Stony Brook Medicine
Comprehensive Stroke Program

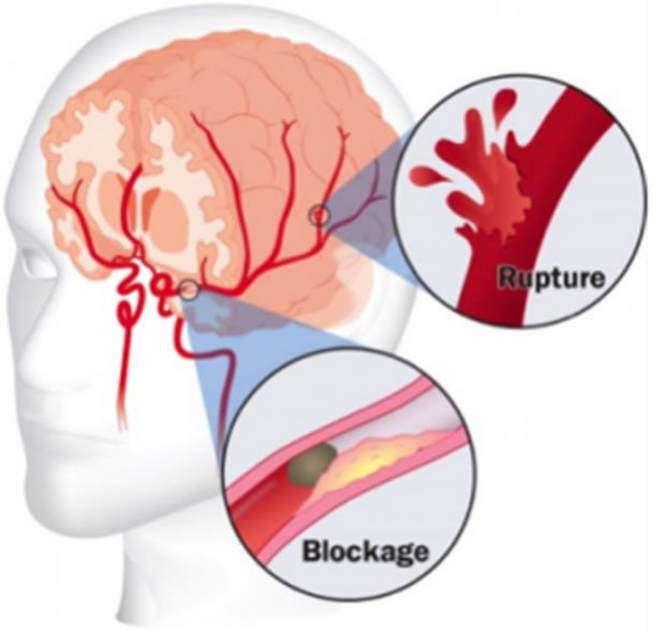
Stroke Program Orientation for Medical Staff

Objectives:

- Familiarize with acute stroke response time targets
- Familiarize with the available acute stroke codes and call criteria -
  CODE BAT (Brain Attack Team)
  CODE CSI (Complex Stroke Intervention)
- Understand responsibilities of the primary team during an Inpatient CODE BAT
- Verbalize where to locate stroke-related clinical practice guidelines and protocols
- Familiarize with Joint Commission, New York State Department of Health and Stroke:Get-With-The-Guidelines core measures and quality requirements

STROKE FACTS

- Each year, about 795,000 people experience a new or recurrent stroke
  - Approximately 610,000 of these are first attacks
  - 185,000 are recurrent attacks
- On average, every 40 seconds, someone in the United States has a stroke
- Stroke is a leading cause of serious long-term disability in the United States
- Stroke is the No. 5 cause of death in United States; 1 of every 19 deaths
- 87% of the stroke risk could be attributed to modifiable risk factors such as HTN, obesity, DM, HLD, and renal dysfunction; 47% could be attributed to behavioral risk factors such as smoking, sedentary lifestyle, and an unhealthy diet.



Centers for Disease Control and Prevention website: Stroke Facts
American Heart Association Heart Disease and Stroke Statistics—2021 Update

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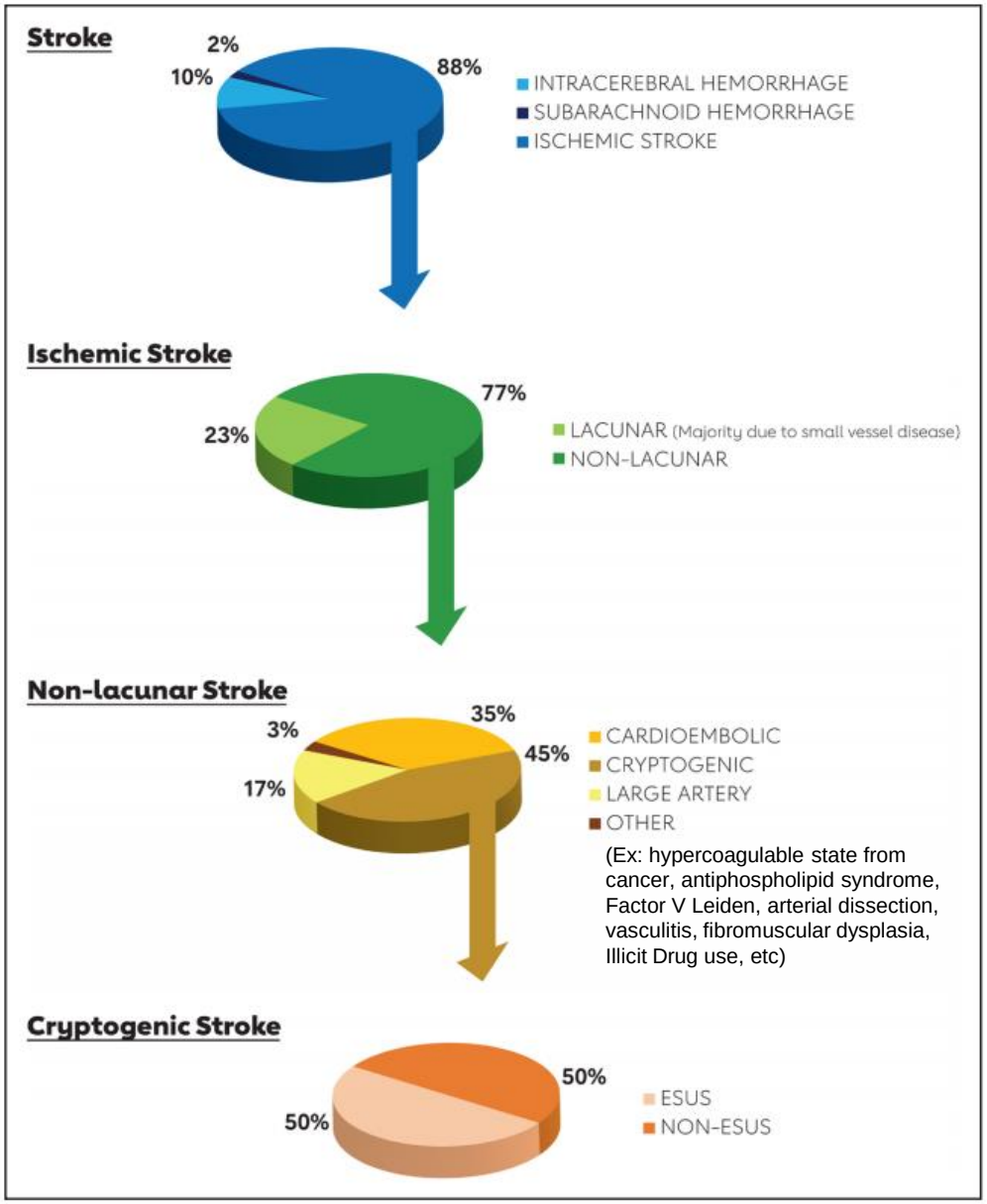
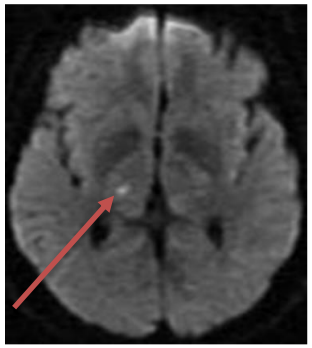
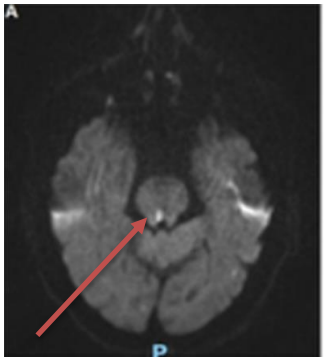
STROKE FACTS

