2018 MMC ED Stroke Packet Table of Contents

Pathways & Protocols

1. MMC ED Guidelines for Activation of an ED Acute Stroke Alert
2. MMC ED Direct-to-CT (D2CT) Pathway
3. MMC Acute Stroke Pathways: Overview
   a. MMC ED Acute Stroke Pathway
   b. MMC ED Endovascular Stroke Transfer Pathway
   c. MMC Inpatient Acute Stroke Pathway
4a & b. IV tPA Eligibility Criteria: 3 tPA questions and risk-based decision tool
5. Pre- and Post-tPA and EVT Blood Pressure Management Protocol
6. Management of Post-tPA Complications: Hemorrhage and Angioedema
8. Dysphagia screen Protocol

Resources

9. NIH Stroke Scale: (for all ischemic stroke patients regardless of tPA eligibility)
10. RACE Score (score designed to detect large vessel occlusions)
11. Severity scores:
   - Pre-stroke modified Rankin Score (all stroke patients)
   - Glasgow Coma Scale (all hemorrhagic strokes)
   - ICH Score (for ICH only)
   - Hunt & Hess Score (for SAH only)
12. Guidelines for the Administration of IV tPA for Treatment of Suspected Acute Stroke
13. Stroke Packet References

The information in this packet is intended to help facilitate appropriate and consistent care of patients presenting with symptoms of acute stroke. These recommendations do not supersede physician judgment nor do they reflect the individual needs of every patient.
MMC ED Guidelines for Activation of an ED Acute Stroke Alert
For patients who initially present to the MMC ED (i.e. not transfers from outside hospitals or inpatients)

Patient presents with symptoms of acute onset, potentially disabling, focal neurological deficits concerning for stroke, whether they be persistent or resolving

Establish time Last Known Well (LKW) and ask 3 tPA eligibility questions (See tPA Eligibility Criteria, Page 1)

LKW less than 4.0 hours and no clear contraindication to tPA (red or orange boxes)

Activate ED Acute Stroke Alert for rapid imaging, labs and Neurology consult. Neurology will involve the Neurointerventionalist (NI) if needed.

The patient is not a tPA candidate. Do not activate an ED Stroke Alert. Evaluate for symptoms of LVO*.
Perform a RACE Score.

Patient has symptoms of LVO* and/or RACE Score greater than or equal to 5?

Yes

STAT CT/CTA +/- CTP and page the on call Neurointerventionalist (NI)
The NI will involve Neurology if needed

No

No

Yes

Proceed with expedient work up. Page Neurology for consult.

*Table 1: Most common symptoms of large vessel occlusion (LVO): Patients may have some or all of the following features in each pattern

<table>
<thead>
<tr>
<th>Left MCA</th>
<th>Right MCA</th>
<th>Vertebrobasilar system</th>
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<tbody>
<tr>
<td>Right hemiparesis</td>
<td>Left hemiparesis</td>
<td>Sudden-onset depressed LOC or coma</td>
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<tr>
<td>Right hemianesthesia</td>
<td>Left hemianesthesia</td>
<td>Quadriplegia or hemiplegia</td>
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<td>Left gaze deviation</td>
<td>Right gaze deviation</td>
<td>Hemianopia</td>
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<td>Aphasia</td>
<td>Inattention/neglect of the left side</td>
<td>Ocular palsies, nystagmus, diplopia</td>
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<tr>
<td>Right side visual field cut</td>
<td>Left side visual field cut</td>
<td>Ataxia, vertigo, nausea/vomiting</td>
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<tr>
<td></td>
<td></td>
<td>Dysarthria, dysphagia</td>
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Guiding principles:
I. IV tPA is contraindicated if the time last known well (LKW) is greater than 4.5 hours. The later in the time window for eligibility, the more closely risk benefit ratio should be considered.
   a. IV tPA treatment is reasonable for patients who present with moderate to severe ischemic stroke and demonstrate early improvement but remain moderately impaired and potentially disabled in the judgment of the examiner, given that these patients often go on to have poor outcomes without treatment.3,7
   b. Perfusion imaging has not been proven to be an effective or safe screening mechanism for selection for treatment with IV tPA outside the 4.5 hour time window.4
II. While the efficacy for endovascular therapies for stroke (EVT) is less likely to be of benefit beyond 6-8 hours from time LKW,8,9 benefits can be seen in select patients up to 24 hours from last known well.10 We do not use any specific time frame, age or stroke severity to exclude patients from EVT. We select patients for treatment based on whether the CTA demonstrates a large vessel occlusion (LVO), whether the CTP demonstrates a favorable ratio of core infarct to penumbra, and whether a clinical benefit is felt to be likely following thrombectomy.

