ASAP instructions

Stroke pager
- Activated whenever patient arrives in ED within 6 hours of suspected stroke
- You will see 3 pages for every patient
  - initial information from ED
    - patient’s name & age, symptoms, onset (time last normal)
    - “EMS to CT scanner then tcc2, 31 yo F c/o numbness and tingling to left arm, slurred speech. Onset 12:45. Eta 4.”
  - “104-xxxx”
    - where xxxx=last 4 digits of responding resident’s pager, indicating resident got the page and will be in CT scanner within 5 minutes
  - summary page stating tPA decision or next step in evaluation
- You should go to the ED after any text page (1st in the series of 3) unless it starts with STROKE RN RESPOND—this indicates an inpatient tPA page
  - If you wait for the summary page, it will usually be too late
- Ignore numerical pages

Wear your white coat and ID badge; no shorts

What to do when you get to the ED
- Enter via basement of hospital near Southwest Tower elevators
- Press button to be buzzed in
- Go to CT scanner; if patient not there, go to TCC (Trauma Critical Care) bay at end of hall
- Introduce yourself to someone on the team
- Observe/focus on at least one item on the checklist on back of this card each time you go to the ED
- If tPA is administered, plan to stay for at least 30 minutes
  - While it is infusing, you can
    - perform the NIHSS/exam
    - look for improvement
    - ask questions
- Follow resident to CTA if one is performed
  - Observe decision process for endovascular treatment
- Follow patient to angio suite if endovascular treatment is elected
  - Introduce yourself to neurointerventional fellow/attending
  - Observe procedure through the window

Return all items Chrissy McIntosh (Biotech 219) at end of rotation or arrange to transfer to next student on schedule. If the latter, make sure you let Chrissy know you did this.
1. Pager
2. ASAP instructions
3. NIHSS scoring booklet

Observe/focus on at least one item on the following checklist each time you go to the ED:
- The process as a whole—the various people involved, processes occurring, what created delays
- Obtaining history/time of onset
- Exam
  - Findings: dysarthria, aphasia, gaze deviation, visual field cut, hemiparesis, neglect
  - Tally the NIHSS as resident is doing it and compare your score to theirs
- Imaging
  - CT: Early stroke signs
  - CTA: Vessel occlusion
- Ensuring eligibility criteria
- Consent process with patient/family
- If tPA was not given, what was the reason?
Acute Ischemic Stroke IV tPA Eligibility Criteria

Inclusion Criteria:
1. Age > 18 years *
2. Clinical diagnosis of ischemic stroke causing a measurable neurological deficit
3. Onset of stroke symptoms** well established to be within 4.5 hours of treatment

Exclusion Criteria:
1. Intracranial hemorrhage on head CT
2. Serious head trauma within past 3 months
3. Active bleeding or suspected underlying abnormality, including but not limited to:
   a. International Normalized Ratio (INR) >1.7
   b. Platelet count <100,000/ml
   c. Patient has received heparin within 48 hours and has elevated PTT
   d. Patient has received treatment doses of injectable anticoagulants within 48 hours
   e. Patient takes apixaban and FXa >0.1U
   f. Patient takes dabigatran and the thrombin time is ≥ 30
   g. Patient takes rivaroxaban and PT >13 / aPTT >0.1U. (If PT ≥13 consider tPA; if <5.0/1U, consider tPA; otherwise, no tPA.)
4. On repeated measurement, SBP >185 or DBP >110 (see Guidelines below)
5. Symptoms suggest subarachnoid hemorrhage despite no hemorrhage seen on CT
6. For 3-4.5 hour window only: severe deficits (NIHSS>25)

Relative Exclusion Criteria:
1. Major surgery or serious trauma (other than head) within last 14 days
2. Intracranial or intraspinal surgery in previous 3 months
3. Serum glucose <50 or >400 mg/dl (Treat to bring glucose ≥50 and <400 mg/dl; consider IPA if symptoms don’t resolve after Rx and are consistent with stroke)
4. Stroke within past 3 months
5. History of intracranial hemorrhage *
6. GI or GU hemorrhage within 21 days or structural GI malignancy with bleeding risk
7. Primary or metastatic intracranial, intraxial neoplasm *
8. Seizure at onset (with deficits thought due to ictal/post-ictal state, not new stroke)
9. Arterial puncture at non-compressible site
10. Unsecured intracranial aneurysm >10 mm or arteriovenous malformation

