Neuro Exams, Alternative Stroke Scales & More!

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Objectives

1. Identify various tools used to assess and treat stroke patients.
2. Provide explanation of the significance of the results of stroke tools.
3. Utilize various stroke tools with an actual patient case.
Evaluation of neurological status - imperative to patient assessment

Level of consciousness - most sensitive indicator of neurological change

Comprehensive exam - pupils, motor, sensory, cranial nerves, cerebellar

Neuro Exam
Neuro Exam & Assessment Tools

Multiple assessment tools exist to assess, diagnose & report

Standardize neuro assessments & provider communication

Improve accuracy, validity & parity in assessment & scoring
Pre-Hospital Stroke Scales

• EMS detection of acute ischemic stroke (AIS)

• Numerous scales exist!
  – Cincinnati Pre-Hospital Stroke Scale
  – Face Arm Speech Test (FAST); BE-FAST
  – MEND
  – LAMS

• Evolution of pre-hospital scales
  – Identify Large Vessel Occlusion (LVO)
  – Expanding evidence
RACE Overview

- Pre-hospital simple & rapid neurological scale
- Simplified NIHSS & uses items with higher ability to detect LVO
- If score = 5 or greater, patient may have LVO
- Hospital destination
  - Stroke Ready, PSC, CSC
Patient Case - Pre-Hospital

• Mrs. Crosby- 71 year old female presents as Level 1 stroke- new onset dysarthria, left facial droop, left arm & leg weakness, gaze deviation noted

• **LSW**: 13:30- pt was napping; spouse noted R hand twitching around 16:00

• **PMH**: MVR (2 weeks ago), EF 45%, TIA, L ICA stenosis, L MCA stroke, hypothyroidism, HLD, lymphoma, bone marrow & stem cell transplants, HTN, A-Fib

• **Home Meds**: Coumadin, Synthroid, Metoprolol, Lipitor
Rapid Arterial Occlusion Evaluation (RACE) Scale

- www.menti.com
- Code 82 88 75
Mrs. Crosby - Presents to the ED

- 71 year old female presents as Level 1 stroke with new onset dysarthria, left facial droop, left arm & leg weakness, gaze deviation
- **LSW:** 13:30 (pt was napping; spouse noted R hand twitching around 16:00
- **PMH:** MVR, EF 45%, TIA, L ICA stenosis, TIA, L MCA stroke, hypothyroidism, HLD, lymphoma, bone marrow and stem cell transplants, HTN, atrial fibrillation
- **Home Medications:** Coumadin, Synthroid, Metoprolol, Lipitor
- **16:55:** presents to CSC
- AA&O; follows commands
- **Labs:** INR 1.5
- **RACE Scale:** 7
GCS Overview

- Developed 1974
- Practical method for assessment of altered LOC
- Peripheral & central stimulation
- Gold standard for assessing neurological function

<table>
<thead>
<tr>
<th>BEHAVIOR</th>
<th>RESPONSE</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye opening response</td>
<td>Spontaneously</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>To speech</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>To pain</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>No response</td>
<td>1</td>
</tr>
<tr>
<td>Best verbal response</td>
<td>Oriented to time, place, and person</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Confused</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Inappropriate words</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Incomprehensible sounds</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>No response</td>
<td>1</td>
</tr>
<tr>
<td>Best motor response</td>
<td>Obey commands</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Moves to localized pain</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Flexion withdrawal from pain</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Abnormal flexion (decorticate)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Abnormal extension (decerebrate)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>No response</td>
<td>1</td>
</tr>
<tr>
<td>Total score:</td>
<td>Best response</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Comatose client</td>
<td>8 or less</td>
</tr>
<tr>
<td></td>
<td>Totally unresponsive</td>
<td>3</td>
</tr>
</tbody>
</table>
Glasgow Coma Scale (GCS)

- www.menti.com
- Code 82 88 75
# Neurological Exam

## Level of Consciousness
- **Alert**
- **No**

## Chemically Paralyzed
- **No**

## Stroke Scale
- **RACE Score: 7**
  - Facial Palsy: 2
  - Arm Motor Function: 2
  - Leg Motor Function: 2
  - Head & Gaze Deviation: 1
  - Aphasia (R side): 0
  - Agnosia (L side): 0

