Evaluation Scales and Goal Setting: Hypertonia/Muscle Over-Activity

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Goals and Objectives

• Review commonly used clinical evaluation scales for various forms of muscle hypertonia
• Enhance understanding of the advantages and limitations of available scales
• Recognize how goal setting and objective measurement of change enhances treatment planning and improves patient outcomes when treating muscle hypertonia/over-activity
Assessment and Treatment Planning: Muscle Hypertonia/Over-activity

• Management options
  – Rehabilitation interventions:
    • ROM/stretching, PT, OT, Casting, splinting etc
  – Pharmacologic
    • Enteral, parenteral, intrathecal
  – Chemodenervation:
    • Botulinum toxins, phenol, alcohol
  – Surgical
    • Intrathecal Baclofen (ITB)
    • Selective Dorsal Rhizotomy (SDR)
    • Deep Brain Stimulation (DBS)
Assessment and Treatment Planning: Muscle Hypertonia/Over-activity

- Selecting the most appropriate treatment for a patient requires detailed assessment of
  - Impairments
  - Function
  - Motivation
  - Access to follow up
  - Setting realistic treatment goal
Assessment and Treatment Planning: Muscle Hypertonia/Over-activity

• Comprehensive assessment of a patient with hypertonia/muscle over-activity determines the
  – Scope, severity,
  – Impact on
    • Quality of life
    • Passive and active function
  – Includes assessment of co-existing impairments
    • Weakness
    • Selective motor control
    • Cognitive
    • Others

Pre/Post ITB
Assessment and Treatment Planning: Muscle Hypertonia/Over-activity

• Combination of impairments will influence
  – Treatment selection
  – Outcomes/efficacy of various treatments

• Patient assessment and identifying goals of treatment will guide selection of the most appropriate therapy
  • Non-invasive interventions
  • Invasive interventions
What do you want to measure?

MUSCLE HYPERTONIA/OVER-ACTIVITY: EVALUATION SCALES
What do Evaluation Scales Measure?

**Impairment**

- **Examination**
  - ROM, contracture, deformity
  - Sensation/proprioception
  - Strength: MMT, Dynamometry
- **Spasticity**
  - Modified Ashworth Scale (MAS)
  - Modified Tardieu Scale (mTS)
  - Australian Spasticity Assessment Scale
  - HAT
- **Dystonia**
  - HAT
  - BAD
  - Burke Fahn Marsden
  - TWSTRS
  - Writer’s Cramp Scale
- **Selective motor control**
  - SCALE: Selective Control Assessment, Lower Extremity

**Function**

- Physician’s Rating Scales
- FIM/WeeFim
- GMFM
- PEDI
- Shriners Hospital Upper Extremity Evaluation (SHUEE)
- QUEST
- COPM (Canadian Occupational Performance Measure)
- AHA (Assisting Hand Assessment)
- UPDRS (United Parkinson’s Disability Rating Scale)
What do Evaluation Scales Measure?

Activity and Participation
- Activity monitors
  - Pedometers, smart phones, activity logs, etc
- Goal Attainment Scaling
- COPM

Quality of Life and Other Factors
- Quality of Life
  - Pain: VAS
  - CPQOL checklist
  - Many others
- Patient’s and family’s
  - Health
  - Social situation
  - Economics
  - Access to care/therapy etc
  - Motivation
  - Behavioral profile
SO MANY SCALES, SO LITTLE TIME.....
## Modified Ashworth Scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No increase in muscle tone</td>
</tr>
<tr>
<td>1</td>
<td>Slight increase in tone – a catch and release at the end of the range of motion</td>
</tr>
<tr>
<td>1+</td>
<td>Slight increase in tone – catch, followed by minimal resistance in remainder of range</td>
</tr>
<tr>
<td>2</td>
<td>More marked increase in tone through most of range</td>
</tr>
<tr>
<td>3</td>
<td>Considerable increase in tone, passive movement difficult</td>
</tr>
<tr>
<td>4</td>
<td>Affected parts rigid in flexion or extension</td>
</tr>
</tbody>
</table>

MAS

Advantages
• Familiar to clinicians
• Quickly/easily administered
• Widely used in clinical trials

Limitations
• Does not really measure spasticity
  – As described, MAS is performed at the speed of limb falling by gravity
  – Therefore is primarily is a measure stiffness
    • Non-contractile elements of muscle
• Ordinal Scale
  – Subjective
• May be insensitive to changes post treatment
Tardieu Scale

