

## 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?

➤ **If patient does not meet criteria but has acute neurologic symptoms, page “Neuro URGENT Consult” [Click here](#)**

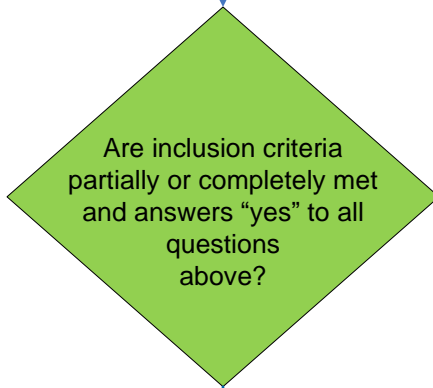
➤ **For oncology patients meeting inclusion criteria see Oncology Stroke Protocol. [Click here](#)**

**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

### 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 50<sup>th</sup>-95<sup>th</sup> percentile for age (see BP Parameters sheet on page 4)
- Normoglycemia: no glucose in IVF
- Normal oxygenation. Notify MD before placing on supplemental O<sub>2</sub>
- Normothermia
- Seizure control
- Bedside RN completes MR checklist
- Arrange transfer to PICU

See written guidelines for more information



No

Consider urgent Neurology consult and initiate neuroprotective care

Yes / No

### Activate Code Stroke

(see addendum for inpatient and ED process – page 6)

### 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

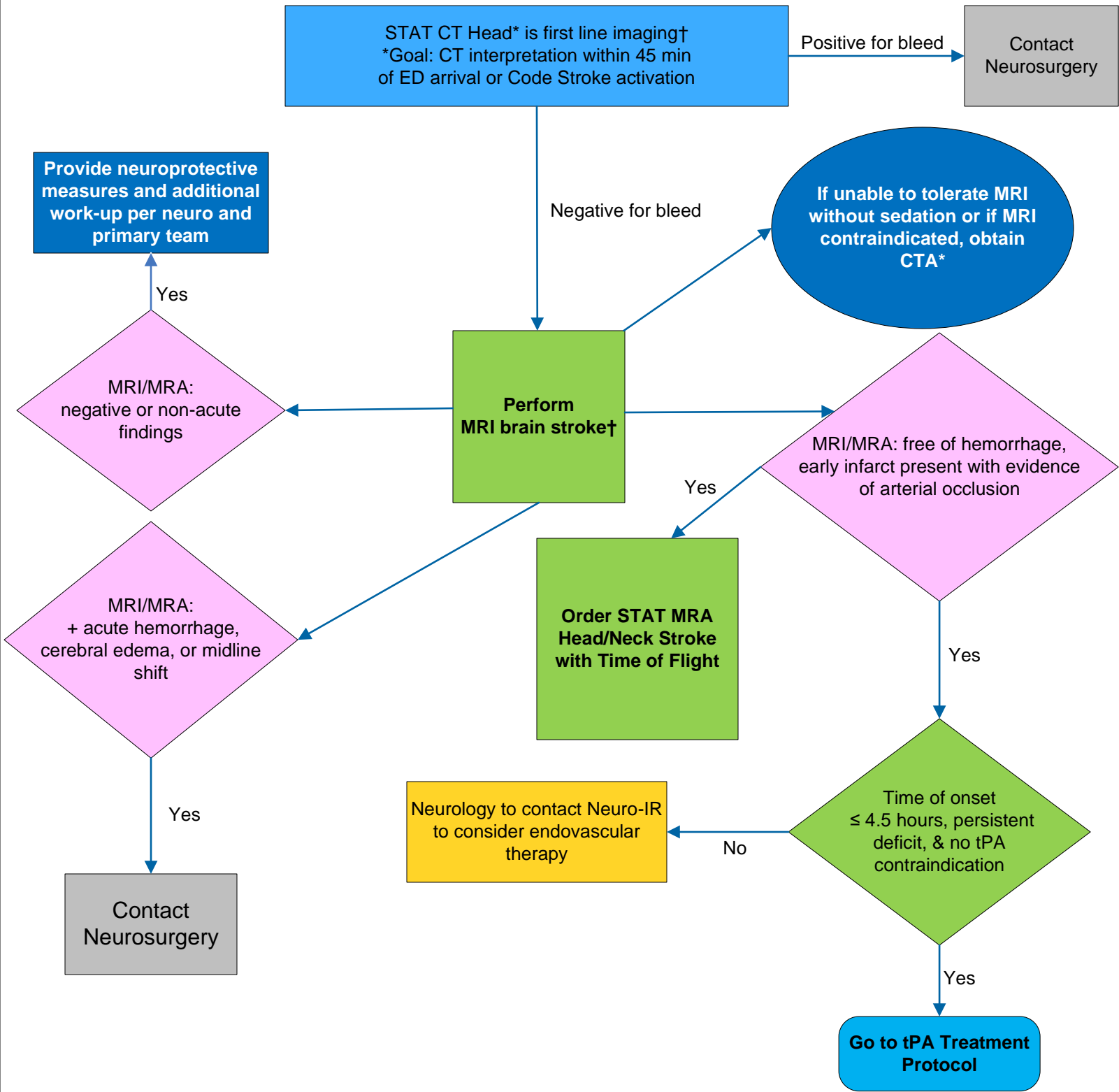
\* Evaluation occurs within 10 minutes, by telemedicine or at bedside.