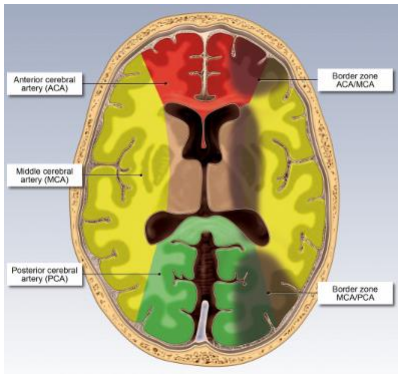


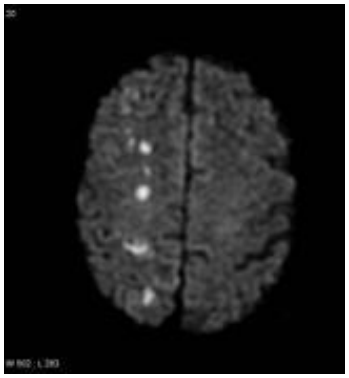
Lacunar infarct - are small (<20 mm) infarcts in the distal distribution of deep penetrating vessels result from occlusion of one of the small penetrating end arteries result primarily from in situ microatheroma formation or lipohyalinosis





Watershed infarct – are ischemic lesions which are situated along the border zones between the territories of two major arteries usually caused by hypoperfusion or decreased blood flow.





Kleindorfer DO, et al 2021 Guideline for the Prevention of Stroke in Patients With Stroke and Transient Ischemic Attack: AHA/ASA. Stroke. 2021 Jul;52(7)

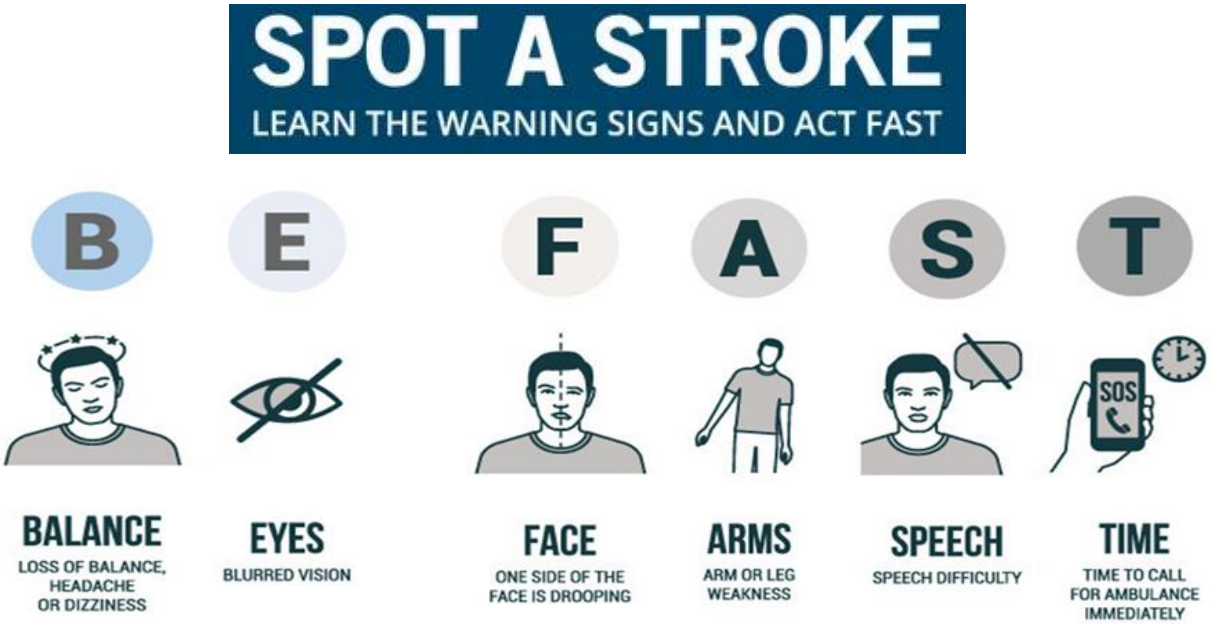
STROKE FACTS

- The direct and indirect cost of stroke in the United States was $49.8 billion

- Common complications after stroke include both short-term complications such as seizures, DVT, PE, urinary infection, aspiration pneumonia, decubitus ulcers, and constipation and long-term sequelae, including pain syndromes, pseudobulbar affect, depression and anxiety, cognitive impairment and dementia, epilepsy, gait instability, and falls and fractures

ACUTE STROKE IS A MEDICAL EMERGENCY

	Neurons Lost
Per Stroke	1.2 billion
Per Hour	120 million
Per Minute	1.9 million
Per Second	32 000



J.L.Saver, Time is Brain-Quantified, Stroke. 2006;37:263-266.

