Management of Acute Ischemic Stroke in Adult Patients

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INITIAL ASSESSMENT

- Look for signs and symptoms of stroke (See Appendix A)
  - STAT finger stick glucose, STAT12-lead EKG
  - Inform radiology that patient has a possible acute ischemic stroke
  - EMERGENT Non-contrast CT brain scan.
    - In cancer patients, if thrombolytic therapy is considered (See Appendix B for contraindications), consider EMERGENT contrast brain CT or EMERGENT contrast brain MRI (if no contraindications to contrast)
    - Consult Neurology and Case Manager for possible transfer to stroke unit
    - Obtain a complete blood count (CBC), PT/INR, aPTT as soon as possible without delaying brain imaging
    - Obtain urine pregnancy test if appropriate

- If no contraindications, give aspirin 325 mg (See Appendix B)
- Management of blood pressure is not recommended for 1st 24 hours unless greater than 220/120 mmHg or in the presence of significant comorbidities
- Transfer to stroke unit

Blood Pressure less than 185/110 mmHg?

- Yes
  - Give aspirin 325mg if no contraindications
  - Transfer to stroke unit
- No
  - SBP greater than 185 mmHg or DBP greater than 110 mmHg
    - Labetalol 10-20 mg IV over 1-2 minutes, may repeat times 1
      - Do not use if heart rate less than 60 beats per minute
    - Nicardipine 5 mg/hour IV continuous infusion
      - See Page 2
  - Yes
    - Administer alteplase per Acute Ischemic Stroke Order Set
  - No
    - See Page 2

Yes

- Neurological exam: NIHSS
  - Avoid inserting foley catheters, nasogastric tubes, or intra-arterial pressure catheters if possible

Bleeding on CT or MRI?

- Yes
  - Consult Neurosurgery
  - Intraparenchymal Hemorrhage or Subarachnoid hemorrhage
- No
  - Symptom Onset?
    - Greater than 4.5 hours
      - Yes
        - See Page 2
      - No
        - Less than 4.5 hours
          - Yes
            - Transfer to stroke unit
          - No
            - See Page 2

Abbreviations
- EKG: Electrocardiogram
- MRI: Magnetic resonance Imaging
- CT: Computed tomography
- SBP: Systolic blood pressure
- DBP: Diastolic blood pressure
- NIHSS: National Institutes of Health Stroke Scale

Examples of significant comorbidities: severe cardiac failure, aortic dissection, or hypertensive encephalopathy.

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**Patient develops severe headache, acute hypertension, severe nausea and vomiting?**
- Yes → Stop alteplase and obtain STAT CT¹ of brain
- No → Patient develops angioedema?
  - Yes → Stop alteplase and initiate “Adult Hypersensitivity and Allergic Reaction Order set”
  - No → Maintain strict blood pressure control in the first 24 hours after alteplase administration.

**SBP¹ greater than 180 - 230 mmHg or DBP¹ greater than 105 - 120 mmHg**
- Labetalol 10 mg IV then IV continuous infusion at 2-8 mg/minute
  - NOTE: Do not use Labetalol if heart rate less than 60 beats per minute
- Nicardipine 5 mg/hour IV continuous infusion titrate by 2.5 mg/hour every 5 minutes to desired effect, max dose 15 mg/hour

**Abbreviations**
- DBP: Diastolic blood pressure
- CT: Computed tomography
- SBP: Systolic blood pressure

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### APPENDIX A - SIGNS AND SYMPTOMS OF ACUTE ISCHEMIC STROKE

**Signs and Symptoms of Acute Ischemic Stroke:**
- Numbness to face, arm, or leg (especially on one side)
- Sudden confusion
- Trouble seeing in one or both eyes
- Sudden weakness
- Sudden severe headache
- Trouble speaking or understanding

### APPENDIX B - CONTRAINDICATIONS TO THROMBOLYTIC THERAPY

**ABSOLUTE CONTRAINDICATIONS**
- Known intracranial neoplasm, leptomeningeal disease, arteriovenous malformation, or aneurysm
- Presentation suggestive of subarachnoid hemorrhage
- Acute myocardial infarction within 3 months
- Postmyocardial infarction pericarditis
- Intracranial or intraspinal surgery within 3 months
- Serious head trauma or previous stroke within 3 months
- Arterial puncture at a noncompressible site in past 7 days
- History of intracranial hemorrhage
- Active internal bleeding or acute trauma
- Witnessed seizure at stroke onset with postictal symptoms
- Platelet count less than 100 K/microliter
- Evidence of subdural hematoma on CT scan
- Evidence of intracranial hemorrhage on CT scan
- Female patient who may be pregnant
- Cerebral infarction size greater than 1/3 of the mid cerebral artery (MCA) territory
- Uncontrolled hypertension at time of treatment (greater than 185/110 mmHg)
- Current anticoagulant use with INR greater than 1.7
- Current use of direct thrombin inhibitors (dabigatran) or direct factor Xa inhibitors (rivaroxaban, apixaban, and edoxaban).
- Therapeutic heparin use within the last 48 hours with an elevated aPTT
- Blood glucose level less than 50 mg/dL or greater than 400 mg/dL