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

### Code stroke alert goes to:

Neurology Attending and Resident, Neuro - IR, Radiology Attending, PICU Attending and Fellow, ED/PICU Charge RN, CCOT RN, Pharmacy, Lab  
 \*If known sickle cell disease patient, page Hematology STAT

## 2. Imaging and tPA and Thrombectomy Candidacy



†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

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

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

### \*\*tPA Contraindications

#### HISTORY

- > 4.5 hours from last seen well or unknown time of symptom 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 angiitis 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 95<sup>th</sup> 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

- Symptoms 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 Stroke” 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 50<sup>th</sup> to 95<sup>th</sup> percentile for age with permissive hypertension up to 15% above the 95<sup>th</sup> percentile.
- Treat to lower BP if >15% above the 95<sup>th</sup> percentile for age for more than 1 hour or if >20% above 95<sup>th</sup> 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

### Systolic Blood Pressure Parameter for Females

Age	50 <sup>th</sup> percentile	95 <sup>th</sup> percentile	> 15% above 95 <sup>th</sup> percentile	> 20% above 95 <sup>th</sup> percentile
1-4 years	90	111	128	133
5 years	94	113	130	136
6-10 years	96	121	139	145
11-18 years	105	131	151	157
>18 years	110	140	161	168

### Systolic Blood Pressure Parameters for Males

Age	50 <sup>th</sup> percentile	95 <sup>th</sup> percentile	> 15% above 95 <sup>th</sup> percentile	> 20% above 95 <sup>th</sup> percentile
1-4 years	90	112	129	134
5 years	95	113	130	136
6-10 years	96	121	139	145
11-18 years	105	140	161	168
>18 years	110	140	161	168

**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.

Relative hypotension should be promptly treated with NS bolus

**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

## 5. Outside Hospital Transfers

### Inclusion criteria:

- $\geq 2$  years old, onset of focal neurological deficit within last 24 hours

### Screening questions:

- Is there a focal neurological deficit?
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**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

