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?

➢ **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

Are inclusion criteria partially or completely met and answers "yes" to all questions above?

No → Consider urgent Neurology consult and initiate neuroprotective care

Yes / No

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 O_2
- Normothermia
- Seizure control
- Bedside RN completes MR checklist
- Arrange transfer to PICU

See written guidelines for more information

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

Approved Evidence Based Medicine Committee
Original: 5/19/2021
Reviewed/Revised: 7/17/2024

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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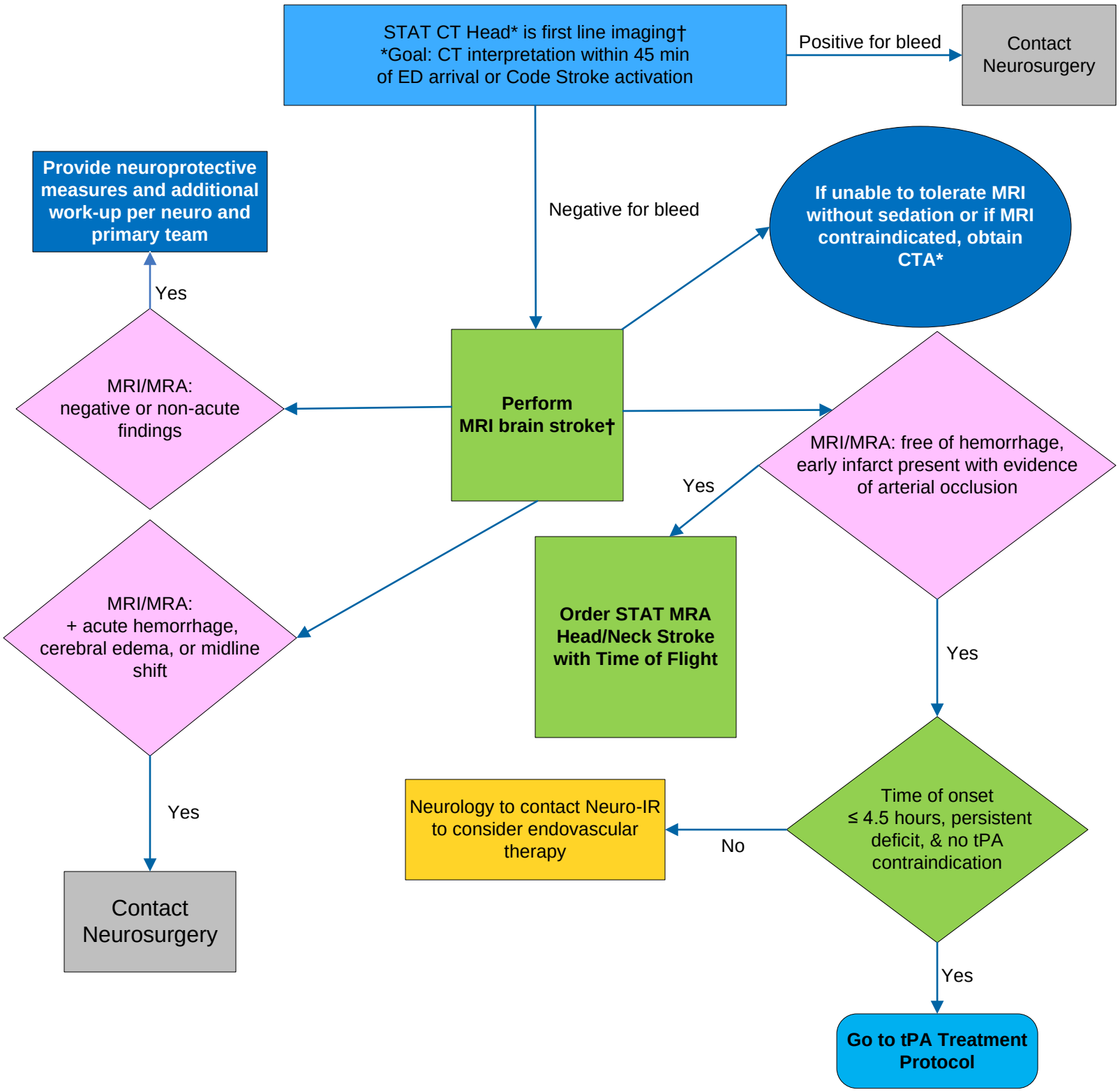
2. Imaging and tPA and Thrombectomy Candidacy



†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.

