

STROKE TEAM REFERENCE CARD



Acute Stroke Activation 559-5555
(Call to activate or cancel code stroke)

Dr. Thorell: 888-0167, Cell 402-651-9507
Dr. Surdell: 888-3561, Cell 402-514-7111
Dr. Gard: 888-2828 Cell: 402-305-3401
Dr. Fayad: 231-5261 Cell: 402-203-2937
Dr. Diesing: 888-0631 Cell: 402-541-4585
Dr. Gress: 888-1178 Cell: 434-981-9366
Dr. Gonzalez: 888-1994 Cell: 646-427-1417
Dr. Pichler: 888-2552 Cell: 402-676-8600
Jen Kaluza APRN: 888-4749 Cell: 402-305-4894
VA: 402-995-3250

Stroke Coordinators:
Nichole Cooks 888-2463 Work: 2-7709
Christie Still 888-2750 Work: 2-3293
Navigator: Becca O'Connor 888-2473 Work: 2-3696

Departments:
LAB: 9-91030
Neuro Radiologist: 9-1008
Night Radiology: 9-1033
CT: 9-1032 MR: 9-1037 BCC CT: 9-1905
ED Direct Line: 9-6637
ED Team Lead: 402-507-3600
Bed desk: 9 BEDS (9-2337)
IR RN: 888-1314 IR Tech: 888-2047
Stroke Team Pager 888-2442
Neurosurgery Pager 888-1866
CCM White Pager 888-7000
Ethics Pager 888-3842
ECHO lab tech 9-6510 Scheduler 9-650

PROTOCOL FOR ACUTE STROKE

Acute Stroke Workup:

"Acute Stroke Protocol" order set
CTA head/neck, laboratory tests, EKG and CXR
Note: Only the assessment of blood glucose and head CT must precede the initiation of IV tPA

STROKE PAGER ACTIVATION RESIDENT'S ROLE:

EMS arrival:

Pager activation en route with ETA and RACE score
"Stroke STOP" briefly to verify assessment and LTKW
Neurology resident to enter "Acute Stroke Protocol"
Do not delay CTA for any reason, neuro assessment en route to CT
If patient not medically stable they will be taken to ED room first
Stroke attending via telestroke robot

ED room activation:

Pager activation as soon as patient seen by ED physician and symptoms < 5 hours
ED physician to enter "Acute Stroke Protocol"
Do not delay CTA for any reason, neuro assessment en route to CT
Stroke attending via telestroke robot

Limited Activation:

Pager activation directed by ED physician for symptoms 6-24 hours and deficits consistent with LVO
Neurology resident to call immediately to discuss with ED to determine if a candidate for mechanical thrombectomy and to activate Acute Stroke pager
Enter "Acute Stroke Protocol"
If LVO present Neurology to notify Neuroendovascular on call

Inpatient activation:

Pager activation by staff as soon as stroke symptoms noticed
Neurology resident to enter "Acute Stroke Protocol"
Do not delay CTA for any reason, neuro assessment en route to CT
Assess patient and call Stroke attending to review

Resident Role for drip and ship transfer stroke patient:

1. Stroke attending will provide patient specific information to resident after patient is accepted
2. Stroke attending who accepted patient will contact and discuss with attending from neuroendovascular team
3. MRN number will be provided by bed placement at time of acceptance IF patient is already in EPIC
4. If MRN not originally know, the resident will need to call bed desk at 9-2337 to obtain the new MRN
5. Acute Stroke pager will be activated prior to patient arrival in ED
6. Neurology resident will meet patient and ED staff at stroke stop
7. Orders for CTA and CTP will be entered by Neurology resident
8. If deemed medically stable patient will be taken to CT suite

CRITERIA FOR THROMBOLYTIC AND REPERFUSION THERAPY

- IV tPA should be administered to adults with focal neurological deficit, no blood in CT scan, LTKW < 4.5 hours and no contraindication.