Page Neurology on-call to discuss next steps in care

No

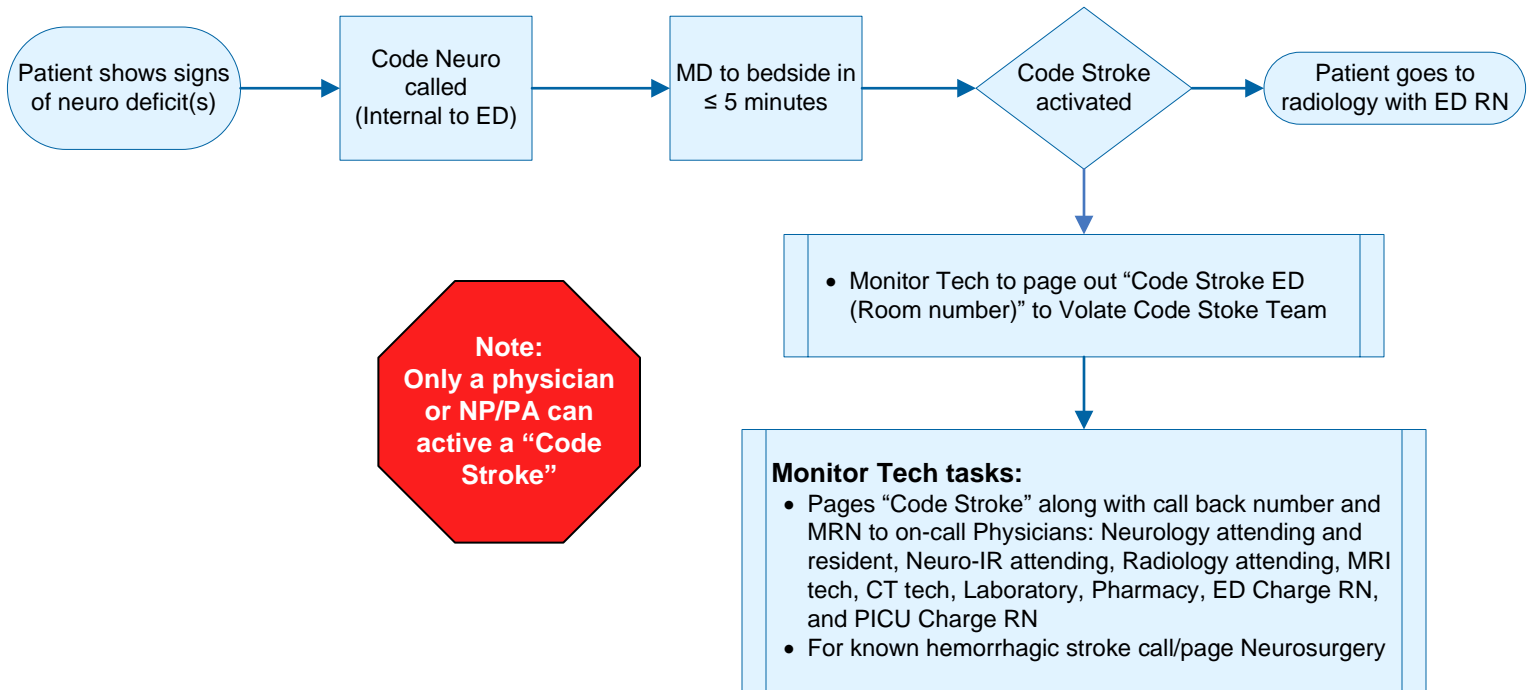
Inclusion criteria are met and answers "yes" to all questions above