See references at the end of the ED Stroke Packet.
DIRECT TO CT (D2CT) PATHWAY

**EMS pre-hospital care:**
- Perform CPSS and note time Last Known Well (LKW)
- Review Pre-Hospital Stroke Checklist for EMS Direct-to-CT (D2CT) Activation
- Ask the 3 tPA questions (See tPA Eligibility, page 1)
- If the patient is appropriate for D2CT Pathway, EMS communicates with MMC ED Attending via REMIS of a potential stroke appropriate for the D2CT Pathway & provides an ETA
- Minimize time on-scene, if possible, manage patient during transport
- Check FSBS, treats abnormalities as indicated per Maine EMS guidelines
- Place 1-2 large bore IVs in the antecubital fossae, with luer lock if possible
- Remove heavy clothing and jewelry from the patient if possible
- Once 10 minutes out from MMC, notify REMIS to send a “Direct-to-CT stroke patient, ETA 10 min” page

**REMIS sends a Direct-to-CT Stroke Alert with ETA to:**
- CT technologists
- ED physician
- ED CC RN
- ED nurse coordinator
- ED triage nurse
- Registration

**PRIOR TO ARRIVAL:**
- CT TECHNOLOGISTS:
  - Clear one of the ED CT scanners
  - Ensure Hoyer blue pad is available for obtaining patient weight prior to CT

**ARRIVAL:**
- Patient is met IN THE AMBULANCE BAY by registration, ED CC RN and ED physician
- The patient is quickly assessed for any signs of medical instability & clinical symptoms of stroke
- If the pt is medically stable, proceed directly to the CT scanner; if unstable, pt taken to CC bay for stabilization

**REGISTRATION:** Register the patient in the system
- ED PHYSICIAN: (Further assessment should occur in or just outside the CT scanner, not in the ambulance bay)
  - Confirm LKW and performs a RACE Score: If Race Score is greater than or equal to 5 the Neurointerventionalist (NI) is also paged directly at this time
  - Note any clear contraindications to tPA (See tPA Eligibility Criteria, page 1)
  - If the patient appears to be having a stroke and no clear contraindications to tPA are identified, the ED physician places orders using the ED Acute Stroke Order Set and activates an ED Acute Stroke Alert (See Guidelines for Activation of an ED Acute Stroke Alert)
- ED RN: (done in or just outside the CT scanner, not in the ambulance bay)
  - Check the IVs and draws blood; checks FSBG if not done by EMS
  - Label blood with chart labels and send to lab in a blue top conical container labeled with a Stroke Alert sticker
  - Attach patient to cardiac monitor

**CT TECHNOLOGISTS:** Move patient onto the Hoyer blue pad and weigh pt before the CT is performed
- CT head initiated, followed by CTA and/or CTP
- NEUROLOGIST: Responds to ED Stroke Alert page by phone within 5 minutes and is at bedside ASAP (max less than 45 min). This may be via telestroke between the hours of 7pm and 7am, which would be done in the Critical Care bay after CTs are done.
- RADIOLOGIST: Interprets the CT/CTA/CTP ASAP (goal less than or equal to 5 min post processing) and calls the ED Physician with results
- LAB Tech: Processes Stroke Alert labs STAT (goal door-to-lab result time less than 45 min)
- ED Pharmacist: Prepares tPA STAT if ordered (goal order-to-delivery 10 min)

**ASSESSMENT & PLAN:**
- NEUROLOGIST reviews scans and patient presentation and recommend tPA if indicated. If the patient is felt to be a good endovascular therapy (EVT) candidate, the NEUROLOGIST is ultimately responsible for ensuring the NI is contacted
- ED PHYSICIAN orders tPA and ensures BP is at goal prior to infusion (See Pre and Post tPA BP Management)
  - tPA administration should occur ASAP, even if the patient is still in the CT scanner

**NEUROINTERVENTIONALIST:**
- Evaluates imaging and the patient as needed
- If the patient is felt to be a good EVT candidate, the NI activates the Neurointerventional Radiology (NIR) team and pages the anesthesiologist
- If tPA is also indicated, it should be initiated prior to transfer to the NIR Suite
- The patient is transported STAT to the NIR suite
- Time to groin puncture minimized

**ED Acute Stroke Alert sent to:**
- Neurologist
- Neurology APP
- Radiologist
- SCU coordinators
- Stroke nurse coordinator
- Stroke data coordinator
- CT technologists
- Lab tech
- ED Pharmacist

**T = 10 min**

**T = 0**

**T ≤ 15 min**

**T ≤ 45 min**

**T ≤ 90 min**

**Revised Jan 2018**
Patient experiences symptoms concerning for acute stroke

**ED ACUTE STROKE PATHWAY**
- Patient is in the community and transported to MMC via POV
  - EMS performs CPSS, notes time LKW and Activates D2CT Pathway for suspected acute stroke
  - Patient arrives at MMC via walk-in
- Patient is evaluated in the CC bay by an ED physician & RN; RACE Score and NIHSS performed
- Acute Stroke Suspected; ED Acute Stroke Order Set is used; ED Stroke Alert is activated
  - CT/CTA +/- CTP ordered STAT; pt transported ASAP