Target Response Times:

- **EMS recognition of stroke in the field** → hospital pre-notification that a stroke patient is en route
- **MD Evaluation**: <10 minutes
- **Stroke Team**: < 15 minutes
- **CT Initiation Time** : <15 minutes
- **Lab result** : <45 minutes ; only the assessment of blood glucose level must precede the administration of IV alteplase or IV tenecteplase unless there is a suspicion of abnormal hematologic or coagulation test.
- **IV thrombolytic administration** : <45 minutes
- **Mechanical Thrombectomy: First Pass** : < 60 minutes for Transfers and Mobile Stroke Unit;

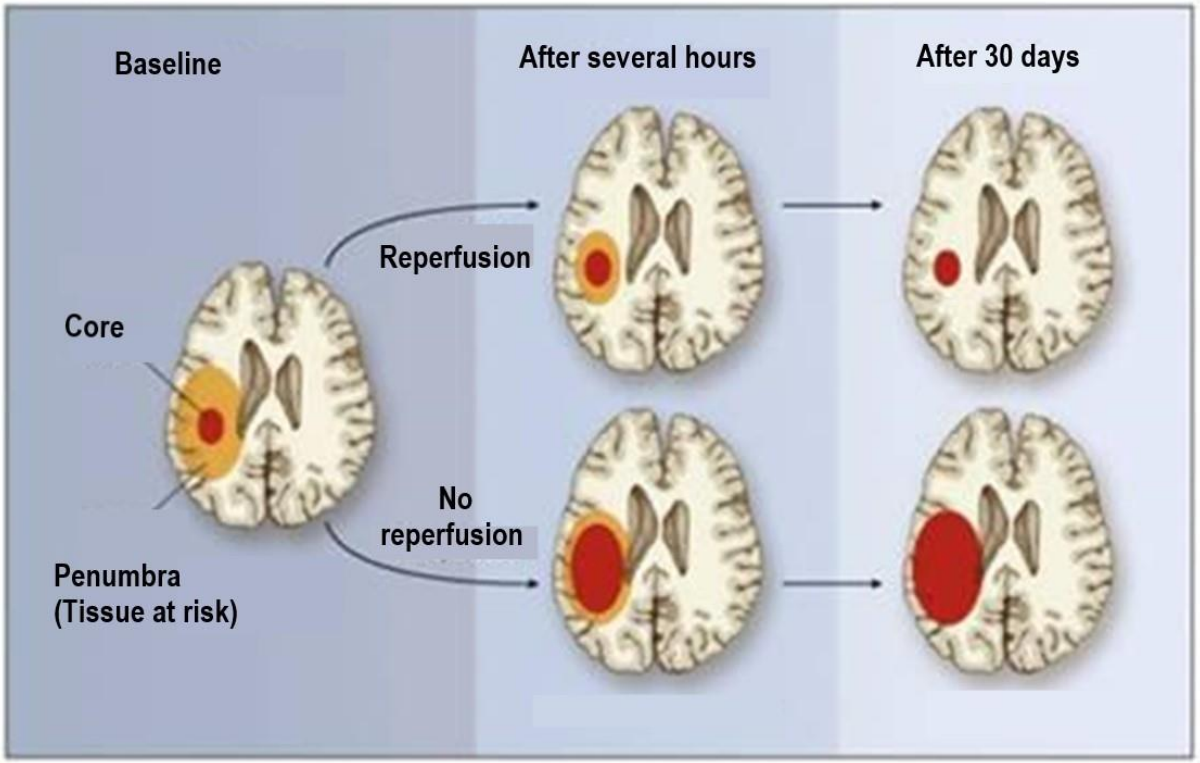
  < 90 minutes for patients presenting directly to Stony Brook ED

Rationale for rapid evaluation and treatment

- At the onset of stroke symptoms, the stroke is evolving
- Rapid clot lysis reperfuses ischemic tissue limiting the eventual size of the infarct
- Timely restoration of blood flow in ischemic stroke patients is effective in reducing long-term morbidity.

Ischemic Penumbra

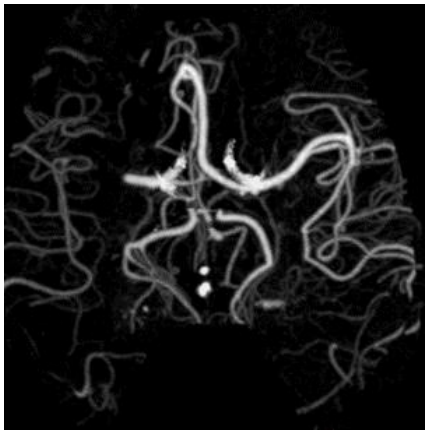
- brain tissue at risk of progressing to infarction but is still salvageable if re-perfused.
- generally located around an infarct core which represents the tissue which has already infarcted or is going to infarct regardless of reperfusion.