**RELATIVE CONTRAINDICATIONS**
- Only minor or rapidly improving symptoms
- Stroke symptoms clear spontaneously
- Gastrointestinal hemorrhage within 21 days
- Urinary tract hemorrhage within 21 days
- Major surgery within 14 days
- Major trauma within 14 days
- CT scan evidence of early edema or mass effect
- Patients who present with severe deficits
- Seizure at the time of presentation with residual deficits due to ischemia rather than the postictal state

**ADDITIONAL CONTRAINDICATIONS IF SYMPTOM ONSET 3 to 4.5 HOURS**
- Patients greater than 80 years old
- Patients on oral anticoagulation regardless of INR
- Patients with baseline NIHSS\(^1\) score greater than 25
- Patients with stroke and diabetes

---

\(^1\) Abbreviations:
- EKG: Electrocardiogram
- MRI: Magnetic resonance Imaging
- CT: Computed tomography
- SBP: Systolic blood pressure
- NIHSS: National Institutes of Health Stroke Scale

\(^2\) See Appendix C for NIHSS

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### APPENDIX C – NATIONAL INSTITUTES OF HEALTH STROKE SCALE (NIHSS)

Best results from rt-PA with score less than 20 and less than 75 years old

<table>
<thead>
<tr>
<th>Title</th>
<th>Responses</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A Level of Consciousness</td>
<td>0 – Alert and responsive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 – Arousable to minor stimulation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 – Arousable to painful stimulation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 – Reflex responses or unarousable</td>
<td></td>
</tr>
<tr>
<td>1B Orientation Questions</td>
<td>0 – Both correct</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 – One correct (or dysarthria, intubated, foreign language)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 – Neither correct</td>
<td></td>
</tr>
<tr>
<td>1C Response to Commands</td>
<td>0 – Both correct (ok if impaired by weakness)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 – One correct</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 – Neither correct</td>
<td></td>
</tr>
<tr>
<td>2 Gaze</td>
<td>0 – Normal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 – Partial gaze palsy; abnormal gaze in 1 or both eyes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 – Forced eye deviation or total paresis</td>
<td></td>
</tr>
<tr>
<td>3 Visual field</td>
<td>0 – No visual loss</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 – Partial hemianopia, quadrantanopia, extinction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 – Complete hemianopia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 – Bilateral hemianopia or blindness</td>
<td></td>
</tr>
<tr>
<td>4 Facial movement</td>
<td>0 – Normal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 – Minor facial weakness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 – Partial facial weakness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 – Complete unilateral palsy (upper and lower face)</td>
<td></td>
</tr>
<tr>
<td>5 Motor Function (Arm) –</td>
<td>0 – No drift before 5 seconds</td>
<td>Left:</td>
</tr>
<tr>
<td>Arms outstretched for 10</td>
<td>1 – Drift but doesn’t hit bed</td>
<td></td>
</tr>
<tr>
<td>secs</td>
<td>2 – Some antigravity effort, but can’t sustain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 – No antigravity effort, but even minimal movement counts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 – No movement at all</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X – Unable to assess due to amputation, fusion, fracture</td>
<td></td>
</tr>
</tbody>
</table>

Continued on Next Page
APPENDIX C – NATIONAL INSTITUTES OF HEALTH STROKE SCALE (NIHSS) - Continued

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Best results from rt-PA with score less than 20 and less than 75 years old

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<th>Title</th>
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<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Motor Function (Leg) – Raise leg 30 degrees supine for 5 secs</td>
<td>0 – No drift before 5 seconds</td>
<td>Left:</td>
</tr>
<tr>
<td></td>
<td>1 – Drift but doesn’t hit bed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 – Some antigravity effort, but can’t sustain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 – No antigravity effort, but even minimal movement counts</td>
<td></td>
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<tr>
<td></td>
<td>4 – No movement at all</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X – Unable to assess due to amputation, fusion, fracture</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Left:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Right:</strong></td>
<td></td>
</tr>
<tr>
<td>7 Limb ataxia</td>
<td>0 – No ataxia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 – Ataxia in upper or lower extremity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 – Ataxia in upper AND lower extremity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X – Unable to assess due to amputation, fusion, fracture</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Left:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Right:</strong></td>
<td></td>
</tr>
<tr>
<td>8 Sensory</td>
<td>0 – No sensory loss</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 – Mild-moderate unilateral loss but pt aware of touch</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 – Total loss, patient unaware of touch</td>
<td></td>
</tr>
<tr>
<td>9 Language</td>
<td>0 – Normal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 – Mild-moderate aphasia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 – Severe aphasia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 – Mute, global aphasia, coma</td>
<td></td>
</tr>
<tr>
<td>10 Articulate</td>
<td>0 – Normal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 – Mild-moderate; slurred but intelligible</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 – Severe; unintelligible or mute</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X – Intubation or mechanical barrier</td>
<td></td>
</tr>
<tr>
<td>11 Extinction/Neglect</td>
<td>0 – Normal, non detected</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 – Neglects 1 sensory modality</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 – Profound neglect in more than one modality</td>
<td></td>
</tr>
</tbody>
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SUGGESTED READINGS


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Monica E, Loghin , MD
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Sudhakar Tummala, MD
Ali Zalpour, PharmD

Core Development Team Leads

T DEVELOPMENT CREDITS

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