- **Velocity of stretch:**
  - V1: As slow as possible (minimizing stretch reflex)
  - V2: Speed of the limb segment falling under gravity
  - V3: As fast as possible (faster than the rate of the natural drop of the limb segment under gravity)
- V1 (R2) = PROM
- V2,V3 (R1) “Catch angle” rates spastic catch
- **Spasticity angle = V1 – V3 or V1 – V2**
  - R1 and R2: Are more commonly used in clinical practice


Tardieu Scale

**Advantages**
- Quickly/easily performed
  - Can be incorporated into physical/ROM exam
- Measures spasticity
  - Velocity dependent increase in tonic stretch reflexes
- Provide more objective measurements than MAS
  - Not an ordinal scale
  - Measure joint catch angles of $V_1$, $V_2$, and catch angle
- May be more sensitive to change than MAS

**Limitations**
- Clinicians may be unfamiliar with this scale
  - Widely used by Pediatric clinicians
- For research studies
  - May be difficult to measure joint angles using a standard goniometer
    - Consider using an electronic goniometer
Hypertonia Assessment Tool: HAT

- **Discriminates between**
  - Spasticity
  - Dystonia
  - Rigidity

- **Scoring**
  - 0 = negative
  - 1 = positive

- **Spasticity**
  - Velocity-dependent resistance to stretch
  - Presence of spastic catch

- **Dystonia**
  - Increased involuntary movements or postures of the designated limb with tactile stimulus of a distant body part
  - Increased involuntary movements or postures with purposeful movement of a distant body part
  - Increased tone with movement of a distant body part

- **Rigidity**
  - Equal resistance to passive stretch during bidirectional movement of a joint
  - Maintenance of limb position after passive movement


Hypertonia Assessment Tool: HAT

Advantages

• Discriminative scale
  – Spasticity
  – Dystonia
  – Rigidity
• Easily and quickly performed
  – Incorporated into exam
• Helps identify patient’s with mixed movement disorders

Disadvantages

• Less familiar to some clinicians
  – Widely used in pediatric populations
Commonly used

DYSTONIA RATING SCALES
Dystonia Rating Scales

• **Discriminative Scales**
  – Hypertonia Assessment Tool: HAT

• **General scales**
  – Burke-Fahn-Marsden-Scale
  – Barry Albright Dystonia Scale (BAD)

• **Focal dystonia scales**
  – Toronto Western Spasmodic Torticollis Rating Scale (TWSTRS)
  – Torticollis Severity Rating Scale
  – Writer’s Cramp Scale
SELECTIVE MOTOR CONTROL
SCALES
# SCALE: Selective Control Assessment of the Lower Extremity

**Score Sheet**

**Date:** ____________  **Patient’s Name:** ____________  **DOB:** ____________  **GMFCS level:** ____________

**Diagnosis:**
- [ ] spastic diplegia
- [ ] spastic quadriplegia
- [ ] spastic hemiplegia
- **R**
- **L**
- [ ] other: ______________________

<table>
<thead>
<tr>
<th>Grade</th>
<th>Left</th>
<th></th>
<th></th>
<th></th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal (2 points)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impaired (1 point)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unable (0 points)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Limb Score**

**L =** ____________  **R =** ____________

**Resisted Synergy**

- knee extension with resisted limb extension
- dorsiflexion with resisted limb flexion

**Descriptors**

- hip flexion contracture
- adductor contracture or spasticity
- knee flexion contracture
- hamstring tightness
- plantar flexion contracture
- plantar flexor spasticity
- inverts or everts, not pure dorsiflexion
- primarily moves toes
- relaxes motion on opposite limb
- motion slower than 3 second verbal count
- moves one direction only (not motion achieved)
- movement of other joints
- motion ≤ 50% of available ROM

**Other comments regarding test:**

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

__________  ____________  ____________  ____________

**Examiner**

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*Version 2.3, Copyright 2009 – University of California Los Angeles/Orthopaedic Hospital Center for Cerebral Palsy*
FUNCTIONAL SCALES
Functional Independence Measure (FIM) or Functional Independence Measure for Children (WeeFIM)

Self Care
A. Eating
B. Grooming
C. Bathing
D. Dressing – Upper Body
E. Dressing – Lower Body
F. toileting