Acute Stroke Care Guideline

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 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

- 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 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 95thpercentile 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

Systolic Blood Pressure Parameter for Females

Age	50th percentile	95th percentile	> 15% above 95th percentile	> 20% above 95th 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	50th percentile	95th percentile	> 15% above 95th percentile	> 20% above 95th 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:
L**abetalol** 0.2 mg/kg IV or N**icardipine** 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:

- ≥ 2 years old, onset of focal neurological deficit within last 24 hours

Screening questions:

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  - Speech difficulty
  - Dizziness/trouble walking
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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**

No

Page Neurology on-call to discuss next steps in care

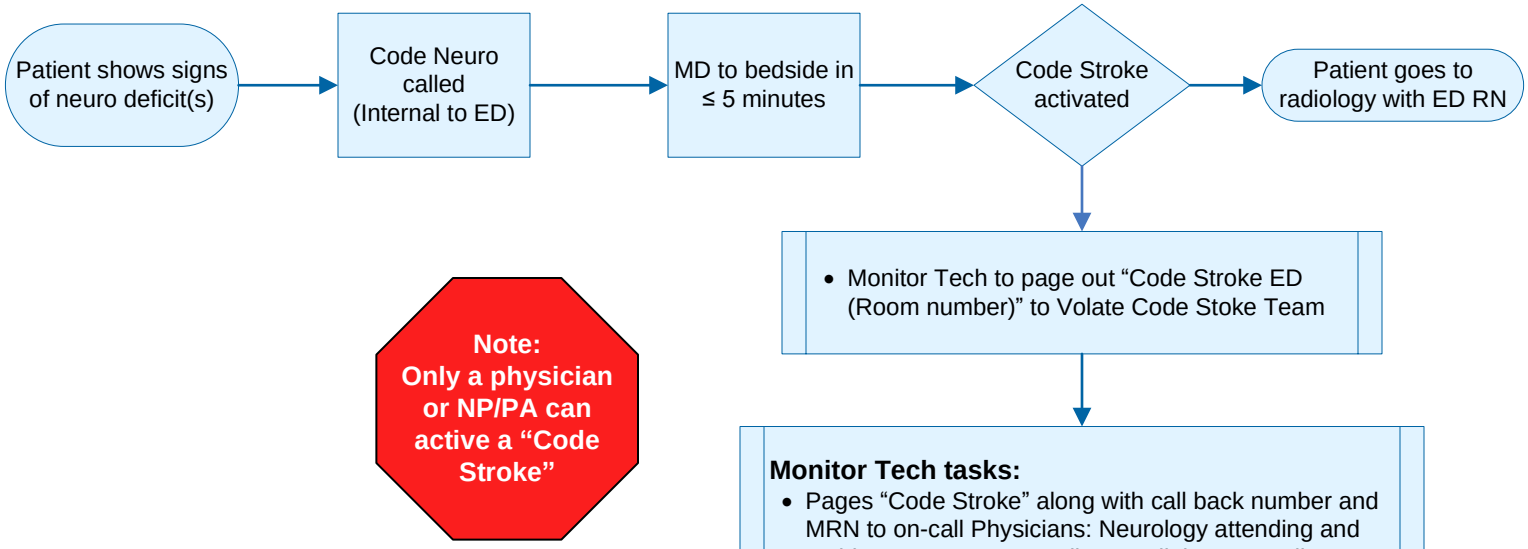
Inclusion criteria are met and answers "yes" to all questions above

