The Neurological Exam In the ICU: High Yield Techniques

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The speaker has no disclosures

Examination Approach

• Two types of neurologic examinations
  – 1. Screening Examination
  – 2. Testing Hypotheses
• Select high-yield tests and techniques

Examination Approach

• Organization
  1. Mental Status
  2. Cranial Nerves
  3. Motor
  4. Reflexes
  5. Sensory
  6. Coordination
  7. Gait

Case 1: Mental Status

• A 73 year-old woman comes to the ER with 2 days of feeling fatigued
• General physical examination is normal and there is no weakness on neurological examination
• Language testing is abnormal
Aphasia Testing

- Fluency: Use Naming and Conversation
- Comprehension: More difficult commands
- Repetition: “Today is a sunny day…”

Aphasia Chart

<table>
<thead>
<tr>
<th>Name</th>
<th>Fluency</th>
<th>Comp</th>
<th>Rep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broca’s</td>
<td>Bad</td>
<td>Good</td>
<td>Bad</td>
</tr>
<tr>
<td>Wernicke’s</td>
<td>Good</td>
<td>Bad</td>
<td>Bad</td>
</tr>
<tr>
<td>Global</td>
<td>Bad</td>
<td>Bad</td>
<td>Bad</td>
</tr>
<tr>
<td>Conduction</td>
<td>Good</td>
<td>Good</td>
<td>Bad</td>
</tr>
<tr>
<td>Transcort Motor</td>
<td>Bad</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Transcort Sens.</td>
<td>Good</td>
<td>Bad</td>
<td>Good</td>
</tr>
<tr>
<td>Transcort Mixed</td>
<td>Bad</td>
<td>Bad</td>
<td>Good</td>
</tr>
</tbody>
</table>

Evaluating Patients for Delirium

- Multiple screening tools have been examined for delirium, each with its own caveats
  - Compared with DSM-IV criteria: likely insensitive
- Would like to design a tool that is short and easy to use by nurses as well as physicians
- ABCDE bundle
Confusion Assessment Method (CAM-ICU)

- Sensitivity and specificity > 90%
- Four elements (need 1 and 2 and 3 or 4) used to define delirium at the bedside
  1. Acute Onset and Fluctuating Course
  2. Inattention
  3. Disorganized Thinking
  4. Altered Level of Consciousness (RASS)

Deficits of Attention

- Neuropsychologic hallmark of delirium
- Diffuse localization
- Diagnose during the history
  - Tangential speech, fragmented ideas
- Test at bedside with digits forward task
  - Four digits or less signifies lack of attention
- MMSE often not helpful

Cranial Nerve Testing

- II: Pupils, Acuity, Visual Fields
- III, IV, VI: Extraocular Movements
- V: Facial Sensation
- VII: Facial Strength
- VIII: Hearing
- IX, X: Palatal Elevation and Gag
- XI: SCM and Trapezius Power
- XII: Tongue Power

Coma

- Definition:
  - Not Awake
  - Not Arousable
  - Not Aware
- Test with cerebral motor response to pain centrally and in all four extremities (supraorbital and nail-bed pressure)
Structures involved in coma


Two Localizations of Coma

• 1. Brainstem
• 2. Bilateral Hemispheres

• Use the CN exam to localize to brainstem or hemispheres

Cranial Nerve Nuclei in the Brainstem

Pupillary Reaction

• Midbrain: CN III
  – Parasympathetics mediate
• Caveats
  – Make sure light stimulus is adequate
  – Assure no drug effects
• In many cases of brain death, the pupils are not “blown” and are midposition
Corneal Reflex
- Pons: CN V and VII
- Test with a Q-tip or drops of saline
- Caveat: Make sure you are touching the cornea not the sclera

Oculocephalic Reflex
- Pons: CN III, VI, and VIII
- Vestibulo-ocular reflex (VOR) which we use on a moment-by-moment basis to foveate
- Testing procedure
- Doll’s don’t do this anymore