## Neurological Present
- Facial Droop, Speech Slurring, Weakness-Left Sided, Hemiparesis-Left

## Mental Present
- Oriented-Person, Oriented-Place, Oriented-Time, Alert

## Pupils

<table>
<thead>
<tr>
<th></th>
<th>Left</th>
<th>Right</th>
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<tbody>
<tr>
<td>Size</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>React</td>
<td>Reactive</td>
<td>Reactive</td>
</tr>
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</table>

## Motor Sensory

<table>
<thead>
<tr>
<th></th>
<th>LA</th>
<th>RA</th>
<th>LL</th>
<th>RL</th>
</tr>
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<tbody>
<tr>
<td>Flaccid</td>
<td>Normal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>Flaccid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>Normal</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Four Score Overview

- Proposed in 2005 as alternative coma assessment
- More detailed assessment of depth of coma than GCS
  - Eye tracking
  - Response to pain
  - Ability to follow commands
  - Presence of myoclonus status
  - Brainstem reflexes
National Institute of Health Stroke Scale

- Systematic assessment tool to provide a **quantitative** measure of the patient's status after a stroke
- Later became a clinical assessment tool for ischemic stroke
  - Validated
  - Efficient
  - Reliable
NIHSS

• LOC
• Vision and eye movement
• Movement and coordination
• Sensation and neglect
• Speech and language
Let’s score NIHSS

• 1. a LOC
• 1. b questions
• 1. c commands
• 2. Gaze
• 3. Visual Fields
• 4. Facial palsy
• 5. Arms motor
• 6. legs motor
• 7. ataxia
• 8. sensation
• 9. language
• 10. dysarthria
• 11. Neglect
Mrs. Crosby’s Neuro Exam Findings

**NEURO:** MS: Alert and oriented to person, place, and date. Speech fluent and appropriate. Repetition and naming intact. Cognition and memory grossly intact.

CN: No BTT on L; LHH vs visual neglect. PERRL. R gaze preference, not crossing midline. L FD. Hearing intact to finger rub bilaterally. Uvula midline with symmetric palatal elevation.

MOTOR: Normal bulk and tone. RUE strength 5/5 with hand grip, no drift. RLE with drift. LUE without movement to noxious stimuli. LLE without movement to noxious stimuli.

SENSORY: Not intact to LT or noxious stimuli on L side

COORDINATION: unable to assess

GAIT: deferred.
NIHSS

• www.menti.com
• Code 82 88 75
Let’s score Mrs. Crosby with NIHSS

• 1. a LOC
• 1. b questions
• 1. c commands
• 2. Gaze
• 3. Visual Fields
• 4. Facial palsy
• 5. Arms motor
• 6. legs motor
• 7. ataxia
• 8. sensation
• 9. language
• 10. dysarthria
• 11. Neglect
NIHSS by brain localization

Level of Consciousness – 1
Vision & Eye Movement- 2 & 3
Movement & Coordination- 4,5,6 & 7
Sensation & Neglect- 8 & 11
Speech & Language Function – 9 & 10

Courtesy of Dr. Jim Gebel
NIHSS Pearls

1. Score what you see not what you think
2. #7 Ataxia and #11 extinction/neglect should only be scored if definitely seen. Don’t confuse weakness for ataxia
3. In poorly responsive patients, score symmetry of grimace in response to noxious stimuli
4. Patients with visual loss can be asked to describe an object in their hand. Intubated patients can be asked to write their answers.
5. Turn off sedation before the exam.
Mrs. Crosby’s Imaging

- **Head CT** - negative for hemorrhage
- **CTA** - occlusion of R ICA at the proximal cervical segment with re-opacification at M1 segment & chronic occlusion of L ICA at the paraclinoid segment with re-opacification at left M1 segment
Treatment Options

- [www.menti.com](http://www.menti.com)
- Code 10 50 99
Mrs. Crosby’s Treatment Plan

• ** Attempt Thrombectomy **
  – 17:40- enters Neuro Interventional Radiology Suite
  – 18:03- groin accessed
  – 18:20- clot accessed
  – 18:27- Intra-arterial thrombectomy done with TICI2b recanalization

