can perform partially

  2 = can perform fully
- Compare motor function to patient's unaffected side
- When in doubt, go with your first instinct

Review of FMA items

Reflexes

Thumb on biceps tendon
Middle finger on triceps tendon

0 = Unable to elicit
2 = Able to elicit

Dynamic Movement within Flexor Synergy

Scapular retraction
Scapular elevation
Humeral abduction
Humeral ER
Elbow flexion
Forearm supination

0 = Unable
1 = Partial
2 = Full
*Dorsum of hand should ultimately face the examiner

Dynamic Movement within Extensor Synergy

Humeral adduction/IR
Elbow extension
Forearm pronation

0 = Unable
1 = Partial
2 = Full

*Have patient start in the flexor synergy position; you can help position the patient in this starting position, if needed.

Movement Mixing Flexion and Extension Synergies

Hand to lumbar spine

0 = Unable
1 = Partial
2 = Full

*Wrist crease must cross the ASIS plane for patient to score a 1.

Movement Mixing Flexion and Extension Synergies

Shoulder to 90 degrees flexion with elbow at 0 degrees and forearm in neutral

0 = Unable
1 = Partial
2 = Full

*Elbow must be maintained in FULL extension

Movement Mixing Flexion and Extension Synergies

Pronation/supination with elbow at 90 degrees

0 = Unable
1 = Partial
2 = Full

*Must demonstrate partial supination AND partial pronation for a score of a 1.

Movements with Little or No Synergy Dependence

Humeral abduction to 90 degrees

0 = Unable
1 = Partial
2 = Full

*Patient must maintain full elbow extension

Movements with Little or No Synergy Dependence

Humeral flexion from 90 degrees to 180 degrees with elbow at 0 degrees and forearm in neutral

0 = Unable
1 = Partial
2 = Full

*Pt starts in 90 degrees of shoulder flexion with elbow extended

Movements with Little or No Synergy Dependence

Forearm pronation/supination with elbow at 0 degrees and shoulder between 30 degrees and 90 degrees of flexion

0 = Unable
1 = Partial
2 = Full
*Must demonstrate partial supination AND partial pronation for a score of a 1.

Normal Reflex Activity

Note: ONLY to be completed if patient scores a total of 6 points in the "Movements with Little or No Synergy Dependence" section

0 = Two of the reflexes are markedly hyperactive
1 = One reflex is hyperactive OR two are lively
2 = One reflex is lively and none are Hyperactive

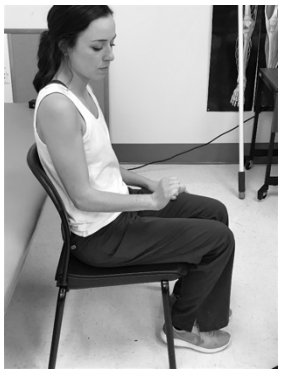
- Lively = Greater response than unaffected reflexes
- Hyperactive= Strong muscle contraction or sustained clonus.

Wrist Stability and Mobility

Wrist stability with wrist in 15 degrees extension and elbow at 90 degrees

0 = Unable to achieve 15 degrees wrist extension
1 = Can achieve at least 15 degrees extension
2 = Can achieve at least 15 degrees extension and maintain position against resistance

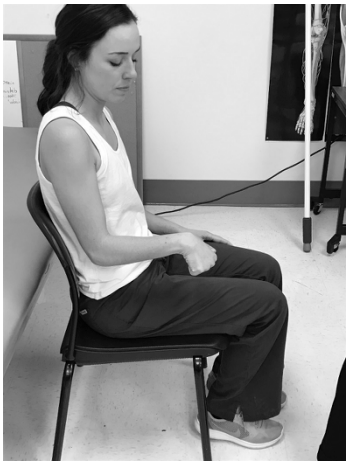
*Note: Amount of resistance applied = the weight of the examiner's hand.



Wrist Stability and Mobility

Wrist mobility with the elbow at
90 degrees
0 = Unable to perform wrist motion
1 = Partially completes wrist flexion and extension
2 = Full wrist flexion and extension

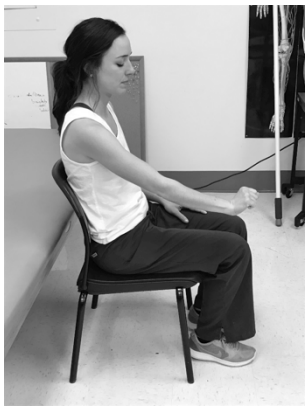
*Must demonstrate partial wrist flexion AND extension to score a 1.