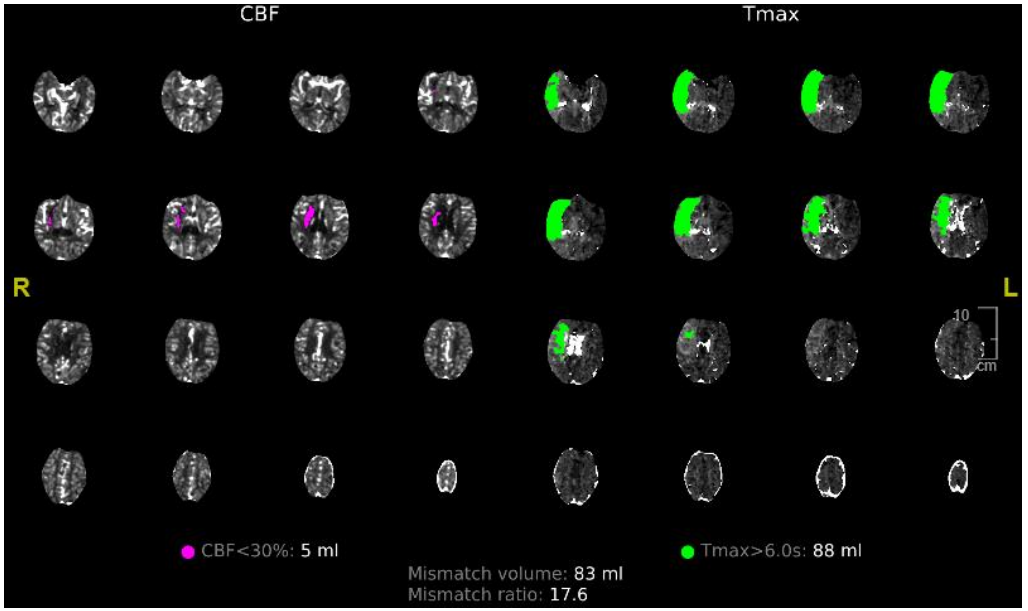


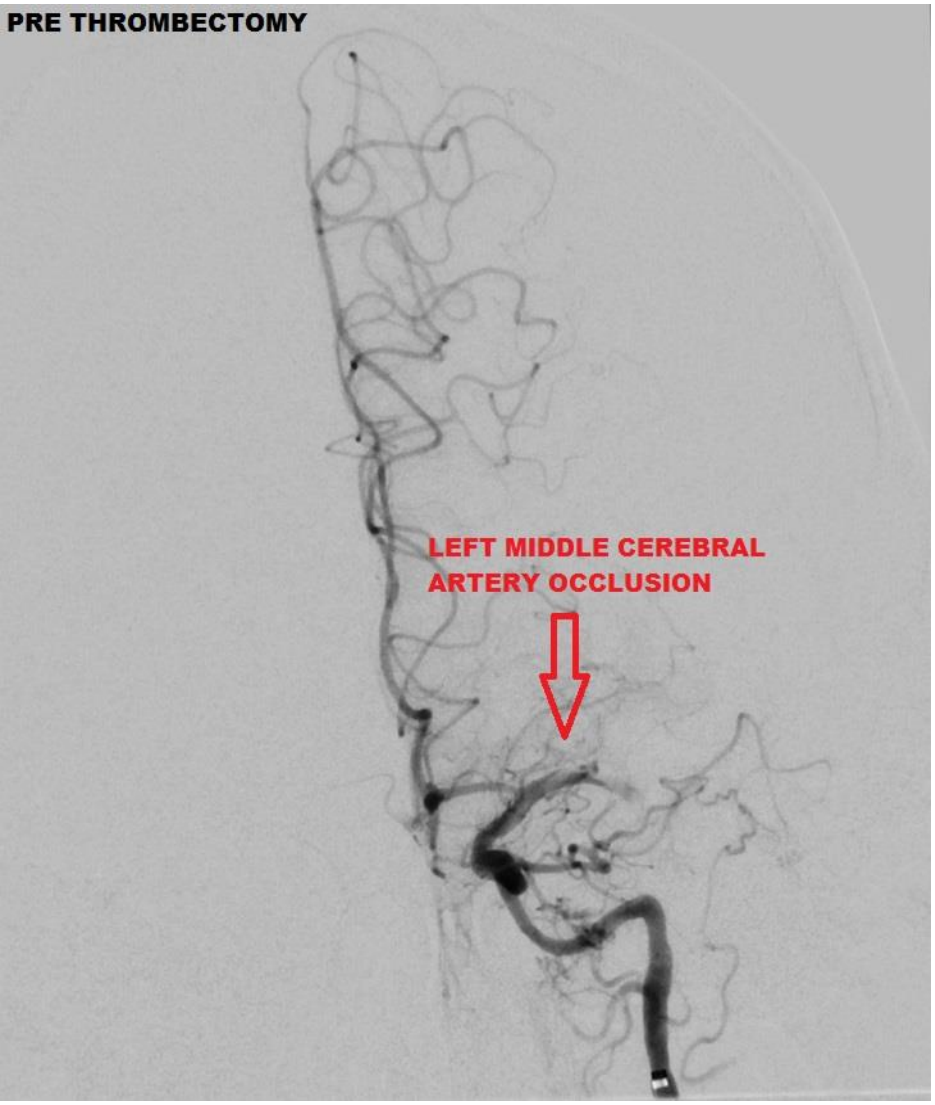
Acute ischemic stroke treatment:

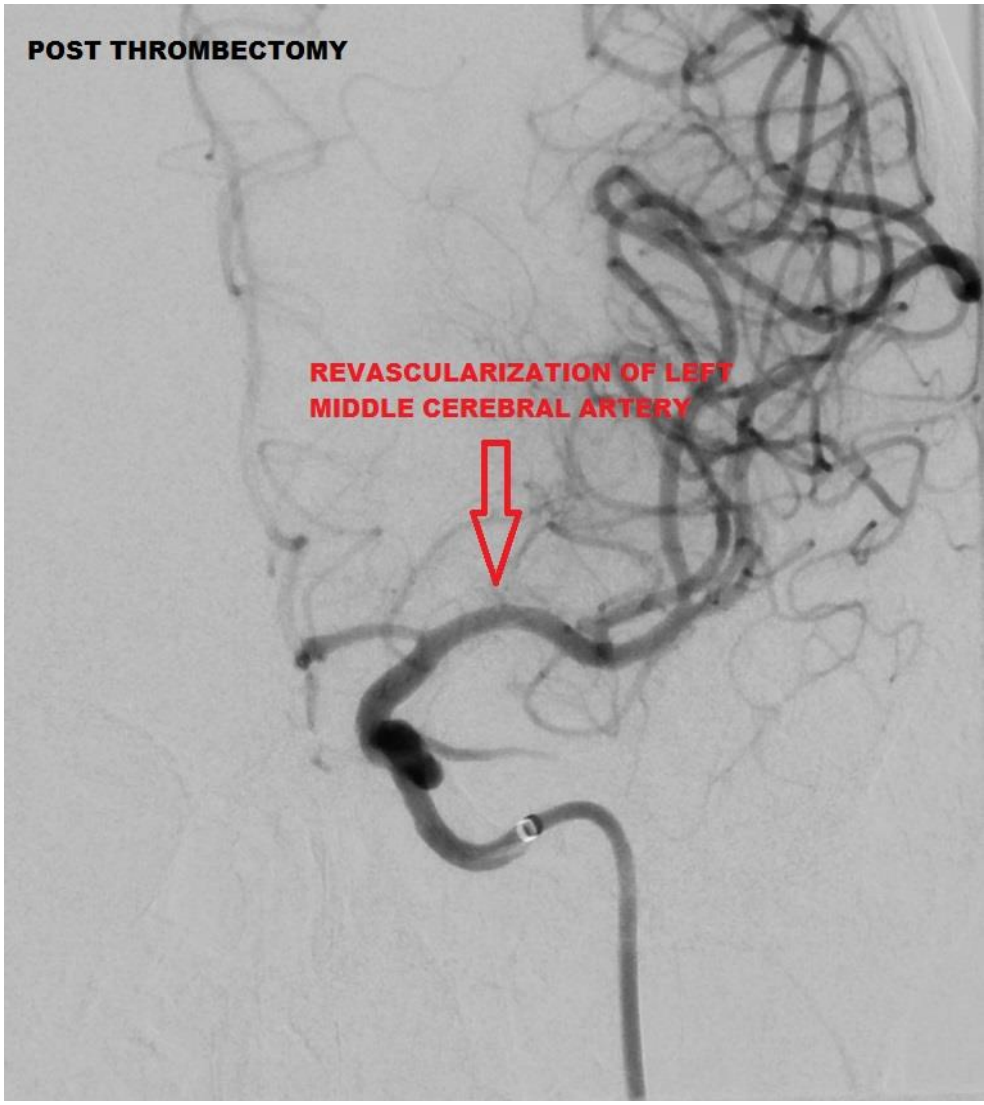
- IV thrombolytic for eligible acute ischemic stroke patients with last known well time up to 4.5 hours
  - Alteplase (Activase)
  - Tenecteplase (TNKase) for patients with who are also eligible for mechanical thrombectomy