Cold Calorics
- Pons: CN III, VI, and VIII
- Stronger stimulus than oculocephalic
- 30cc of ice saline in each ear (1-3 min between); wait 1 minute for the response
- Correct response very misunderstood and poorly taught

Cough and Gag
- Medulla: CN IX and X
- Best to do both by suctioning through ET tube and touching each side of the palate with a tongue depressor
- Asymmetry is more interesting for us…
  - Remember 10-30 percent have no gag normally
Respiratory Drive

- Lowest Part of the Medulla
- Technique
  - Are they overbreathing?
  - Consider apnea test in specific situations such as brain death determination

Case 2: Motor

- A 75 yo male with HTN, DM and current tobacco use comes from the ED with mild problems walking and a complaint of “my left arm is not working right.”

Case 2: Motor

- The ED physician tells you that he knows the patient has no weakness in his extremities as his own exam shows equal hand grasps, moving all fours, and “stepping on the gas” in the lower extremities.

Upper Motor Neurons of the Pyramidal Tract

Predictable Pattern of Weakness
Distal Extensors of the UEs and Distal (Dorsi)Flexors of the LEs
Quick Screen for Upper Motor Neuron/Pyramidal Weakness

- Pronator Drift
- Fine Finger Movements/Toe Taps
- One muscle in each of four extremities
  - Upper Extremities: 1st DI or finger extensors
  - Lower Extremities: Extensor of big toe
- Common ED screen VERY insensitive!

<table>
<thead>
<tr>
<th></th>
<th>UMN</th>
<th>LMN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pattern of Weakness</td>
<td>Pyramidal</td>
<td>Variable</td>
</tr>
<tr>
<td>Function/Dexterity</td>
<td>Slow alternate motion rate</td>
<td>Impairment of function is mostly due to weakness</td>
</tr>
<tr>
<td>Tone</td>
<td>Increased</td>
<td>Decreased</td>
</tr>
<tr>
<td>Tendon Reflex</td>
<td>Increased</td>
<td>Decreased, absent or normal</td>
</tr>
<tr>
<td>Other signs</td>
<td>Babinski sign, other CNS signs (e.g. aphasia, visual field cut)</td>
<td>Atrophy (except with problem of neuromuscular junction)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weakness Pattern</th>
<th>Motor Neuron Disease</th>
<th>Neuropathy</th>
<th>NMJ</th>
<th>Myopathy</th>
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</thead>
<tbody>
<tr>
<td>DTR</td>
<td>Variable</td>
<td>Distal</td>
<td>Diffuse</td>
<td>Proximal</td>
</tr>
<tr>
<td>Atrophy</td>
<td>Increased, normal and/or decreased</td>
<td>Decreased or absent</td>
<td>Normal or decreased</td>
<td>Normal or decreased</td>
</tr>
<tr>
<td>Fasciculations</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Sensory symptoms/signs</td>
<td>Yes</td>
<td>Sometimes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Case 3: Sensory

- A 45 yo man presents with 2 days of progressive tingling and weakness of the lower extremities. He now is having trouble walking and rising from a chair.
Case 3: Sensory

- Exam
  - MS, CN normal
  - Motor: normal tone throughout, normal power in upper ext., 4/5 throughout in the lower extremities
  - Sensory: decreased PP/Vib/temp patchy in lower extremities
    - A sensory level is found at T10

Case 4: Coordination

- A 54 year-old woman presents with vertigo and gait difficulties
- On finger-nose-finger, she exhibits dysmetria with the right upper extremity, but not with the left

Key Cerebellar Exam Tips

- Bilateral dysfunction is often benign and drug/medication related
- Unilateral dysfunction is a cerebellar lesion until proven otherwise
  - CT insensitive in this region
- Cerebellar tracts run through the brainstem
  - Cerebellar signs with cranial nerve deficits is a brainstem lesion until proven otherwise