Yes

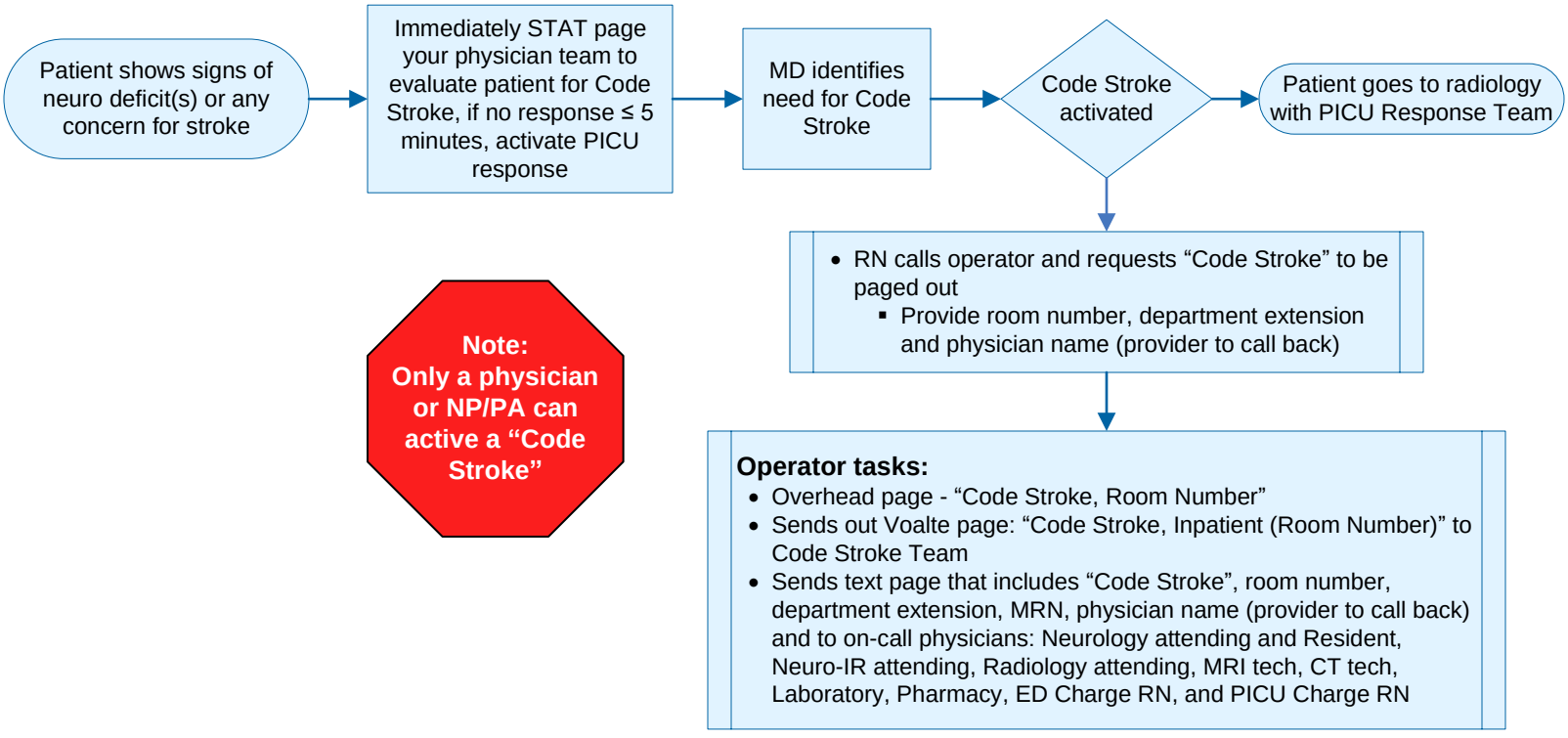
Call/Page CHOC Emergency Department immediately 714-509-9095