Sphincter Control
G. Bladder Management
H. Bowel Management

Transfers
I. Chair/Wheelchair
J. Toilet
K. Tub/Shower

Locomotion
L. Walk/Wheelchair/Crawl
M. Stairs

Communication
N. Comprehension
O. Expression

Social Cognition
P. Social Interaction
Q. Problem Solving
R. Memory

Independence on each item rated on scale of 1 to 7

GOAL SETTING
Setting Appropriate Goals

Setting Goals

- Patient’s and Clinician’s expectations and goals are often quite different
  - Discuss patient’s goals
  - Determine if these goals are realistic
  - Set goals that are measurable, obtainable and realistic

Frequently used scales

- Visual Analog Scales (VAS)
- Goal Attainment Scaling (GAS)


VAS

Advantages
• VAS is easily/quickly administered
  – Rated by most patients or family/caregiver)
• Clinicians are familiar with this scale
  – VAS pain scale

Characteristics
• Subjective measurement response
• Continuous rather than discrete response scale
• VAS may outperform discrete scales

Goal Attainment Scaling (GAS)

- Goals are set in collaboration, patient, family, caregivers and clinician identify a specific goal
- Measures effectiveness of treatment in reaching the goal or goals
- Numeric assessment
  - Worst to best possible outcomes
  - -2 to +2

- Ex Following treatment nighttime awakenings from spasms will decrease from > 6/night to < 3/night

- Scoring
  - -2 (most unfavorable outcome): No change in spasms > 6 awakenings per night
  - -1 (less than expected outcome): spasms improved < 6 but >3/night
  - 0 (expected outcome): < 3 awakenings from spasms/night
  - +1 (greater than expected outcome): 1-2 awakenings from spasms/night
  - +2 (most favorable outcome likely): No awakenings from spasms at night

Elliott, Catherine M.; Siobhan L. Reid (2011). "Lycra arm splints in conjunction with goal-directed training can improve movement in children with cerebral palsy". *NeuroRehabilitation* 28 (1): 47–54
In Summary, Most Commonly Used Evaluation Scales for Muscle Hypertonia and Over-Activity

- **Spasticity**
  - Ashworth Scale (AS)
  - Modified Ashworth Scale (MAS)
  - Modified Modified Ashworth Scale (MMAS)
  - Modified Tardieu Scale (mTS or TS)
  - Hypertonia Assessment Tool (HAT)
  - VAS

- **Dystonia**
  - Hypertonia Assessment Tool
  - Burke-Fahn-Marsden (BFM)
  - Toronto Western Spasmodic Torticollis Rating Scale (TWSTRS)
  - Writer’s Cramp Rating Scale
  - Parkinson UPDRS
  - VAS
Conclusions:

• Critical Issues in treatment of patients with hypertonia/muscle over-activity
  – Patient selection, evaluation
  – When selecting a scale to evaluate a problem or outcome
    • Scale measures what it is intended to measure
    • Sensitive to change
  – Goal setting
    • Measurable
    • Sensitive to change
    • Meaningful
Commonly used

DYSTONIA RATING SCALES
Burke-Fahn-Marsden Dystonia Scale

<table>
<thead>
<tr>
<th>Region</th>
<th>Provoking factor</th>
<th>Severity</th>
<th>Weight factor</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyes</td>
<td>0–4</td>
<td>x</td>
<td>0–4</td>
<td>0.5</td>
</tr>
<tr>
<td>Mouth</td>
<td>0–4</td>
<td>x</td>
<td>0–4</td>
<td>0.5</td>
</tr>
<tr>
<td>Speech</td>
<td>0–4</td>
<td>x</td>
<td>0–4</td>
<td>1.0</td>
</tr>
<tr>
<td>Swallow</td>
<td>0–4</td>
<td>x</td>
<td>0–4</td>
<td>1.0</td>
</tr>
<tr>
<td>Neck</td>
<td>0–4</td>
<td>x</td>
<td>0–4</td>
<td>0.5</td>
</tr>
<tr>
<td>R arm</td>
<td>0–4</td>
<td>x</td>
<td>0–4</td>
<td>1.0</td>
</tr>
<tr>
<td>L arm</td>
<td>0–4</td>
<td>x</td>
<td>0–4</td>
<td>1.0</td>
</tr>
<tr>
<td>Trunk</td>
<td>0–4</td>
<td>x</td>
<td>0–4</td>
<td>1.0</td>
</tr>
<tr>
<td>R leg</td>
<td>0–4</td>
<td>x</td>
<td>0–4</td>
<td>1.0</td>
</tr>
<tr>
<td>L leg</td>
<td>0–4</td>
<td>x</td>
<td>0–4</td>
<td>1.0</td>
</tr>
</tbody>
</table>