- Mechanical thrombectomy for eligible patients with large vessel occlusion

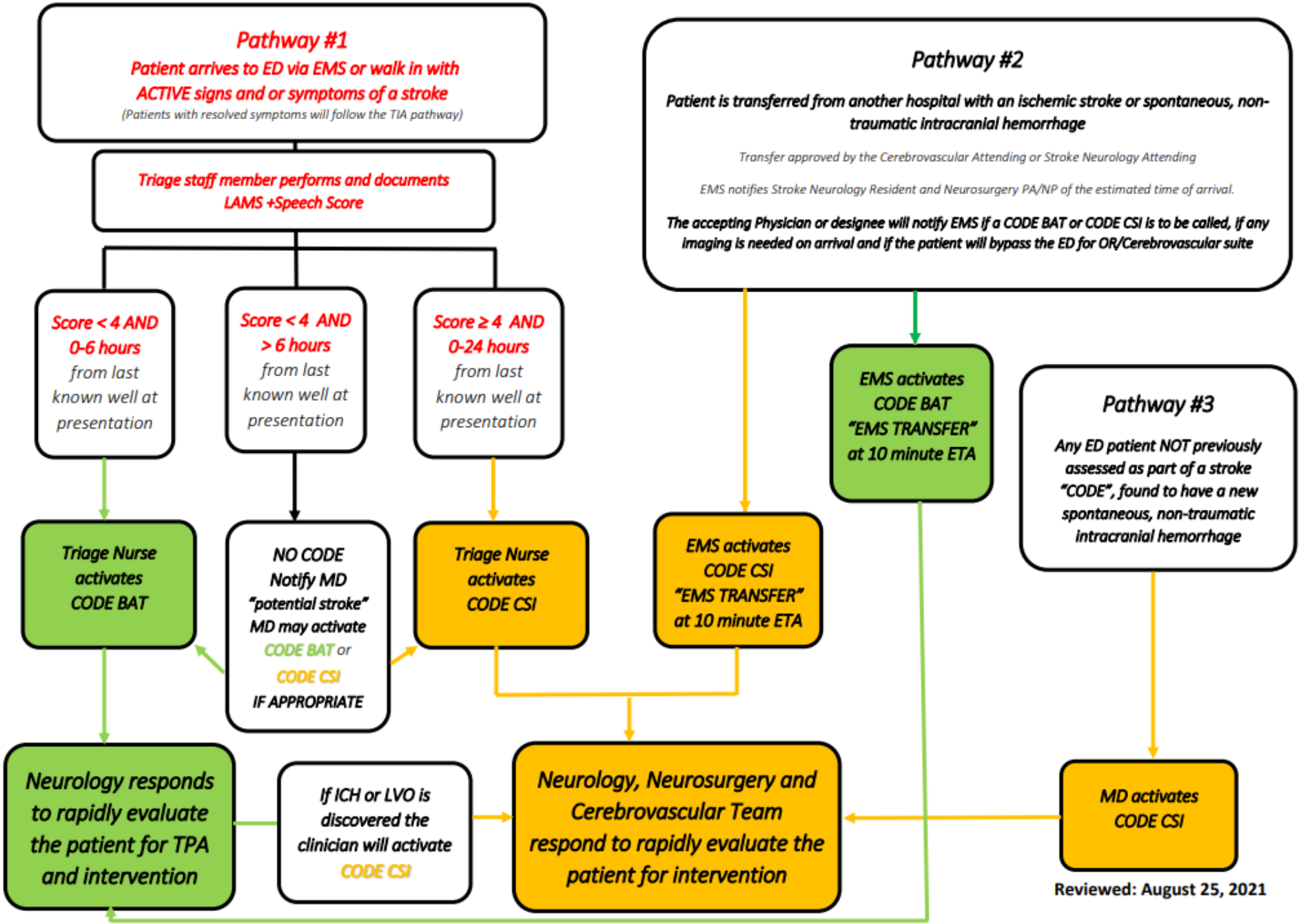





PRE THROMBECTOMY
LEFT MIDDLE CEREBRAL ARTERY OCCLUSION


POST THROMBECTOMY
REVASCULARIZATION OF LEFT MIDDLE CEREBRAL ARTERY

Stony Brook Emergency Department Acute Stroke Team Activations



Reviewed: August 25, 2021

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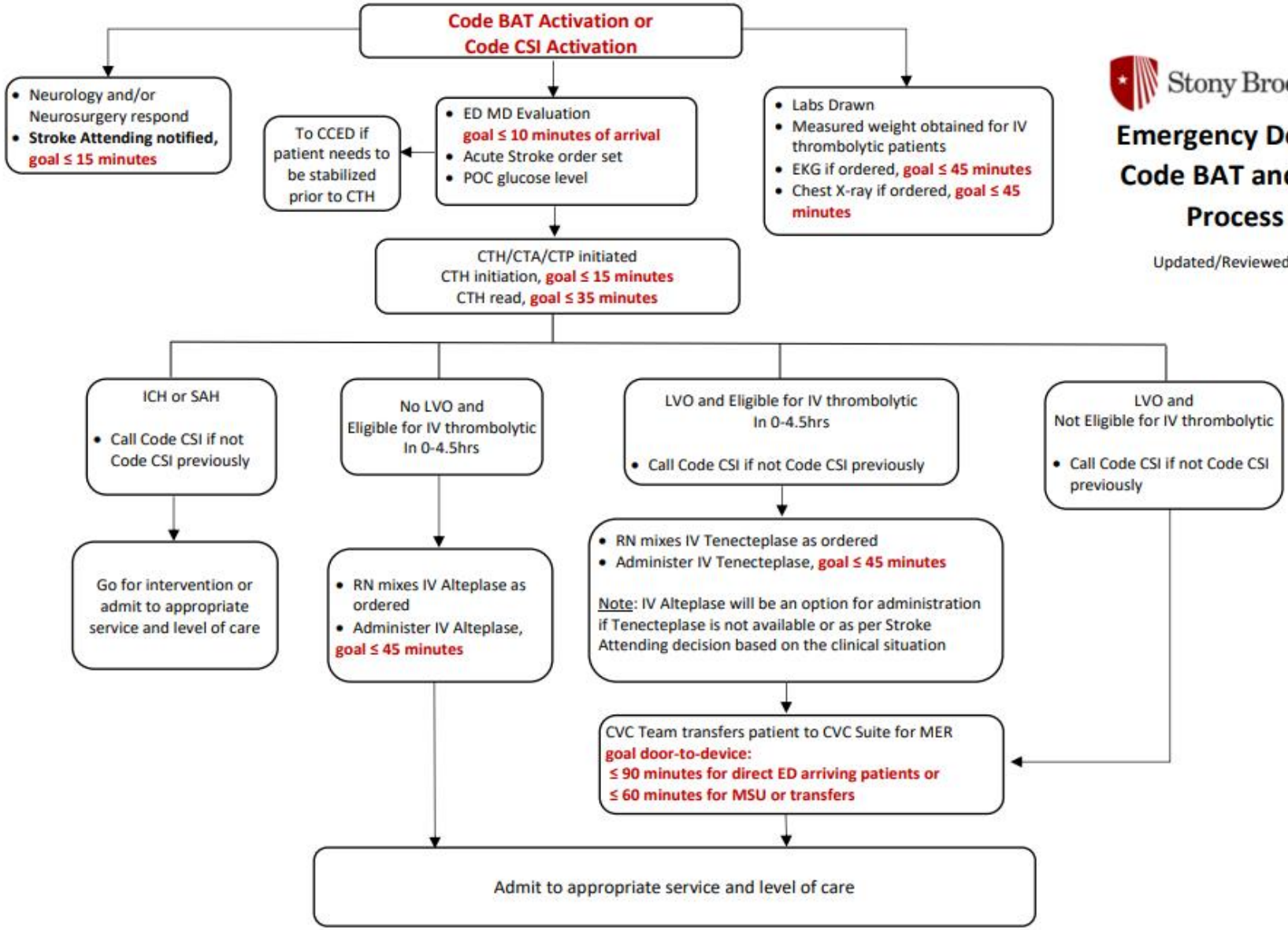
Emergency Department Code BAT and Code CSI Process Flow

Updated/Reviewed – August 25, 2021



When more than one patient arrives at the same time and fulfill the Code BAT or Code CSI criteria:
The Stroke Attending (or his/her designee) in collaboration with the ED Attending Physician or Neurosurgery Attending are responsible for overseeing the decision-making process for prioritizing and expediting a rapid primary survey, evaluation, stabilization, management, and treatment for suspected acute stroke/TIA patients.