- Consider not administering IV tPA if BP > 185/110 mmHg despite aggressive treatment
 - Mechanical thrombectomy for large vessel occlusion (ICA, M1, M2, basilar and vertebral occlusion), LTKW < 6 hr, NIHSS > 6 and ASPECTS score \geq 6.
 - Mechanical thrombectomy for LVO LTKW < 24 hrs
 - RAPID criteria
 - Infarct core volume < 70 ml
 - Mismatch ratio \geq 1.8
 - Penumbra volume > 15
- **do not wait for radiology official read**
****if in doubt call Neuro Radiology at 9-1008 or at night 9-1033**
- Neurology to notify Neuroendovascular on call
 - Neuroendovascular to activate thrombectomy pager

IV tPA:

1. If patient qualifies for IV tPA do not delay administration
2. Notify pharmacist as soon as potential candidate is known and they will start mixing the dose
3. Neurology resident enters "Neurology Acute Ischemic Stroke Thrombolytic Treatment" order set for eligible patients

BLOOD PRESSURE MANAGEMENT PRIOR TO IV tPA INFUSION:

IF Systolic BP > 185 mmHg or diastolic > 110 mmHG

- Labetalol 10 to 20 mg IVP over 1 to 2 minutes, may repeat x1 OR
- Nicardipine infusion, 5 mg/h, titrate up by 2.5 mg/h at 10 minute intervals, max dose 15 mg/h; when desired blood pressure obtained, titrate dose to desired pressure

CONSENT

Neurology obtains verbal consent for IV tPA and documents in Stroke Navigator
Neurosurgery obtains written consent (when able) for thrombectomy

Exclusion criteria are meant as guidelines, waiving them is at the discretion and responsibility of the physician. **For all patients, whether they meet IV tPA criteria or not, they should be considered for treatment with intracranial reperfusion therapies if eligible by CTA and by LTKW < 6 hours**

CONTRAINDICATIONS FOR tPA:

- Do not administer Activase to treat acute ischemic stroke in the following situations in which the **risk of bleeding is greater than the potential benefit** [see Warnings and Precautions (5.1)]:
- Current intracranial hemorrhage
 - Subarachnoid hemorrhage
 - Active internal bleeding
 - Recent (within 3 months) intracranial or intraspinal surgery or serious head trauma
 - Bleeding diathesis
 - Current severe uncontrolled hypertension.

WARNINGS or Relative Exclusion Criteria for tPA:

When Activase is prescribed in the following conditions, the **risks of bleeding are increased** and should be weighed against the anticipated benefits

- Recent major surgery or procedure, (e.g., coronary artery bypass graft, obstetrical delivery, organ biopsy, previous puncture of non-compressible vessels)
- Cerebrovascular disease
- Recent intracranial hemorrhage
- Recent gastrointestinal or genitourinary bleeding
- Recent trauma
- Hypertension: SBP above 175 mmHg or diastolic BP above 110 mmHg
- High likelihood of left heart thrombus, e.g., mitral stenosis with atrial fibrillation
- Acute pericarditis
- Subacute bacterial endocarditis
- Hemostatic defects including those secondary to severe hepatic or renal diseases
- Significant hepatic dysfunction
- Pregnancy
- Diabetic hemorrhagic retinopathy, or other hemorrhagic ophthalmic conditions
- Septic thrombophlebitis or occluded AV cannula at seriously infected site
- Advanced age [see Activase Prescribing Use in Specific Populations (8.5)]
- Patients currently receiving anticoagulants (e.g., warfarin sodium, with INR > 1.7)
- Any other condition in which bleeding constitutes a significant hazard or would be particularly difficult to manage because of its location

BLOOD PRESSURE MANAGEMENT POST tPA INFUSION

BP Goal at or less than 180/105 mmHg for 24 hours

If Systolic > 180 to 230 mm Hg or diastolic > 105 to 120 mm Hg:

- Labetalol 10 mg IV followed by an infusion at 2 to 8 mg/min
- Nicardipine 5 mg/h IV, titrate up to desired effect by 2.5 mg/h every 5-15 minutes, maximum 15 mg/h

If BP not controlled or DBP > 140 mmHg, consider IV sodium nitroprusside

BLOOD PRESSURE MANAGEMENT POST THROMBECTOMY

If successful, TIC1 2b or 3

BP Goal Strict < 140 mmHg

If unsuccessful, goal per neurosurgery

MANAGEMENT OF INTRACRANIAL HEMORRHAGE POST IV t-PA INFUSION

- Notify Neurosurgery
- Anticoagulation Reversal Focused Order set
 - Select Alteplase subset