3. Moderate. Prolonged spasms of eyelid closure, but eyes open most of the time
4. Severe. Prolonged spasms of eyelid closure, with eyes closed at least 30% of the time

Mouth
0. No dystonia present
1. Slight. Occasional grimacing or other mouth movements (e.g., jaw opened or clenched; tongue movement)
2. Mild. Movement present less than 50% of the time

Speech and swallowing
0. Normal
1. Slightly involved; speech easily understood or occasional choking
2. Some difficulty in understanding speech or frequent choking
3. Marked difficulty in understanding speech or inability to swallow firm foods
4. Complete or almost complete anarthria, or marked difficulty swallowing soft foods and liquids

Neck
0. No dystonia present
1. Slight. Occasional pulling
2. Obvious torticollis, but mild
3. Moderate pulling
4. Extreme pulling

Arm
0. No dystonia present
1. Slight dystonia. Clinically insignificant
2. Mild. Obvious dystonia, but not disabling
3. Moderate. Able to grasp, with some manual function
4. Severe. No useful grasp

Spasmodic Torticollis/Cervical Dystonia, Writer’s Cramp

FOCAL DYSTONIA ASSESSMENT SCALES
## Cervical Dystonia/Spasmodic Torticollis

**Toronto Western Spasmodic Torticollis Rating Scale (TWSTRS)**

### I. Torticollis Severity Scale

(MAXIMUM = 35)

#### A. Maximal Excursion

- **Rotation** *(turn: right or left)*
  - 0 = None [0°]
  - 1 = Slight [< 1/4 range, 1° – 22°]
  - 2 = Mild [1/4 – 1/2 range, 23° – 45°]
  - 3 = Moderate [1/2 – 3/4 range, 46° – 67°]
  - 4 = Severe [> 3/4 range, 68° – 90°]

- **Laterocollis** *(tilt: right or left, exclude shoulder elevation)*
  - 0 = None [0°]
  - 1 = Mild [1° – 15°]
  - 2 = Moderate [16° – 35°]

### II. Disability Scale

(MAXIMUM = 10)

#### A. Work

0 = None

#### B. Activities of Daily Living

0 = None

#### C. Driving

0 = None

#### D. Reading

0 = None

#### E. Television

0 = None

#### F. Activities Outside the Home

0 = None

### III. Pain Scale

(MAXIMUM = 3)

#### A. Severity of Pain (record + best + (2xusual)/4)

0 = None

#### B. Duration of Pain

0 = None

#### C. Disability Due to Pain

0 = None

### TWSTRS Examination Record

[Image of the TWSTRS Examination Record form]

**PHYSICIAN’S SIGNATURE**

**TOTAL TWSTRS SCORE**
# CD Injection Record Form

**Injection Record**

<table>
<thead>
<tr>
<th>Muscle Injected</th>
<th>Units Injected</th>
<th>Volume Injected</th>
<th>Number of Injections</th>
<th>Total Units</th>
<th>Total Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sternoclavicular m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serratus anterior m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rhomboid major m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rhomboid minor m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trapezius m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trapezius minor m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trapezius long m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trapezius minor m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trapezius major m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oblique externus m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erector spinae m.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Amount Administered</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Amount Used</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Electromyography Utilized?**
- [ ] Yes
- [ ] No

**Physician’s Signature**

---

# Toronto Western Spasmodic Torticollis Rating Scale (TWSTRS)

- **Score**
- **Notes**
Appendix

Writer’s Cramp Rating Scale

Part A: writing movement score

1. dystonic posture*
   elbow score (ES)
   pathological flexion   pathological extension
   0 no                  0
   1 moderate            1
   2 marked              2                      ES (0–2)

   wrist score (WRS)
   pathological flexion   pathological extension
   0 no                  0
   1 moderate            1
   2 marked              2                      WRS (0–4)

   pathological ulnar-abd. pathological radial-abd.
   0 no                  0
   1 moderate            1
   2 marked              2

   finger score (FS)
   finger I
   pathological flexion   pathological extension
   0 no                  0
   1 moderate            1
   2 marked              2

   finger II
   pathological flexion   pathological extension
   0 no                  0
   1 moderate            1
   2 marked              2

   finger III
   pathological flexion   pathological extension
   0 no                  0
   1 moderate            1
   2 marked              2                      FS (0–6)

2. Latency of dyskinesia (L)
   at least 3 letters possible with start of writing
   0 no
   1 moderate            1
   2 marked              2                      L (1–2)

