Acute Stroke Care Guideline

1. Initial Approach

**Inclusion Criteria:** ≥ 2 years old, onset of focal neurological deficit within last 24 hours

**Screening questions**
- Is there a focal neurological deficit?
  - Unilateral weakness or sensory change
  - Vision loss/double vision
  - Speech difficulty
  - Dizziness/trouble walking
- Did the problem start/worsen suddenly?
- Was child last seen well (at neurologic baseline) within the last 24 hours?

**Exclusion criteria:**
- Patients with brain tumor, history of seizures with Todd’s paralysis, current signs of meningitis, endocarditis; onset of symptoms >24 hours ago; h/o hemorrhagic stroke

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**ED/PICU Immediate Actions**
- Stabilize patient
- Use order set: “ED-ACUTE STROKE” or “PICU-ACUTE STROKE”
- Assure STAT Head CT ordered
- ED/ICU attending calls radiology attending for STAT stroke imaging
- Physician performs and documents PedNIHSS (if able)
- Vital signs, continuous monitoring
- Start IV x2
- STAT Labs: CBC, CMP, DIC panel, LFTs, ESR, CRP, urine tox screen, bHCG (if appropriate), type/screen, thromboelastogram; if SCD add Hb electrophoresis
- NPO
- HOB flat
- EKG
- Normotension: target SBP 50th-95th percentile for age (see BP Parameters sheet on page 4)
- Normoglycemia: no glucose in IVF
- Normal oxygenation. Notify MD before placing on supplemental O₂
- Normothermia
- Seizure control
- Bedside RN completes MR checklist
- Arrange transfer to PICU

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**Neurology Actions**
- Neurology resident* evaluation includes:
  - Documents PedNIHSS
  - Confirms presentation consistent with acute arterial ischemic stroke
  - Documents last known well time
  - Verifies with radiology that correct imaging ordered
  - Completes t-PA and thrombectomy checklists
- * Evaluation occurs within 10 minutes, by telemedicine or at bedside.

Attending neurologist will communicate with attending radiologist by the time the patient is en route to imaging.

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**Activate Code Stroke**
(see addendum for inpatient and ED process – page 6)

**Code stroke alert goes to:**
- Neurology attending and resident, CT tech, MRI tech, Radiology attending, Neuro-IR, ED Charge RN, PICU Charge RN, Pharmacy, Laboratory
- *If known sickle cell disease patient, page hematology stat

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See written guidelines for more information

Approved Evidence Based Medicine Committee 5.19.2021

Reassess the appropriateness of Care Guidelines as condition changes and 24 hrs after admission. This guideline is a tool to aid clinical decision making. It is not a standard of care. The physician should deviate from the guideline when clinical judgment so indicates.

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2. Imaging and tPA and Thrombectomy Candidacy

**STAT CT Head*** is first line imaging†
- *Goal: CT interpretation within 45 min of ED arrival or Code Stroke activation

- **Provide neuroprotective measures and additional work-up per neuro and primary team**

- **MRI/MRA:** negative or non-acute findings
  - **Yes** → **Contact Neurosurgery**

- **MRI/MRA:** + acute hemorrhage, cerebral edema, or midline shift
  - **Yes** → **Contact Neurosurgery**

- **Perform MRI brain stroke†**
  - **Negative for bleed** → **If unable to tolerate MRI without sedation or if MRI contraindicated, obtain CTA***
  - **Positive for bleed** → **Contact Neurosurgery**

- **MRI/MRA:** free of hemorrhage, early infarct present with evidence of arterial occlusion
  - **Yes** → **Order STAT MRA Head/Neck Stroke with Time of Flight**
  - **No** → **Neurology to contact Neuro-IR to consider endovascular therapy**

- **Time of onset ≤4.5 hours, persistent deficit, & no tPA contraindication**
  - **Yes** → **Go to tPA Treatment Protocol**
  - **No** → **Neurology to contact Neuro-IR to consider endovascular therapy**

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†Radiology reports imaging results to neurology and ED/PICU attending
*If unable to tolerate CTA, ED/PICU to call anesthesia for emergent sedation for imaging.
3. tPA Treatment Protocol

**IV tPA Treatment candidate:** ≤4.5 hours from onset, persistent focal deficits, no contraindications**, BOTH proven infarct AND arterial occlusion on MR or CT/CTA

**Exclusion criteria:**< 2 years old or any contraindication to tPA listed below

Neurology contacts Hematology and ED/PICU pharmacy, orders tPA via Acute Stroke tPA order set, verifies no contraindications, obtains consent from family.

*Neurology attending provides final approval for tPA

ED Pharmacist prepares tPA infusion with STAT release.

