Management Acute Ischemic Stroke in Adult Patients

This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson’s specific patient population; MD Anderson’s services and structure; and MD Anderson’s clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

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

Blood Pressure less than 185/110 mmHg?

- Give aspirin 325mg if no contraindications
- Transfer to stroke unit

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 OR
- Nicardipine 5 mg/hour IV continuous infusion

Intraparenchymal Hemorrhage or Subarachnoid hemorrhage

- 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

Consult Neurosurgery

Sympotm Onset?

Greater than 4.5 hours

Less than 4.5 hours

Neurological exam: NIHSS

Avoid inserting foley catheters, nasogastric tubes, or intra-arterial pressure catheters if possible

Bleeding on CT or MRI?

Yes

No

Administer alteplase per Acute Ischemic Stroke Order Set

See Page 2

ABBRIVIATIONS

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

1 See Appendix C for NIHSS
2 Examples of significant comorbidities: severe cardiac failure, aortic dissection, or hypertensive encephalopathy.

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Administer Alteplase per Acute Ischemic Stroke Order Set

Patient develops severe headache, acute hypertension, severe nausea and vomiting?

- Yes
  - Stop alteplase and obtain STAT CT\(^1\) 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.

Patients blood pressure increases to greater than 180/105 mmHg?

- Yes
  - OR
    - SBP\(^{1}\) greater than 180 - 230 mmHg or DBP\(^{1}\) 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

- No

Abbreviations

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

\(^{1}\) Abbreviations

DBP: Diastolic blood pressure  CT: Computed tomography  SBP: Systolic blood pressure

Stop alteplase and obtain STAT CT\(^{1}\) of brain

Stop alteplase and initiate “Adult Hypersensitivity and Allergic Reaction Order set”

Glucose control

Stress ulcer prophylaxis

Deep vein thrombosis prophylaxis at least 24 hours after alteplase administration

Admit to ICU or transfer to stroke unit

Department of Clinical Effectiveness V6

Approved by The Executive Committee of Medical Staff 12/15/2015
### 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
- Sudden trouble walking
- 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 100,000/mm³
- Evidence of multilobar infarction 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 185/110mmHg)
- 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 score greater than 25
- Patients with stroke and diabetes

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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
### 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></td>
<td></td>
</tr>
<tr>
<td></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></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● Ask patients age and month</td>
<td></td>
</tr>
<tr>
<td></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></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● Open/Closed eyes and grip and release hand</td>
<td></td>
</tr>
<tr>
<td></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></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● Horizontal Extraocular Movement</td>
<td></td>
</tr>
<tr>
<td></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></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● Use visual threat if necessary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 – No visual loss</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 – Partial hemianopia, quadrantopia, 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></td>
<td></td>
</tr>
<tr>
<td></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) – Arms outstretched for 10 secs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● Left</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 – No drift before 5 seconds</td>
<td></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>
</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>
<tr>
<td></td>
<td>● Right</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 – No drift before 5 seconds</td>
<td></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>
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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>
</tbody>
</table>

Greater than or equal to 25: Very severe neurological impairment

5 to 24: Mild to adequately severe neurological impairment

Less than 5: Mild impairment

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

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>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Motor Function (Leg) – Raise leg 30 degrees supine for 5 secs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Left</td>
<td>0 – No drift before 5 seconds</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Right</td>
<td>1 – Drift but doesn’t hit bed</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 – Some antigravity effort, but can’t sustain</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 – No antigravity effort, but even minimal movement counts</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 – No movement at all</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>X – Unable to assess due to amputation, fusion, fracture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Left:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Right:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Limb ataxia</td>
<td>0 – No ataxia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Check finger-nose-finger; heel-shin; and score if only out of proportion to paralysis</td>
<td>1 – Ataxia in upper or lower extremity</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 – Ataxia in upper AND lower extremity</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>X – Unable to assess due to amputation, fusion, fracture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 – No ataxia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Sensory</td>
<td>0 – No sensory loss</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Use safety pin</td>
<td>1 – Mild-moderate unilateral loss but pt aware of touch</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 – Total loss, patient unaware of touch</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Language</td>
<td>0 – Normal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Name objects; use repeating</td>
<td>1 – Mild-moderate aphasia</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 – Severe aphasia</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 – Mute, global aphasia, coma</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Articulate</td>
<td>0 – Normal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Read a list of words</td>
<td>1 – Mild-moderate; slurred but intelligible</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 – Severe; unintelligible or mute</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>X – Intubation or mechanical barrier</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Extinction/Neglect</td>
<td>0 – Normal, non detected</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Simultaneously touch patient on both hands, show fingers in both visual fields, ask about deficit</td>
<td>1 – Neglects 1 sensory modality</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 – Profound neglect in more than one modality</td>
<td></td>
</tr>
</tbody>
</table>

**Scores:**
- Greater than or equal to 25: Very severe neurological impairment
- 5 to 24: Mild to adequately severe neurological impairment
- Less than 5: Mild impairment
SUGGESTED READINGS


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DEVELOPMENT CREDITS

This practice consensus algorithm is based on majority expert opinion of the Ischemic Stroke work group at the University of Texas MD Anderson Cancer Center. It was developed using a multidisciplinary approach that included input from the following medical, radiation and surgical oncologists.

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Core Development Team Leads

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