3. Writing tremor (WT)
   no writing tremor
   moderate writing tremor
   severe writing tremor
   0 no
   1 moderate            1
   2 marked              2                      WT (0–2)

Part B: Writing speed

writing speed (WS)
   normal
   mild slowing           1
   severe slowing         2                      WS (0–2)

The WCRS consists of two subscores, the writing movement score and the writing speed subscore:

Writing movement score = (ES + WRS + FS) × L +
WTS × 2          (0–28)

Writing speed score = WS          (0–2)

*Following a study in 24 healthy controls a “normal writing posture” of the upper extremity was defined as an elbow flexion of around 90 degrees, a neutral position of the wrist concerning extension, flexion and ulnar- or radial abduction of the wrist and a flexion of around 25 degrees in the finger joints of the first, second and third finger. To ensure standardised procedures subjects should keep the same sitting position and distance to the table while writing a standard text with always the same pen during each assessment.
FUNCTIONAL RATING SCALES
ADULT/PEDIATRIC

Fim, Wee Fim
<table>
<thead>
<tr>
<th>Crouch</th>
<th>Hindfoot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe (&gt;20° hip, knee, ankle)</td>
<td>Varus at foot strike</td>
</tr>
<tr>
<td>Mod (5°-20° hip, knee, ankle)</td>
<td>Valgus at foot strike</td>
</tr>
<tr>
<td>Mild (&lt;5° hip, knee, ankle)</td>
<td>Occasionally neutral at foot strike</td>
</tr>
<tr>
<td>None</td>
<td>Neutral at foot strike</td>
</tr>
<tr>
<td>Equinus foot</td>
<td></td>
</tr>
<tr>
<td>Constant (fixed contracture)</td>
<td></td>
</tr>
<tr>
<td>Constant (dynamic contracture)</td>
<td></td>
</tr>
<tr>
<td>Occasionally heel contact</td>
<td></td>
</tr>
<tr>
<td>Heel-to-toe gait</td>
<td></td>
</tr>
<tr>
<td>Gait</td>
<td></td>
</tr>
<tr>
<td>Toe-to-toe</td>
<td>Only slow</td>
</tr>
<tr>
<td>Occasional heel to toe</td>
<td>Variable (slow-fast)</td>
</tr>
<tr>
<td>Heel-to-toe</td>
<td></td>
</tr>
</tbody>
</table>

**Hindfoot**

Varus at foot strike
Valgus at foot strike
Occasionally neutral at foot strike
Neutral at foot strike

**Knee**

Recurvatum >5°
Recurvatum 0°-5°
Neutral (no recurvatum)

**Speed of gait**

Only slow
Variable (slow-fast)

**Total**

0 to 14

Koman et al, 1993
PEDIATRIC FUNCTIONAL RATING SCALES
Pediatric Evaluation of Disability Inventory (PEDI)

**Functional Skills**
- 197 items
- 0 = incapable
- 1 = capable of task performance in most situations without assistance

**Caregiver Assistance**
- 20 activities
- 0 = complete dependence
- 1 = maximal assistance
- 2 = moderate assistance
- 3 = minimal assistance
- 4 = supervision
- 5 = complete independence

**Modifications or Adaptive Equipment Used**
- 20 items

Gross Motor Function Measure (GMFM)

Gross Motor Skills Based on Developmental Milestones

A. Lying, rolling
B. Sitting
C. Crawling, kneeling
D. Standing
E. Walking, running, jumping

<table>
<thead>
<tr>
<th>Scoring</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Does not initiate</td>
<td>0</td>
</tr>
<tr>
<td>Completes &lt;10%</td>
<td>1</td>
</tr>
<tr>
<td>Completes 10%-100% of task</td>
<td>2</td>
</tr>
<tr>
<td>Completes task</td>
<td>3</td>
</tr>
</tbody>
</table>

ADULT FUNCTIONAL RATING SCALES
ADULT FUNCTIONAL SCALES: UNITED PARKINSON’S DISABILITY RATING SCALE: UPDRS

• **MENTATION, BEHAVIOR AND MOOD**
  • **1. Intellectual Impairment**
    • 0 = None.
    • 1 = Mild. Consistent forgetfulness with partial recollection of events and no other difficulties.
    • 2 = Moderate memory loss, with disorientation and moderate difficulty handling complex problems. Mild but definite impairment of function at home with need of occasional prompting.
    • 3 = Severe memory loss with disorientation for time and often to place. Severe impairment in handling problems.
    • 4 = Severe memory loss with orientation preserved to person only. Unable to make judgements or solve problems. Requires much help with personal care. Cannot be left alone at all.