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



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Acute Stroke Care Guideline

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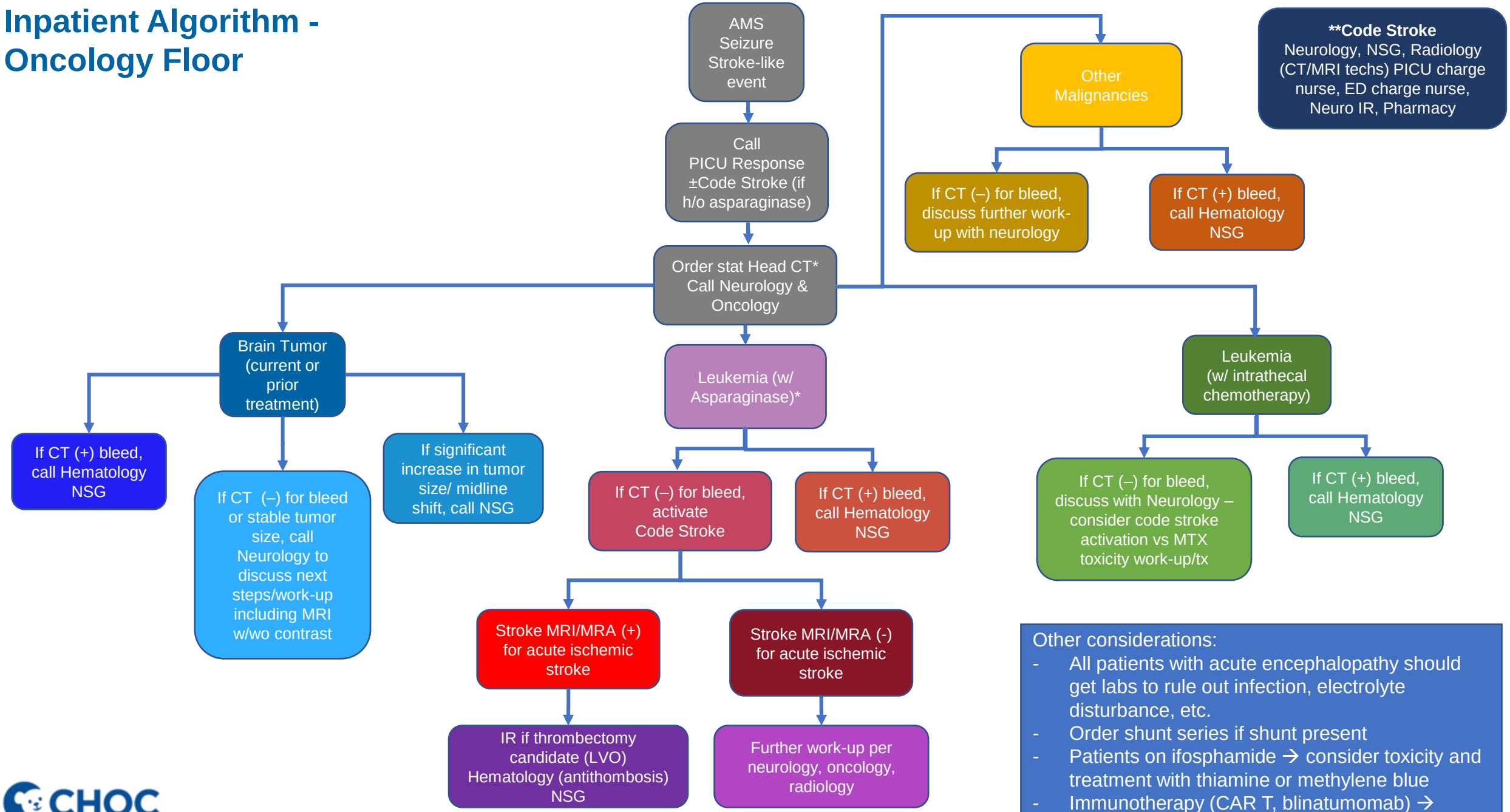
“URGENT NEUROLOGY CONSULT”

In order to expedite call backs from neurology team for non-code stroke “urgent” neurology consults such as:

- Convulsive status epilepticus
- Concern for non-convulsive status epilepticus
- Non-code stroke focal weakness (i.e. symptoms > 24 hours or bilateral symptoms)
- Concern for increased ICP
- Concern for serotonin syndrome, NMS, malignant hyperthermia
- Decompensation of any children followed by neurology on gene therapy (ex: liver failure after Zolgensma)
- Concern for cerebral sinus venous thrombosis

Please page out:
“URGENT neuro consult, call back number, and MRN”