* May consider tPA (with chief/fellow/attending) in these situations: Age < 18, old traumatic intracranial hemorrhage, history of SAH with secured aneurysm (consider time since collision & completeness of treatment). tPA is potentially harmful in patients w/ history of parenchymal hemorrhage. Incidental chronic micro-hemorrhages on MRI are not a contraindication

** Stroke Onset defined as last documented time patient observed to be without symptoms (time last known normal)—NOT time patient awakened with symptoms or was found down.

Guidelines for Blood Pressure Management before tPA administration
(Adapted from AHA Guidelines Stroke. 2007;38:1655-1711)

Note: Suggested guidelines below are for 0-3 hour protocol only: for 3-4.5 hours, only one dose of IV Labetalol or Hydralazine may be attempted to lower BP

Treat for Systolic BP >185 mm Hg or Diastolic BP >110 mm Hg
Labetalol 10-20 mg IV over 1 to 2 minutes, wait 10 minutes, may repeat x 1-2; For low heart rate < 70, may substitute Hydralazine 10-20 mg IV instead of Labetalol.

Or Nicardipine infusion, 5 mg/h, titrate up by 2.5 mg/h at 5- to 15-minute intervals, maximum dose 15 mg/h; when desired blood pressure attained, reduce to 3 mg/h;

If blood pressure remains >185/110 mm Hg, do not administer tPA.

Monitor blood pressure every 15 minutes during the antihypertensive therapy. Observe for hypotension (defined as BP lowering > 25% initial BP measurement on arrival). If neurologic worsening or hypotension occurs, consider IVF bolus, discontinuing nicardipine infusion, and/or reversing antihypertensive effects

Guidelines for Blood Pressure Management during and after tPA administration
(Adapted from AHA Guidelines Stroke. 2007;38:1655-1711)

Note: Suggested guidelines below are for both 0-3 hour and for 3-4.5 hour protocols

Monitor blood pressure every 15 minutes during treatment and for additional 2 hours after treatment, then every 30 minutes for 6 hours, and then every hour for 16 hours.

1. For Systolic BP 175 to 179 mm Hg or Diastolic BP 100 to 104 mm Hg
   Recheck BP after 5 minutes. If still remains greater than or equal to above parameters, treat according to #2 below.

2. For Systolic BP 180 to 230 mm Hg or Diastolic BP 105 to 120 mm Hg
   Labetalol 10 mg IV over 1 to 2 minutes, may repeat every 10 to 20 minutes, maximum dose of 300 mg; For low heart rate <70, may substitute Hydralazine 10-20 mg IV instead of Labetalol.

3. For Systolic BP > 231 mm Hg or Diastolic BP > 121 mm Hg
   Labetalol 10 mg IV over 1 to 2 minutes, may repeat every 10 to 20 minutes, maximum dose of 300 mg; For low heart rate <70, may substitute Hydralazine 10-20 mg IV instead of Labetalol.

Or Nicardipine infusion, 5 mg/h, titrate up to desired effect by increasing 2.5 mg/h every 5 minutes to maximum of 15 mg/h

If blood pressure not controlled, discuss use of further agents with attending.

Monitor blood pressure every 15 minutes during the antihypertensive therapy. Observe for hypotension (defined as BP lowering > 25% initial BP measurement on arrival). If neurologic worsening or hypotension occurs, consider IVF bolus, discontinuing nicardipine infusion, and/or reversing antihypertensive effects,

Rapidly Improving Deficits:
Consider in pt w/eary improvement who remains impaired/potentially disabled. Since time to Rx powerfully impacts outcome, delaying to monitor for further improvement is not recommended

Acute MI or MI within 3 Months: For concurrent acute stroke = MI, IPA followed by coronary angioplasty ± stenting is reasonable. For recent MI, IPA is reasonable for non-STEMI or right/inferior STEMI; may be reasonable for left anterior STEMI.