TPA administration occurs in ED or PICU with close monitoring and tight blood pressure control as defined in BP Parameters and Management (see page 4)

TPA given as:
- Bolus: 10% of total dose, IV over 5 min
- Infusion: remaining 90%, IV over 1 hour
- Total dose: 0.9 mg/kg IV

**tPA Contraindications**

**HISTORY**
- >4.5 hours from last seen well or unknown time of sx onset
- Stroke, major head trauma, or intracranial surgery within 3 months
- History of prior intracranial hemorrhage, known AVM, aneurysm
- Major surgery or parenchymal biopsy within 10 days
- GI or GU bleeding within 21 days
- Neoplasm/malignancy within 1 month of completion of tx
- Underlying significant bleeding disorder (mild platelet dysfunction, mild vWF, other mild disorders are not excluded)
- Previously diagnosed primary CNS angitis or secondary arteritis

**PATIENT FACTORS**
- Pt would decline blood transfusion if indicated
- Presentation c/w acute myocardial infarction or post-MI pericarditis that requires cardiology evaluation before tx
- Arterial puncture at non-compressible site or LP within 7 days (Pt with cardiac cath via compressible artery are NOT excluded).

**ETIOLOGY**
- Stroke due to SBE, sickle cell, meningitis, embolism (bone marrow, air, or fat), or Moya Moya

**EXAM**
- Persistent SBP >15% above 95th percentile for age while sitting or supine
- Mild deficit (PedNIHSS <6) at start of tPA infusion
- Severe deficit suggesting large territory stroke
- PedNIHSS >25, regardless of infarct volume on imaging

**IMAGING**
- Sx suggestive of SAH, even if normal imaging
- CT with hypodensity/sulcal effacement >33% of MCA territory
- Intracranial cervicocephalic arterial dissection

**LABS**
- Glucose <50 or >400 mg/dL
- Platelets <100 K, PT >15 sec, INR >1.4, or PTT > upper limit of normal range
### 4. Systolic blood pressure parameters and management

This guideline for systolic blood pressure parameters is for children in whom a “Code Stoke” has been activated.

Maintain these blood pressure parameters for the first 48 hours if an acute stroke has been confirmed.

Goals are to maintain systolic blood pressure between the 50th to 95th percentile for age with permissive hypertension up to 15% above the 95th percentile.

Treat to lower BP if >15% above the 95th percentile for age for more than 1 hour or if >20% above 95th percentile for age at any time.

If a blood pressure lowering agent is used, avoid a precipitous drop in blood pressure that may worsen cerebral ischemia.

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### Systolic Blood Pressure Parameter for Females

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<th>Age</th>
<th>50th percentile</th>
<th>95th percentile</th>
<th>&gt; 15% above 95th percentile</th>
<th>&gt; 20% above 95th percentile</th>
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<td>1-4 years</td>
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<td>133</td>
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<td>5 years</td>
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<td>113</td>
<td>130</td>
<td>136</td>
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<tr>
<td>6-10 years</td>
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<td>121</td>
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<tr>
<td>&gt;18 years</td>
<td>110</td>
<td>140</td>
<td>161</td>
<td>168</td>
</tr>
</tbody>
</table>

### Systolic Blood Pressure Parameters for Males

<table>
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<th>Age</th>
<th>50th percentile</th>
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</tbody>
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**Hypertension** should be treated with labetalol 0.2 mg/kg IV or nicardipine continuous infusion to lower blood pressure by approximately 25% over 24 hours.

**Caution!** Use of labetalol in children with bradycardia or severe asthma should be avoided.

Do not use nitroprusside as this can cause cerebral venous dilation and decrease cerebral perfusion.

Relative hypotension should be promptly treated with NS bolus.
5. Outside Hospital Transfers

**Inclusion criteria:**
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Page Neurology on-call to discuss next steps in care

No

Inclusion criteria are met and answers “yes” to all questions above

Yes

**Call/Page CHOC Emergency Department immediately**

714-509-9095

Emergency Department attending will discuss and collaborate with the sending physician and neurology team to determine the mode of transport (IFT vs. Transport Team) and stabilization of patient (as needed) in accordance with EMTALA requirements.
**ED Code Stroke Activation Algorithm**

1. Patient shows signs of neuro deficit(s)
2. Code Neuro called (internal to ED)
3. MD to bedside <10 minutes
4. Code stroke activated
5. Monitor Tech pages out “Code Stroke” via Voalte code critical list

**Monitor Tech tasks:**
- Pages “Code Stroke” along with call back number and MRN to On-call Physicians: Neurology attending and resident, Neuro-IR attending, Radiology attending; MR tech, CT tech, Laboratory, Pharmacy, ED Charge RN, PICU Charge RN
- For known hemorrhagic stroke call/page Neurosurgery

**Note:**
Only a physician or NP/PA can active a “code stroke”

**Inpatient Code Stroke Activation Algorithm**

1. Patient shows signs of neuro deficit(s) or any concern for stroke
2. Rapid Response Team (RRT) called (paged overhead)
3. RRT Team arrives (MD identifies need for Code Stroke)
4. Code Stroke activated
5. Charge RN calls operator requests “Code Stroke, room #, call back #” (PICU Fellow ASCOM 58381 and/or RRT RN Voalte phone)

**Operator tasks:**
- Sends hospital – wide overhead page - “Code Stroke, Room #”
- Sends text page that includes Code Stroke, call back number, and MRN to On-call physicians: Neurology attending and resident, Neuro - IR attending, Radiology attending; MR tech, CT tech, Laboratory, Pharmacy, ED Charge RN, PICU Charge RN

**Note:**
Only a physician or NP/PA can active a “code stroke”
References


