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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

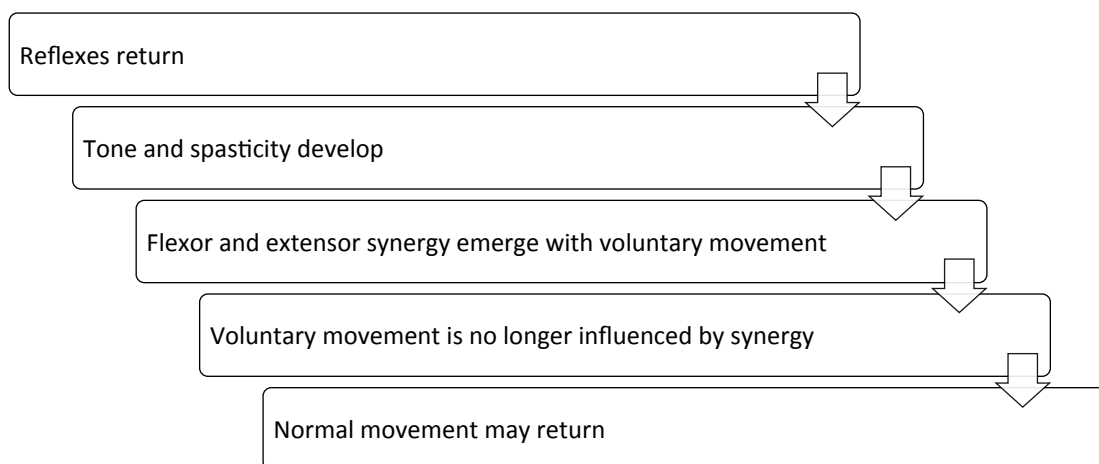
## Background

- 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

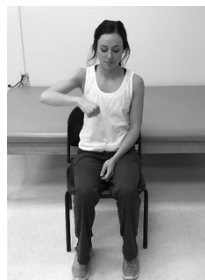
Humeral adduction/IR  
 Elbow extension  
 Forearm pronation

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: 1<sup>st</sup> and 2<sup>nd</sup> 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: 1<sup>st</sup> and 2<sup>nd</sup> 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

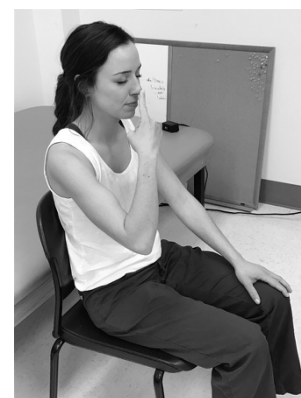
### Speed:

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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