POST THROMBOLYTIC AND REPERFUSION THERAPY

Acute Ischemic Stroke Post Thrombolysis/Thrombectomy Admission

- IF post IV tPA Neurology enters order set
- IF post thrombectomy Neurosurgery enters order set
- CCM completes medication rec at admission
- If no intervention CCM enters admission orders

Notify CCM White of acute stroke patient admission

Bed request for NSICU; goal is for rapid transfer from ED to NSICU

ANTICOAGULATION REVERSAL FOCUSED ORDER SET

- Vitamin K Antagonists-Kcentra
- Vitamin K Antagonists-other treatment (warfarin reversal)
- Factor Xa Inhibitors (Xarelto, Eliquis, Savaysa)-Kcentra
- Direct Thrombin Inhibitor (Pradaxa)
- Antiplatelet Agents
- Unfractionated Heparin
- Low Molecular Weight Heparin
- Alteplase

Management of Orolingual Angioedema after IV-tPA

During the administration of IV alteplase and for 30 minutes after completion RN monitors lips, tongue and mouth for swelling. If noted follow the angioedema treatment orders within the [Neurology Acute Ischemic Stroke Thrombolytic Treatment](#) order set

- Diphenhydramine 50mg IV
- Methylprednisolone 125mg IV
- Ranitidine 50mg IV

Code Stroke Nurse Role (NSICU LEAD RN):

- Respond to all inpatient Stroke Codes
- Set Vitals to q15min, O2>94%
- NIH Assessment
- Retrieve LTKW (last time known well)
- Bedside POC glucose
- Check IV lines-anticipate 2nd IV if necessary
- Verify daily weight.

Assist Stroke Team Resident

While Stroke Team is Assessing Patient: Anticipate orders for STAT labs, CTA and EKG:

- Monitor and assist to CT if patient is a possible tPA/thrombectomy candidate or unstable
- Stay at bedside until tPA decision is made
With Pharmacist: Double check dosing and pump
- Post tPA protocol on transfer to ICU

MEDICAL/SURGICAL PROTOCOL FOR MALIGNANT CEREBRAL EDEMA

The Stroke Team will clarify the family's wishes for an aggressive level of care which may include potential surgical intervention. This should be done in conjunction with clarifying the resuscitation status of the patient on admission.

RECOMMENDATIONS FOR MEDICAL MANAGEMENT

- PICC line or central line placement
- Consider serial imaging with non-contrast Head CT

- Osmotherapy with Mannitol or 3% hypertonic saline at a dose sufficient to reach a serum osmolality of 315-320 mOsm
 - Initial dosing of Mannitol of 0.5 – 1 gm/kg IV
 - Caution: Slowly withdrawal osmotic therapy to avoid rebound cerebral edema
- Daily monitoring of serum Na+ and osmolality
 - Serum Na+ and K+ every 4-6 hours while employing osmotic therapy
 - Correction of Na+ more than 0.5mmol/L per hr (12mmol/L in 24h) may require a decrease in rate/volume/dose of osmotic therapy
- Intubation and mechanical ventilation:
 1. If the patients Glasgow Coma Score is less than 9 or
 2. Signs of herniation on exam or
 3. Signs of respiratory insufficiency or
 4. Airway compromise
- Hyperventilation as a rescue measure in the event of further neurological deterioration or an uncontrolled increase in intracranial pressure.
 - Target pCO2 of 28-32 mmHg.
 - Hyperventilation is to be used as a temporary measure until other modalities can be instituted (i.e. osmotic therapy, CSF drainage, or decompressive surgery).
- Invasive monitoring of intracranial pressure, preferably on the same side as the infarct can be considered.
- Sedation in the case of mechanical ventilation or further neurological deterioration is discouraged unless an ICP monitor is in place.
- Treatment of blood pressure higher than 220/120 mmHg with anti-hypertensive agents.
- Treatment of hypotension or a reduction of cerebral perfusion pressure to maintain CPP greater than 60 mmHg.
- Elevation of the head to 30-45 degrees.
- Maintenance of normothermia, normoglycemia, and normovolemia.
- Initiate early nutrition with special attention to osmotic concentration of tube feeds. Consider free water restrictions to keep serum Na+ stable and normal.