Wrist Stability and Mobility

Wrist stability with wrist in 15 degrees extension and elbow at 0 degrees with shoulder between 30-90 degrees of flexion

0 = Unable to achieve 15 degrees wrist extension
1 = Can achieve at least 15 degrees extension
2 = Can achieve at least 15 degrees extension and maintain position against resistance



Wrist Stability and Mobility

Wrist mobility with the elbow at 0 degrees and shoulder between 30-90 degrees of flexion

0 = Unable to perform wrist motion
1 = Partially completes wrist flexion and extension
2 = Full wrist flexion and extension

Wrist Stability and Mobility

Circumduction of the wrist

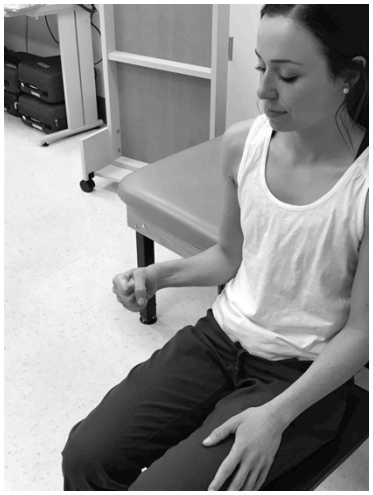
0 = Unable
1 = Partial
2 = Full

*Patient can lean forward to rest forearm on thigh for this item

Hand

Mass flexion

0 = Unable
1 = Partial
2 = Full



*Look for complete flexion of DIPs

Hand

Mass extension

0 = Unable
1 = Partial
2 = Full

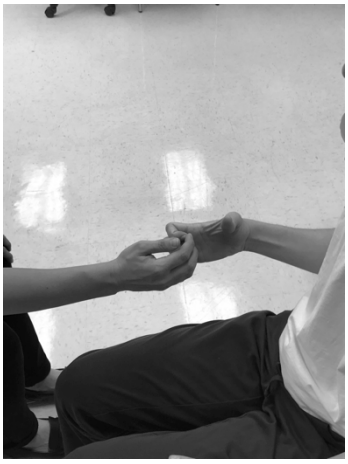
*Compare to unaffected side

Hand

Grasp A: Hook grasp

0 = Unable to achieve position
1 = Can achieve position but not against resistance
2 = Can achieve position against resistance

*MCPs of digits 2-5 maintain extension while IPs flex



Hand

Grasp B: Thumb adduction (with paper)

0 = Unable to achieve position
1 = Can achieve position and hold paper but not against slight pull
2 = Can achieve position and hold paper against slight pull

*Watch for flexion of digits 2-5

Hand

Grasp C: 1st and 2nd digit pulpa approximation (with pencil)

0 = Unable to achieve position
1 = Can maintain grasp on pencil but not against resistance
2 = Can maintain grasp with resistance

Hand

Grasp D: 1st and 2nd digit cylindrical (with can)

0 = Unable to maintain position
1 = Can maintain grasp on can but not against resistance
2 = Can maintain grasp on can against resistance

Hand

Grasp E: Spherical (with tennis ball)
DIPs of all digits must make contact with ball

0 = Unable to achieve position
1 = Can maintain grasp on ball but not against resistance
2 = Can maintain grasp on ball against resistance

Coordination/Speed

Tremor:
0 = Marked tremor (>2cm margin)
1 = Slight tremor (<2cm margin)
2 = No tremor
Dysmetria:
0 = Pronounced dysmetria (>2cm margin)
1 = Slight dysmetria (<2cm margin)
2 = No dysmetria
Speed:
0 = 6.0+ seconds slower than the unaffected side
1 = Between 2 and 5.99 seconds slower
2 = Less than 2 seconds slower

Note: Patient should be blindfolded!

Limitations

- May be challenging to administer with patients who have cognitive deficits
- Scoring system could be more robust
- Has a ceiling effect
  - May not capture improvement in patients with higher level hand function
- Does not include items related to higher level coordination: dexterity, finger isolation, manipulation, etc.

Conclusion

- The FMA is a valid and reliable outcome measure for evaluating upper extremity motor function after stroke
- Gold standard assessment in clinical trials
- Highly recommended for use in various clinical settings (inpatient rehab, outpatient rehab, acute care)
- Results from the FMA can capture patient progress
  - Implications for reimbursement

*Special thank you to Shannon Caldwell, Laura Fish, Madi Sternberg, and Dr. Stephen Page

Q&A

Feel free to email me with additional questions, comments, or concerns:

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