BAT- Brain Attack Team
CSI – Complex Stroke Intervention
MER – Mechanical Endovascular Reperfusion
LVO – Large Vessel Occlusion
Door-to-Device - arrival to first pass with thrombectomy device
MSU – Mobile Stroke Unit
LKWT- Last known well time

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Inpatient Code BAT Process Flow

Updated/Reviewed: May 10, 2022

Code BAT Activation
(Discovery of stroke signs and symptoms, LKWT within 0 to 24 hours)

- Stroke Team responds and evaluates patient
- Stroke Attending notified
  goal ≤ 15 minutes

- Notify Primary Team if not yet aware
- Primary Team and /or RN stay at bedside to give SBAR information to Stroke Team
  Example: LKWT, Symptoms discovery time, pertinent PMH and hospital course, if on anticoagulation, recent surgery
- Primary Team orders Code BAT CT imaging

- Obtain Blood Sugar level
- Obtain Vital Signs
- Send lab work if needed
- Make sure patient has working IV access
- Connect to transport monitor
- Measured weight obtained for IV thrombolytic patients

- Transport to CT by the Primary Team Physician/PA/NP, ICU competent RN or Stroke ICR competent RN

- CTH Initiated
  goal ≤ 25 minutes
  stretch goal ≤ 15 minutes
- CTH read
  goal ≤ 35 minutes

- Stroke Attending or designee collaborates with CVC Team for patients with LVO
- CVC group page

ICH or SAH

Neurosurgery Consult

Go for intervention or continue management per Primary Team or transfer to appropriate service and level of care

IV thrombolytic and/or Endovascular Intervention?

NO

Management per Primary Team or transfer to appropriate level of care

YES
IV thrombolytic

For IV thrombolytic administration:
- Call 13N Charge RN if the Code BAT is in the old hospital building
- Call NCCU/NICR Charge RN if the Code BAT is in the new hospital pavilion
- 13N or NCCU/NICR RN will bring the IV thrombolytic to the Code BAT location

- 13N or NCCU/NICR RN mixes IV thrombolytic as ordered
- Administers IV tPA
  goal ≤ 60 minutes
  stretch goal ≤ 45 minutes

If going for Endovascular Intervention

If No Endovascular Intervention

Transfer to Stroke Unit or ICU for further management

YES
Endovascular Intervention

CVC Team evaluates patient

Patient transferred to CVC Suite

When there is more than one Code BAT called simultaneously:
The Stroke Attending (or designee) in collaboration with the Primary Team are responsible for overseeing the decision-making process for prioritizing and expediting a rapid primary survey, evaluation, stabilization, management, and treatment for suspected acute stroke patients.

BAT- Brain Attack Team
LKWT – Last Known Well Time or last known time to be at baseline
LVO – Large Vessel Occlusion
CVC – Cerebrovascular Center

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INPATIENT CODE BAT

To help expedite inpatient Code BAT process:

- Primary Team Physician/NP/PA and/or Primary RN to stay at bedside to give SBAR to Stroke Team
  Ex: Pertinent PMH/hospital course, stroke symptoms, **last known well time, symptoms discovery time**, if patient is on anticoagulation, if recent surgery, pertinent lab result
- Obtain blood sugar level to rule-out hypoglycemia
- Make sure a working IV is in place, 2 IVs preferable
- Primary Team to order "**CODE BAT CT Head w/o Contrast**" STAT to rule-out ICH.
  If indicated, a STAT "**CODE BAT CT Angio Head/ Neck with IV CON with Perfusion"** will be ordered to evaluate vessels and perfusion.
- Connect patient to a portable cardiac monitor for transport, have oxygen available if needed
- **Patient is transported to CT Scan by Primary Team Physician/NP/PA, ICU competent RN or Stroke ICR competent RN**
- Notify CT staff if patient is en route to CT, if Code BAT is being cancelled or if there is delay in transporting patient

For IV thrombolytic:

- Call the **13N charge nurse** if IV thrombolytic is needed for an **inpatient Code BAT in the original hospital building**
- Call the **NCCU/NICR charge nurse** if IV thrombolytic is needed for an **inpatient Code BAT in the new hospital pavilion**
- The RNs in 13N and NCCU/NICR are competent in IV thrombolytic administration and monitoring during and after administration
- Collaborate with ADN if patient needs transfer to another service or higher level of care
- The ED may be contacted if additional assistance is needed for IV thrombolytic administration

Note: Measured weight is needed for IV thrombolytic dosing

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JOINT COMMISSION: PRIMARY STROKE CORE MEASURES

STK-1 VTE prophylaxis on the day of or the day after hospital admission.
STK-2 Antithrombotic therapy at hospital discharge.
STK-3 Anticoagulation for Atrial fibrillation/flutter at hospital discharge.
STK-4 IV t-PA initiated at this hospital within 3 hours of time last known well.
STK-5 Antithrombotic therapy by the end of hospital day 2.
STK-6 Statin medication at hospital discharge.
STK-8 Patient and/or caregiver stroke education: EMS Activation/calling 911, need for follow-up after discharge, medications prescribed at discharge, personal risk factors for stroke and warning signs and symptoms of stroke.
STK-10 Rehabilitation services assessment

- ✓ LIPs must be mindful of the specific time period of the core measures for compliance.
- ✓ Reason(s) must be documented in the medical record why elements of the core measures were not implemented for the patient

  Example:
  - No antithrombotic by hospital day 2 secondary to concern for bleeding.
  - No statin on discharge due to patient refusal of statin recommendation.