Pericarditis: Urgent consultation with a cardiologist is recommended. IPA may be reasonable when stroke deficits are severe. When stroke deficits are mild, treatment w/IPA is of uncertain net benefit.

Endocarditis: IPA is not recommended because of the increased risk of intracranial hemorrhage.

Hemodialysis is not a contraindication if PTT normal; ↓PTT may increase risk for hemorrhagic complications.

Dementia: Individual considerations such as life expectancy and premorbid level of function are important to determine whether IPA may offer a clinically meaningful benefit.
### Guidelines for Management of Intracranial Hemorrhage Post-tPA Administration

Adapted from Brain Attack Coalition Guidelines

**Suspect intracranial hemorrhage following start of tPA infusion if there is acute neurological deterioration, new headache, acute hypertension, or nausea and vomiting.**

**If hemorrhage is suspected do the following:**
- Discontinue tPA infusion unless other causes of neurological deterioration are apparent.
- Obtain immediate CT scan.
- Draw blood for PT, aPTT, platelet count, fibrinogen, and type and cross.

**If intracranial hemorrhage present:**
- Administer 10 units of cryoprecipitate
- If patient is on an antiplatelet agent or platelet dysfunction is suspected, administer one 6-pack of platelets
- After cryoprecipitate administered, check fibrinogen. If low, give 10 units more cryoprecipitate
- Consider second CT to assess progression of intracranial hemorrhage.
- If continued bleeding, consider additional cryoprecipitate, platelets, and/or fresh frozen plasma (FFP) and/or prothrombin complex concentrate (PCC)
- Consider neurosurgical consultation

#### Inpatient tPA pages

(Alteplase supply for patients located in 10400 ICU)

1) Neurology resident learns about potential tPA patient and initiates tPA page, texting "STROKE RN RESPOND" with patient name, birth date, and hospital room
2) Neurology resident proceeds to patient room to evaluate patient
3) RN from Neuro Step-down or NeuroICU meets resident at bedside with tPA and assumes all tPA-related nursing care
4) Neurology resident and RN transport patient to head CT on 2nd floor of Mallinckrodt.
5) tPA may be administered in CT if decision ready; otherwise return to patient room for decision.

**NOTE for stroke team:** Alteplase can only be dispensed directly to a physician.

#### Abbreviated Alteplase (tPA) mixing instructions:

1) Insert spike included in kit into diluent (liquid) vial. Leave vial upright.
2) Place vial containing powder over diluent vial and insert into spike.
3) Invert vials to allow diluent to drip into powder vial
4) Remove diluent vial after empty.
5) **Gently swirl** vial to dissolve powder. DO NOT SHAKE. (Vial will become foam if shaken.)
6) **DO NOT DISCARD unused** vials. Return to pharmacy and hospital will be reimbursed.

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**Acute Ischemic Stroke Endovascular Treatment Algorithm**

**General Inclusion Criteria for protocol activation**
1. **Age >18**
2. **NIHSS ≥ 6**
3. **Arterial occlusion at M1/M2, ICA, vertebral, or basilar**
4. For anterior circulation stroke: able to be in angio suite in appropriate time frame so treatment occurs w/in 6 hours
5. For posterior circulation stroke: treatment time window is at the discretion of attending physician