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 0</td>
<td>No perfusion</td>
</tr>
<tr>
<td>Grade 1</td>
<td>Penetration with minimal perfusion</td>
</tr>
<tr>
<td>Grade 2</td>
<td>Partial perfusion</td>
</tr>
<tr>
<td>2a</td>
<td>Only partial filling (2/3) of the entire vascular territory is visualized</td>
</tr>
<tr>
<td>2b</td>
<td>Complete filling of all of the expected vascular territory is visualized, but the filling is slower than normal</td>
</tr>
<tr>
<td>Grade 3</td>
<td>Complete perfusion</td>
</tr>
</tbody>
</table>
Neuro Interventional Radiology
Outcome & Discharge Plan

Post-Intervention
• Pt with marked improvement to NIHSS 3-left facial droop & mild dysarthria

Hospital Course
• Complicated by recent open heart surgery, effusion & anti-coagulation management

Discharge Plan
• Home with spouse, NIHSS 1-facial droop
## Functional Assessment Scales

**Modified Rankin Scale (mRS)**

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No symptoms</td>
</tr>
</tbody>
</table>
| 1     | No significant disability  
Able to carry out all usual activities, despite some symptoms. |
| 2     | Slight disability  
Able to look after own affairs w/o assistance, unable to resume all previous activities. |
| 3     | Moderate disability  
Requires some help, able to walk unassisted. |
| 4     | Moderately severe disability  
Unable to attend to own bodily needs w/o assistance, unable to walk unassisted. |
| 5     | Severe disability  
Requires constant nursing care / attention, bedridden, incontinent. |
| 6     | Dead |
### Outcome Assessment Scale

#### Functional Independence Measure (FIM) Score

<table>
<thead>
<tr>
<th>No Helper</th>
<th>Scores 18 items into 7 levels of function ranging from complete dependence to complete independence</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Complete independence</td>
</tr>
<tr>
<td>6</td>
<td>Modified Independence (device)</td>
</tr>
</tbody>
</table>
| Helper/Modified Dependence | 5  Supervision  
| 4         | Minimal Assistance                                                                            |
| 3         | Moderate Assistance                                                                           |
| Helper    | 2  Maximal Assistance                                                                         |
| 1         | Total Assistance                                                                              |

- **Self Care**
- **Sphincter Control**
- **Mobility**
- **Locomotion**
- **Cognition**
- **Social Cognition**
The Other Side of Ischemic Stroke - The Bleeds
Severity Scales for Hemorrhagic Strokes

Hunt and Hess Scale

• **Grade 1**: Asymptomatic or mild headache, slight nuchal rigidity

• **Grade 2**: Moderate to severe HA, stiff neck, no neuro deficit except cranial nerve palsy

• **Grade 3**: Drowsy or confused, mild focal neuro deficit

• **Grade 4**: Stupor, moderate or severe hemiparesis

• **Grade 5**: Deep coma, decerebrate posturing
ICH Scale

**GCS score**
- 3-4: 2 points
- 5-12: 1 point
- 13-15: 0 points

**ICH volume**
- ≥30 cm³: 1 point
- < 30 cm³: 0 points

**IVH**
- Yes: 1 point
- No: 0 points

**Infratentorial origin of ICH**
- Yes: 1 point
- No: 0 points

**Age**
- Age 80 years or older: 1 point
- Younger than 80 years: 0 point
30-40 neuro assessment & stroke scales exist internationally
- Pre-hospital, acute, functional & outcome scales

Designed for initial & ongoing assessments, prognostic indicator, communication & measure of successful outcome

Provide framework for multiple disciplines to speak the same language
Questions?
References

• A. Almojuela (2018). (online). The Full Outline of Unresponsiveness (FOUR) Score and Its Use in Outcome Prediction: A Scoping Systematic Review of the Adult Literature. *Neuro Critical Care*

• Mary E Braine, (2016). The Glasgow Coma Scale and evidence-informed practice: a critical review of where we are and where we need to be. *Journal of Clinical Nursing* 280-290