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JOINT COMMISSION: COMPREHENSIVE STROKE CORE MEASURES

CSTK 01 – Initial NIH Stroke Scale score

CSTK 02 - Modified Rankin Score at 90 Days

CSTK 03a - Severity Measurement Performed : Hunt and Hess Scale performed for SAH patients

CSTK 03b – Severity Measurement Performed: ICH Score performed for ICH patients

CSTK 04 - Procoagulant Reversal Agent Initiation for ICH patients

CSTK 05a - Hemorrhagic Transformation for IV t-PA patients

CSTK 05b - Hemorrhagic Transformation for IA t-PA and/or Endovascular Reperfusion Therapy patients

CSTK 06 - Nimodipine Treatment Administered

CSTK 07 - Median Time to Revascularization

CSTK 08 - Thrombolysis in Cerebral Infarction (TICI) post-treatment reperfusion grade

CSTK 09 - Arrival Time to Skin Puncture

CSTK 10 - Modified Rankin Score at 90 Days

CSTK 11 - Timeliness of Reperfusion: Arrival Time to TICI 2B or Higher

CSTK 12 - Timeliness of Reperfusion: Skin Puncture to TICI 2B or Higher

Additional Requirements for New York State and Stroke: Get-With-The-Guidelines:

- EMS pre-notification of a potential stroke patient with Last Known Well time and Stroke Scale Findings.
- Dysphagia Screen before being given any food, fluids, or medication by mouth
  - RN or LIP completes bedside swallow evaluation using the Yale Swallow Protocol
  - If indicated, formal swallow evaluation by Speech and Language Pathologist
  - For patients who failed swallow evaluation and need to be on an antithrombotic: Consider ordering Aspirin Per Rectum or place NGT for patients who need Plavix (Clopidogrel), Brilinta (Ticagrelor) or oral anticoagulant
- Lipid profile
- HgbA1C
- NIH Stroke Scale at discharge
- modified Rankin Score at discharge
- Intensive statin therapy use: Lipitor (Atorvastatin) ≥ 40mg, Crestor (Rosuvastatin) ≥ 20mg
  - Need documentation of reason if intensive statin dose is not considered/ordered at discharge
- Stroke-Diabetes measures: Diabetes Treatment (diet or medication, follow-up for diabetes management at discharge), Therapeutic lifestyle recommendation (diet, target BMI ≤ 25, increasing physical activity), antihyperglycemic medication with proven CVD benefit (GLP-1 receptor agonist or SGLT-2 inhibitor)

- Annual 8 hours of cerebrovascular-related continuing education for Physicians, NP, PAs and RNs taking care of stroke patients

- ✓ Check-out the Stroke Intranet Site in ThePulse.
- ✓ It contains the Stroke-related Clinical Practice Guidelines (CPGs), protocols, staff and patient resources.

Click to review

STROKE CLINICAL PRACTICE GUIDELINES

- Guidelines for the early management of patients with acute ischemic stroke 2019 update (AHA/ASA 2019)
- Guidelines for the management of spontaneous ICH (AHA/ASA, 2015)
- Guideline for reversal of antithrombotic in intracranial hemorrhage (NCS,2015)
- Guidelines for prevention of stroke in patients with stroke and TIA (AHA/ASA 2021)
- Guidelines for adult stroke rehabilitation and recovery (AHA/ASA 2016)
- Guidelines for the management of patients with unruptured intracranial aneurysms (AHA/ASA, 2015)
- Guidelines for the management of aneurysmal SAH (AHA/ASA, 2012)
- Guidelines for the acute treatment of cerebral edema in neurocritical care patients (NCS 2020)
- Guidelines on the management of patients with extracranial carotid and vertebral artery disease (AHA/ASA, 2011)
- Updated Society for Vascular Surgery guidelines for management of extracranial carotid disease (Society for Vascular Surgery, 2011)
- The Society for Vascular Surgery practice guidelines on follow-up after vascular surgery arterial procedures (Society for Vascular Surgery, 2018)

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MOBILE STROKE UNIT (MSU)

- Dispatched by Suffolk County EMS/911
- Assessment on scene
  - CC ED RN, Paramedic, Neurologist-telemedicine
- Imaging on scene immediately sent to PACS
  - CT Head to see bleeding/stroke
  - CTA Head to see vessel occlusion
- Treatment provided en route
  - IV thrombolytic for eligible patients
  - KCentra for bleeding due to anticoagulant
  - Critical Care medicines and equipment for blood pressure and airway emergencies
- Disposition to the appropriate hospital coordinated by Stony Brook EMS
  - Stony Brook or nearest Comprehensive Stroke Center for complex stroke:
    - ICH/SAH
    - Large Vessel Occlusion requiring mechanical thrombectomy
  - Nearest Primary Stroke Center for non-interventional stroke care

Stroke Support Group

Receive encouragement, feedback and inspiration. Gain knowledge. Learn about helpful programs and resources. Open to all stroke survivors, family members and caregivers.

Stroke Caregiver Support Group - Meets the second Tuesday of every month, 7pm-8pm
Stroke Survivor Support Group - Meets the last Tuesday of every Month, 7pm-8pm
For more information, contact:
Tel: (631) 638-2638
Email: marret.anderson@stonybrookmedicine.edu, anne.froehlich@stonybrookmedicine.edu

Brain Aneurysm/ Arteriovenous Malformations (AVM) Support Group

This support group is co-sponsored by Stony Brook Medicine and the Brain Aneurysm Foundation.

Meets: Third Monday of each month (no meetings in July and August)
Time: 6PM to 7:30 PM
For more information, contact:
Tel: (631) 444-8121
Email: dawn.madigan@stonybrookmedicine.edu

Stony Brook Medicine

Thank you for all you do everyday for our stroke patients.

For questions, contact:

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