**General Exclusion Criteria for Endovascular Treatment**
1. **ASPECTS score < 6 on CT or imaging evidence of infarction involving greater than one-third of MCA territory**
2. **Pre-morbid disability (mRS >2) or comorbidities that will affect recovery potential**
3. **Intracranial hemorrhage, mass, or mass effect as cause of symptoms**
4. **Current severe uncontrolled hypertension (e.g. SBP > 185 mmHg or DBP > 110 mmHg) despite reasonable efforts to treat**
5. **Bleeding diathesis***
   a. **Use of warfarin:** INR > 3.0
   b. **Use of dabigatran:** TT > 30 sec and PTT > 70 sec (wait for manual TT correction to rule out heparin contamination)
   c. **Use of rivaroxaban:** PT > 20 sec or αFXa > 0.5 U of heparin activity (check only if PT 15-20 sec; takes 30 minutes to run)
   d. **Use of apixiban:** αFXa > 0.1 U of heparin activity
   e. **Use of edoxaban:** αFXa > 0.1 U of heparin activity
   f. **Thrombocytopenia:** platelet count < 30,000/mL

* Exceptions may be made in the presence of an approved research protocol or at the discretion of the treating physician if there is compelling clinical and radiological evidence suggesting benefit

**IV tPA exclusions related to risks of systemic complications of fibrinolysis are generally not risks for endovascular treatment (e.g., post-operative systemic bleeding risk, therapeutic oral anticoagulation)**

*** Correction of bleeding diathesis may be considered on a case-by-case basis following discussion between stroke neurology and INR

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**ED Acute Stroke Protocol**

1. Patient arrives via ambulance/EMS or walks-in via ED triage.
2. Patient goes immediately to CT.
3. Team (Neuro and EM Residents, EM attending, RN, tech, Social Work, Pharmacist) converges at CT to obtain information from EMS regarding time of onset, witnesses, blood glucose, etc, obtain history and NIHSS, place IVs, draw blood
   a. RN immediately draws labs, estimates patient weight
   b. RN and/or ED resident order Stroke Order set
   c. Tech obtains EKG
   d. Social Work brings family to bedside to expedite getting time of onset (may help find phone numbers if family not present)
   e. Neuro + ED residents obtain history and NIHSS
      i. If NIHSS ≥ 6, CTA will be obtained
   f. EM resident orders BP meds as needed
   g. Neuro resident calls Neuro Chief → tPA decision made; EM resident to ensure EM attending agrees with decision (if Attending not at bedside) → RN notified of tPA decision → Neuro resident documents decision time
   h. TIME OUT: Neuro/EM Resident, EM attending, and ED RN at bedside to agree on time of onset, weight, and dose of tPA
   i. EM resident orders tPA
   j. RN administers tPA & documents tPA bolus time in chart
   k. tPA may be administered either in CT or in TCC
4. Once tPA is administered, BP and neurological status (NIHSS) obtained every 15 minutes during tPA infusion; BP monitored q15 minutes for the first 2 hours, then q 30 minutes

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CT scan score: CTpatient evaluation, decide likely Rx

- **tPA eligible**
  - stay in CT for tPA decision
- Need more info or tPA treatment
- **tPA ineligible**
- Go: time out then tPA bolus
- TCC
  - NIHSS>6
  - NIHSS>6 & able to be in angio suite w/in 5h
  - Endovasc ineligible

**Goal Door-to-Needle time:** ≤ 25 min

**TCC**= Trauma/Critical care bay

**LVO**= large vessel occlusion
Acute Stroke Trials – Page 40-STUDY

RHAPSODY
A multi-center, Phase 2 study to determine the safety and tolerability of 3K3A-APC, a recombinant variant of human activated protein C (APC), in combination with tPA in moderately severe acute hemispheric ischemic stroke. (APC is thought to help with vascular damage, neuro-inflammation, and neuronal injury or neuro-degeneration).

PRISMS
A multi-center, Phase 3 study to evaluate IV tPA vs. placebo in patients with minor stroke (NIHSS 0-5) or rapidly improving symptoms and no disabling deficit presenting within 3 hours of onset and not getting standard-of-care tPA.

ACTION II
A multi-center dose-ranging study to evaluate the safety and efficacy of IV natalizumab in acute ischemic stroke.

POINT
A multi-center, Phase 3 study to evaluate aspirin + clopidogrel vs. aspirin + placebo within 12 hours of symptom onset in mild stroke (NIHSS <4) not receiving tPA or high-risk TIA patients.

Acute Stroke Team