  • **2. Thought Disorder** (Due to dementia or drug intoxication) 0 = None.
    • 1 = Vivid dreaming.
    • 2 = "Benign" hallucinations with insight retained.
    • 3 = Occasional to frequent hallucinations or delusions; without insight; could interfere with daily activities.
    • 4 = Persistent hallucinations, delusions, or florid psychosis. Not able to care for self.

  • **3. Depression**
    • 1 = Periods of sadness or guilt greater than normal, never sustained for days or weeks.
    • 2 = Sustained depression (1 week or more).
    • 3 = Sustained depression with vegetative symptoms (insomnia, anorexia, weight loss, loss of interest).
    • 4 = Sustained depression with vegetative symptoms and suicidal thoughts or intent.

  • **4. Motivation/Initiative**
    • 0 = Normal.
    • 1 = Less assertive than usual; more passive.
    • 2 = Loss of initiative or disinterest in elective (nonroutine) activities.
    • 3 = Loss of initiative or disinterest in day to day (routine) activities.
    • 4 = Withdrawn, complete loss of motivation.

• **II. ACTIVITIES OF DAILY LIVING (for both "on" and "off")**
  • **5. Speech**
    • 0 = Normal.
    • 1 = Mildly affected. No difficulty being understood.
    • 2 = Moderately affected. Sometimes asked to repeat statements.
    • 3 = Severely affected. Frequently asked to repeat statements.
    • 4 = Unintelligible most of the time.

  • **6. Salivation**
    • 0 = Normal.
    • 1 = Slight but definite excess of saliva in mouth; may have nighttime drooling.
    • 2 = Moderately excessive saliva; may have minimal drooling.
    • 3 = Marked excess of saliva with some drooling.
    • 4 = Marked drooling, requires constant tissue or handkerchief.

  • **7. Swallowing**
    • 0 = Normal.
    • 1 = Rare choking.
    • 2 = Occasional choking.
    • 3 = Requires soft food.
    • 4 = Requires NG tube or gastrostomy feeding.

  • **8. Handwriting**
    • 0 = Normal.
    • 1 = Slightly slow or small.
    • 2 = Moderately slow or small; all words are legible.
    • 3 = Severely affected; not all words are legible.
    • 4 = The majority of words are not legible.

  • **9. Cutting food and handling utensils**
    • 0 = Normal.
    • 1 = Somewhat slow and clumsy, but no help needed.
    • 2 = Can cut most foods, although clumsy and slow; some help needed.
    • 3 = Food must be cut by someone, but can still feed slowly.
    • 4 = Needs to be fed.

  • **10. Dressing**
    • 0 = Normal.
    • 1 = Somewhat slow, but no help needed.
    • 2 = Occasional assistance with buttoning, getting arms in sleeves.
    • 3 = Considerable help required, but can do some things alone.
    • 4 = Helpless.

  • **11. Hygiene**
    • 0 = Normal.
    • 1 = Somewhat slow, but no help needed.
    • 2 = Needs help to shower or bathe; or very slow in hygienic care.
    • 3 = Requires assistance for washing, brushing teeth, combing hair, going to bathroom.
    • 4 = Foley catheter or other mechanical aids.
II. ACTIVITIES OF DAILY LIVING (for both "on" and "off") continued

12. Turning in bed and adjusting bed clothes
   0 = Normal.
   1 = Somewhat slow and clumsy, but no help needed.
   2 = Can turn alone or adjust sheets, but with great difficulty.
   3 = Can initiate, but not turn or adjust sheets alone.
   4 = Helpless.

13. Falling (unrelated to freezing)
   0 = None.
   1 = Rare falling.
   2 = Occasionally falls, less than once per day. 3 = Falls an average of once daily.
   4 = Falls more than once daily.

14. Freezing when walking
   0 = None.
   1 = Rare freezing when walking; may have startlesitation. 2 = Occasional freezing when walking.
   3 = Frequent freezing. Occasionally falls from freezing. 4 = Frequent falls from freezing.

15. Walking
   0 = Normal.
   1 = Mild difficulty. May not swing arms or may tend to drag leg. 2 = Moderate difficulty, but requires little or no assistance.
   3 = Severe disturbance of walking, requiring assistance. 4 = Cannot walk at all, even with assistance.