Inpatient Algorithm - Oncology Floor



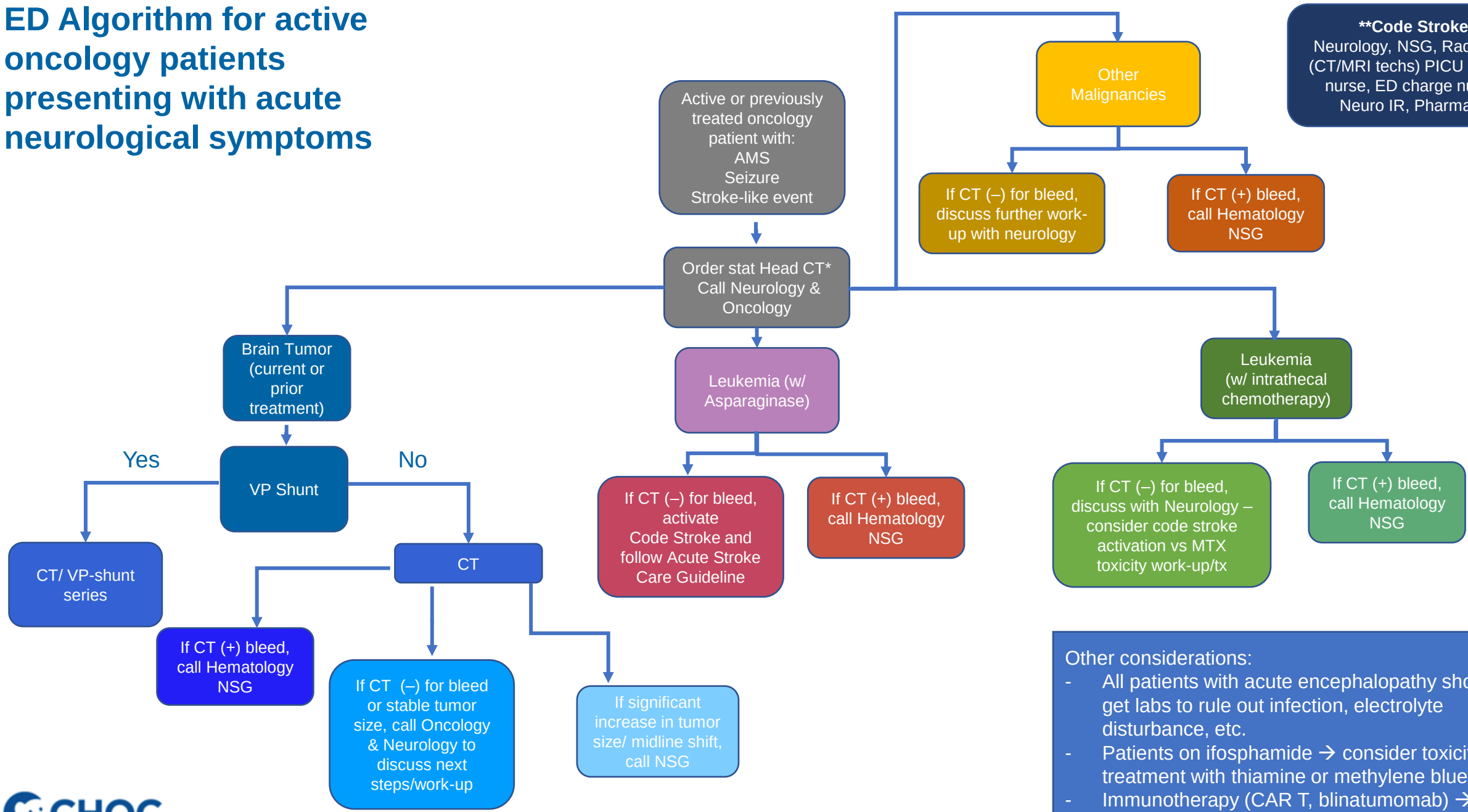
Other considerations:

- All patients with acute encephalopathy should get labs to rule out infection, electrolyte disturbance, etc.
- Order shunt series if shunt present
- Patients on ifosphamide → consider toxicity and treatment with thiamine or methylene blue
- Immunotherapy (CAR T, blinatumomab) → consider treatment related effects

CHOC

*consider CT venogram along with Head CT if high suspicion/risk for CSVT, ex. Leukemia (+PEG)

ED Algorithm for active oncology patients presenting with acute neurological symptoms



Other considerations:

- All patients with acute encephalopathy should get labs to rule out infection, electrolyte disturbance, etc.
- Patients on ifosphamide → consider toxicity and treatment with thiamine or methylene blue
- Immunotherapy (CAR T, blinatumomab) → consider treatment related effects

CHOC

*if shunt present, also order shunt series; consider CT venogram if high suspicion/risk for CSVT, ex. Leukemia (+PEG)