INDICATIONS FOR DECOMPRESSIVE CRANIECTOMY IN PATIENTS WITH ISCHEMIC STROKE

Hemispheric/supratentorial stroke (MCA stroke with malignant cerebral edema)

Indications:

Inclusion Criteria:

1. Hemispheric stroke involving the middle cerebral artery territory with onset within 96 hours
 - a. The anterior cerebral artery and the posterior cerebral artery territories may be involved.
2. Ischemic changes on CT that affect two-thirds or more of the territory of the MCA, the formation of space-occupying edema and displacement of midline structures on imaging (volume 145 – 210 mL)
 - a. Note: In patients with hemispheric stroke with volume > 210mL, the fatality rate is 100% without decompressive craniectomy.
3. Good pre-stroke functional status (Kamofsky score > 80)
4. Written informed consent by the patient or a legal representative

Relative Contraindications:

1. Dementia
2. Multiple vascular risk factors
3. Multiple co-morbidities
4. Pre-stroke score on the modified Rankin scale of greater than 1 or less than 95 on the Barthel index

Exclusion Criteria:

1. Bilateral fixed pupils
2. Contralateral ischemia or other brain lesion that could affect outcome
3. Life expectancy < 3 years
4. Known coagulopathy or systemic bleeding disorder
5. Decrease in consciousness from causes other than the formation of edema, such as metabolic disturbances or medication

In patients with malignant cerebral edema from a hemispheric stroke with any of the above relative contra indications, the overall outcome is very poor even with aggressive non-surgical edema/ICP management. Therefore, a palliative-care approach should be considered.

POSTERIOR FOSSA/CEREBELLAR INDICATIONS:

1. Post-ischemic cerebellar edema
2. Neurologic decline from edema /mass effect
3. Radiographic mass effect from edema
4. No significant brainstem infarction (e.g. small posterolateral medullary stroke, Wallenberg's, has relatively good prognosis so a patient with this stroke would be considered for surgery)

Age is less of a factor in the outcome of patients with cerebellar stroke treated with decompressive surgery. Patients with low GCS should be considered for surgery, but the clinical goal is to perform decompressive surgery prior to onset of brainstem compression or coma.

STROKE QUALITY MEASURES

SK1 VTE PROPHYLAXIS
SK2 DISCHARGED ON ANTITHROMBOTIC
SK3 ANTICOAGULATION FOR AFIB/FLUTTER
SK4 THROMBOLYTIC THERAPY
SK5 ANTITHROMBOTIC THERAPY BEFORE DAY 2
SK6 DISCHARGED ON STATIN
SK8 STROKE EDUCATION
SK10 ASSESSED FOR REHAB

COMPREHENSIVE QUALITY MEASURES

CSTK1 NIHSS ON ISCHEMIC STROKE (12 HR)
CSTK3 SEVERITY SCORE SAH AND ICH
CSTK4 PROCOAGULANT REVERSAL IN ICH
CSTK5 HEMORRHAGIC CONVERSION RATE
CSTK6 NIMODIPINE TREATMENT ADMINISTERED
CSTK8 TIC1 SCORE
CSTK9 ARRIVAL TIME TO SKIN PUNCTURE
CSTK10 MRS AT 90 DAYS
CSTK 11 ARRIVAL TO TIC12B OR HIGHER
SCTK 12 SKIN PUNCTURE TO TIC12B OR HIGHER

NIHSS

Completed on admission for stroke/rule out stroke

24 hours after IV tPA and/or thrombectomy

Change in condition

Discharge for all stroke patients

*if consulting remember to do NIHSS before signing off

mRS:

Pre event score upon admission

Discharge for all stroke patients

90 days post tPA/thrombectomy

Stroke Order Sets

Acute Stroke Protocol

Neurology Acute Ischemic Stroke Thrombolytic Treatment

Acute Ischemic Stroke Post Thrombolysis/Thrombectomy Admission

** (Neurology if tPA) (Neurosurgery if thrombectomy)

Neurology Acute Ischemic Stroke or TIA admission

Neurology Acute Ischemic Stroke or TIA Focused

Anticoagulation Reversal Focused

Neurosurgery Intracranial Hemorrhage Admission

Neurosurgery Subarachnoid Hemorrhage Admission

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