16. Tremor (Symptomatic complaint of tremor in any part of body.) 0 = Absent.
    1 = Slight and infrequently present.
    2 = Moderate; bothersome to patient.
    3 = Severe; interferes with many activities. 4 = Marked; interferes with most activities.

17. Sensory complaints related to parkinsonism
    0 = None.
    1 = Occasionally has numbness, tingling, or mild aching.
    2 = Frequently has numbness, tingling, or aching; not distressing. 3 = Frequent painful sensations.
    4 = Excruciating pain.

III. MOTOR EXAMINATION

18. Speech
    0 = Normal.
    1 = Slight loss of expression, diction and/or volume.
    2 = Monotone, slurred but understandable; moderately impaired.
    3 = Marked impairment, difficult to understand.
    4 = Unintelligible.

19. Facial Expression
    0 = Normal.
    1 = Minimal hypomimia, could be normal "Poker Face".
    2 = Slight but definitely abnormal diminution of facial expression 3 = Moderate hypomimia; lips parted some of the time.
    4 = Masked or fixed face with severe or complete loss of facial expression; lips parted 1/4 inch or more.

20. Tremor at rest
    0 = Absent.
    1 = Slight and infrequently present.
    2 = Mild in amplitude and persistent. Or moderate in amplitude, but only intermittently present. 3 = Moderate in amplitude and present most of the time.
    4 = Marked in amplitude and present most of the time.

21. Action or Postural Tremor of hands
    0 = Absent.
    1 = Slight; present with action.
    2 = Moderate in amplitude, present with action.
    3 = Moderate in amplitude with posture holding as well as action.
    4 = Marked in amplitude; interferes with feeding.

22. Rigidity (Judged on passive movement of major joints with patient relaxed in sitting position. Cogwheeling to be ignored.)
    0 =Absent.
    1 = Slight or detectable only when activated by mirror or other movements. 2 = Mild to moderate.
    3 = Marked, but full range of motion easily achieved.
    4 = Severe, range of motion achieved with difficulty.

23. Finger Taps (Patient taps thumb with index finger in rapid succession.) 0 = Normal.
    1 = Mild slowing and/or reduction in amplitude.
    2 = Moderately impaired. Definite and early fatiguing. May have occasional arrests in movement.
    3 = Severely impaired. Frequent hesitation in initiating movements or arrests in ongoing movement.
    4 = Can barely perform the task.

24. Hand Movements (Patient opens and closes hands in rapid succession.) 0 = Normal.
    1 = Mild slowing and/or reduction in amplitude.
    2 = Moderately impaired. Definite and early fatiguing. May have occasional arrests in movement.
    3 = Severely impaired. Frequent hesitation in initiating movements or arrests in ongoing movement.
    4 = Can barely perform the task.
III. MOTOR EXAMINATION continued

25. Rapid Alternating Movements of Hands (Pronation-supination movements of hands, vertically and horizontally, with as large an amplitude as possible, both hands simultaneously.)

- 0 = Normal.
- 1 = Mild slowing and/or reduction in amplitude.
- 2 = Moderately impaired. Definite and early fatiguing. May have occasional arrests in movement.
- 3 = Severely impaired. Frequent hesitation in initiating movements or arrests in ongoing movement.
- 4 = Can barely perform the task.

26. Leg Agility (Patient taps heel on the ground in rapid succession picking up entire leg. Amplitude should be at least 3 inches.)

- 0 = Normal.
- 1 = Mild slowing and/or reduction in amplitude.
- 2 = Moderately impaired. Definite and early fatiguing. May have occasional arrests in movement.
- 3 = Severely impaired. Frequent hesitation in initiating movements or arrests in ongoing movement.
- 4 = Can barely perform the task.

27. Arising from Chair (Patient attempts to rise from a straightbacked chair, with arms folded across chest.)

- 0 = Normal.
- 1 = Slow; or may need more than one attempt.
- 2 = Pushes self up from arms of seat.
- 3 = Tends to fall back and may have to try more than one time, but can get up without help.
- 4 = Unable to arise without help.

28. Posture

- 0 = Normal erect.
- 1 = Not quite erect, slightly stooped posture; could be normal for older person.
- 2 = Moderately stooped posture, definitely abnormal; can be slightly leaning to one side.
- 3 = Severely stooped posture with kyphosis; can be moderately leaning to one side.
- 4 = Marked flexion with extreme abnormality of posture.

29. Gait

- 0 = Normal.
- 1 = Walks slowly, may shuffle with short steps, but no festination (hastening steps) or propulsion.
- 2 = Walks with difficulty, but requires little or no assistance; may have some festination, short steps, or propulsion.
- 3 = Severe disturbance of gait, requiring assistance.
- 4 = Cannot walk at all, even with assistance.