Yes

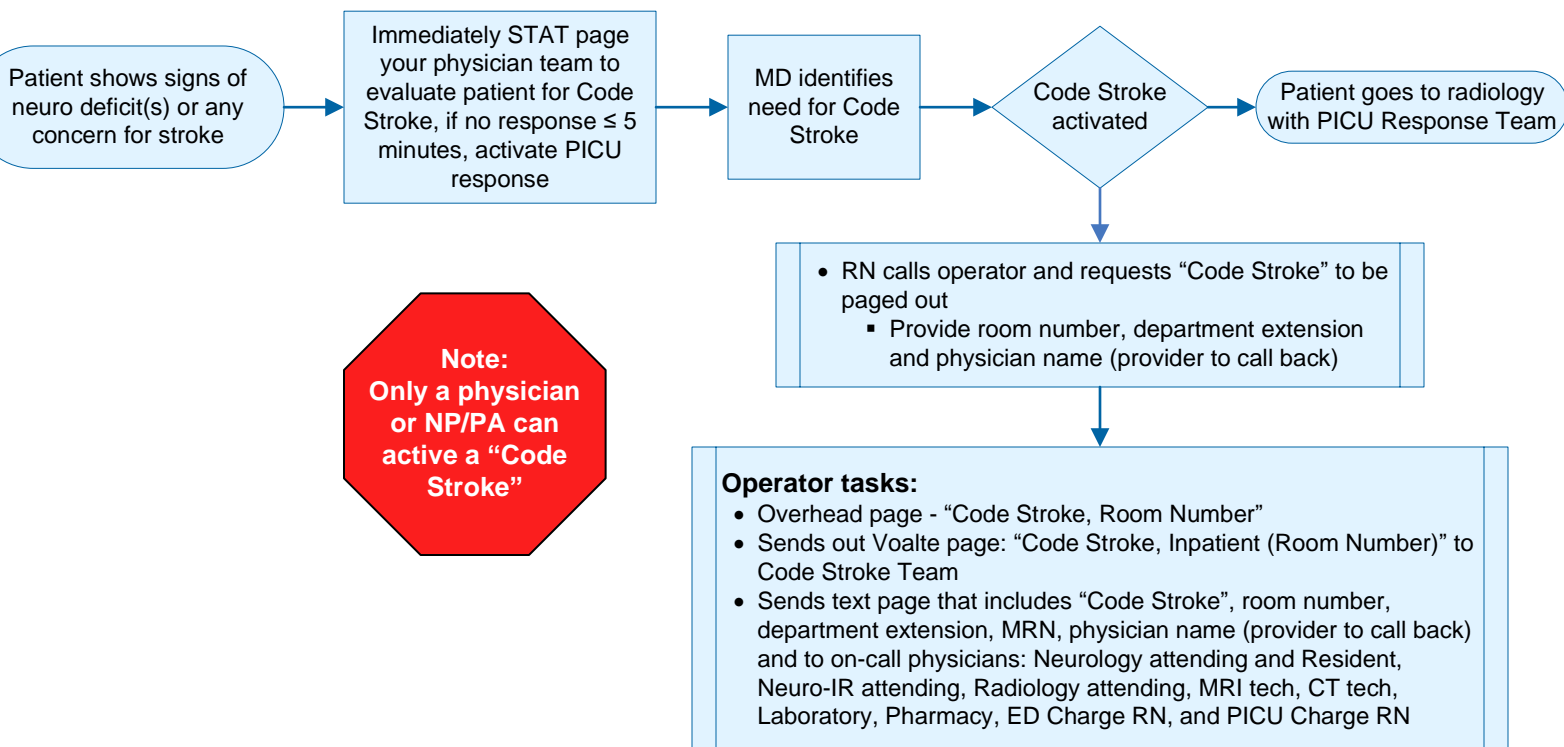
**Call/Page CHOC Emergency Department immediately  
714-509-9095**

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 appropriate EMTALA requirements

## ED Code Stroke Activation Algorithm



## Inpatient Code Stroke Activation Algorithm



## *References*

### *Acute Stroke Care Guideline*

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- Ellis, M. J., Amlie-Lefond, C., & Orbach, D. (2012). Endovascular therapy in children with acute ischemic stroke: Review and recommendations. *Neurology*, *79*, S158-S164. <https://doi:10.1212/WNL.0b013e31826958bf> (Level V)
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- Rivkin, M. J., Bernard, T. J., Dowling, M. M., & Amlie-Lefond, C. (2016). Guidelines for urgent management of stroke in children. *Pediatric Neurology*, *56*, 8-17. <https://doi:10.1016/j.pediatrneurol.2016.01.016> (Level V)
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