30. Postural Stability (Response to sudden, strong posterior displacement produced by pull on shoulders while patient is erect with eyes open and feet slightly apart. Patient is prepared.)

- 0 = Normal.
- 1 = Retropulsion, but recovers unaided.
- 2 = Absence of postural response; would fall if not caught by examiner.
- 3 = Very unstable, tends to lose balance spontaneously.
- 4 = Unable to stand without assistance.

31. Body Bradykinesia and Hypokinesia (Combining slowness, hesitancy, decreased armswing, small amplitude, and poverty of movement in general.)

- 0 = None.
- 1 = Minimal slowness, giving movement a deliberate character; could be normal for some persons. Possibly reduced amplitude.
- 2 = Mild degree of slowness and poverty of movement which is definitely abnormal. Alternatively, some reduced amplitude.
- 3 = Moderate slowness, poverty or small amplitude of movement.
- 4 = Marked slowness, poverty or small amplitude of movement.

IV. COMPLICATIONS OF THERAPY (In the past week)

A. Dyskinesias

32. Duration: What proportion of the waking day are dyskinesias present? (Historical information.)

- 0 = None
- 1 = 1-25% of day.
- 2 = 26-50% of day.
- 3 = 51-75% of day.
- 4 = 76-100% of day.

33. Disability: How disabling are the dyskinesias? (Historical information; may be modified by office examination.)

- 0 = Not disabling.
- 1 = Mildly disabling.
- 2 = Moderately disabling. 3 = Severely disabling.
- 4 = Completely disabled.

34. Painful dyskinesias: How painful are the dyskinesias?

- 0 = No painful dyskinesias.
- 1 = Slight.
- 2 = Moderate.
- 3 = Severe.
- 4 = Marked.

35. Presence of Early Morning Dystonia (Historical information.)

- 0 = No
- 1 = Yes
B. CLINICAL FLUCTUATIONS
36. Are "off" periods predictable?
0 = No
1 = Yes
37. Are "off" periods unpredictable?
0 = No
1 = Yes
38. Do "off" periods come on suddenly, within a few seconds?
0 = No
1 = Yes
39. What proportion of the waking day is the patient "off" on average?
0 = None
1 = 1-25% of day.
2 = 26-50% of day.
3 = 51-75% of day.
4 = 76-100% of day.
C. OTHER COMPLICATIONS
40. Does the patient have anorexia, nausea, or vomiting?
0 = No
1 = Yes
41. Any sleep disturbances, such as insomnia or hypersomnolence?
(Record the patient's blood pressure, height and weight on the scoring form)
0 = No
1 = Yes
42. Does the patient have symptomatic orthostasis?
0 = No
1 = Yes

V. MODIFIED HOHN AND YAHRI STAGING
STAGE 0 = No signs of disease.
STAGE 1 = Unilateral disease.
STAGE 1.5 = Unilateral plus axial involvement.
STAGE 2 = Bilateral disease, without impairment of balance. STAGE 2.5 = Mild bilateral disease, with recovery on pull test.
STAGE 3 = Mild to moderate bilateral disease; some postural instability; physically independent. STAGE 4 = Severe disability; still able to walk or stand unassisted.
STAGE 5 = Wheelchair bound or bedridden unless aided.

VI. SCHWAB AND ENGLAND ACTIVITIES OF DAILY LIVING SCALE
100% = Completely independent. Able to do all chores without slowness, difficulty or impairment. Essentially normal. Unaware of any difficulty.
90% = Completely independent. Able to do all chores with some degree of slowness, difficulty and impairment. Might take twice as long. Beginning to be aware of difficulty.
80% = Completely independent in most chores. Takes twice as long. Conscious of difficulty and slowness.
70% = Not completely independent. More difficulty with some chores. Three to four times as long in some. Must spend a large part of the day with chores.
60% = Some dependency. Can do most chores, but exceedingly slowly and with much effort. Errors; some impossible. 50% = More dependent. Help with half, slower, etc. Difficulty with everything.
40% = Very dependent. Can assist with all chores, but few alone.
30% = With effort, now and then does a few chores alone or begins alone. Much help needed. 20% = Nothing alone. Can be a slight help with some chores. Severe invalid.
10% = Totally dependent, helpless. Complete invalid.
0% = Vegetative functions such as swallowing, bladder and bowel functions are not functioning. Bedridden.