**ENDOVASCULAR STROKE TRANSFER PATHWAY**
- Patient is admitted to or initially taken to an OSH and LVO is suspected or identified in need of STAT transfer to MMC
- OSH contacts NI via REMIS and the patient is accepted for transfer; Endo Stroke Alert “Heads Up” ETA page is sent
  - EMS transports patient to MMC ED and sends an Endo Stroke Alert “Update” page with ETA when 10-30 min out
  - EMS transports patient to MMC ED and sends an Endo Stroke Alert “Update” page with ETA when 10-30 min out
- Patient arrives at MMC ED via transfer; REMIS announces overhead “Endo Stroke Patient Direct to CT”
  - Patient is evaluated in the Ambulance Bay by an ED physician & RN for medical stability and signs of stroke
- Inpatient Stroke Alert is called; Inpatient Acute Stroke Order Set is used
  - Patient is evaluated in their room by the Neurologist if the Neurologist is in house
- Acute Stroke Suspected
  - CT/CTA +/- CTP ordered STAT; pt transported ASAP

**INPATIENT ACUTE STROKE PATHWAY**
- Patient hospitalized at MMC RN/Clinical staff suspects stroke
- Possible Acute Stroke is activated; N.APP evaluates the patient; NIHSS performed;
  - Inpatient Stroke Alert is called; Inpatient Acute Stroke Order Set is used

**CT/CTA +/- CTP performed; Neurologist/NI reviews scans and evaluates/reevaluates patient after scans complete**

- tPA candidate? Yes
  - tPA ordered STAT and initiated ASAP
  - BP controlled per Pre and Post tPA BP Guidelines
  - Patient requires ICU level monitoring post tPA
  - tPA candidate? No
  - EVT candidate? Yes
  - LVO confirmed, Favorable penumbral pattern;
    - Patient is taken to NIR Suite STAT
    - Patient requires ICU level monitoring post EVT
  - EVT candidate? No

Created Jan 2018

* D2CT pathway: DTCT goal ≤ 15 min; Endo Stroke Pathway: DTP goal ≤ 60 min
Patient in the community experiences symptoms concerning for acute stroke

- Patient transported to MMC via POV
- Patient arrives at MMC via ED walk-in
- Patient met by greeter in the ED; stroke symptoms identified; pt triaged to CC bay
- Patient is evaluated in the CC bay by an ED physician & RN

**ED Nurse Evaluation:**
- Places Hoyer pads under patient when moved onto ED stretcher
- Ensures 2 large bore IVs in place
- Check FSBS
- Draws and labels blood with patient stickers
- Pt is Kept NPO with HOB at 30 degrees

**ED Physician Evaluation:**
- Confirms presentation is consistent with acute stroke
- Establishes symptom onset/time LKW
- Asks 3 tPA questions (See tPA Eligibility Criteria, page 1); clarifies any Yes answers.
- Performs NIHSS and RACE Score

If the pt is a tPA candidate based on initial information and exam, tPA should be ordered immediately after head CT excludes hemorrhage and pharmacy STAT line (662-333) should be called to expedite mixing and delivery if pharmacist is not available in the ED.

Acute Stroke is suspected → ED Acute Stroke Alert is activated

- CT/CTA +/- CTP ordered STAT; pt transported ASAP
- Patient taken directly to CT; See D2CT Pathway

**CT/CTA +/- CTP performed; Neurologist reviews scans and evaluates/reevaluates the patient after scans complete***

**tPA candidate?**
- Yes → tPA ordered STAT and initiated ASAP; See Pre and Post tPA BP Protocol
- No → Patien tis taken to NIR Suite STAT

**EVT candidate?**
- Yes → NI Team to Use the Cerebral Thrombectomy Post-Procedure Order Set

Created Jan 2018

*After hours, the Neurologist may evaluate the pt via TeleStroke following the CT scan
LKW/Onset of symptoms

Patient experiences symptoms concerning for acute stroke

Provider at an Outside Hospital (OSH) identifies a patient with a suspected or confirmed large vessel occlusion (LVO)

OSH provider calls REMIS 662-2950 and asks to speak with the on call Neurointerventionalist (NI) to discuss the case

Neuroimaging will be pushed to Impax and reviewed by the NI whenever possible. Clinical features including age, time LKW, baseline functional status and family wishes will be considered.

Patient felt to be a good endovascular (EVT) candidate?

No

The NI considers whether there is need for transfer for other stroke related care and triages as appropriate

YES

ED-to-ED transfer to MMC STAT is recommended by the NI and REMIS is asked to send an Endo Stroke Alert Page “Heads Up” page with the patient’s estimated time of arrival (ETA)

EMS transports patient to MMC ED and sends an Endo Stroke Alert “Update” page with ETA when 10-30 min out

Patient arrives at MMC ED via transfer; REMIS announces overhead “Endo Stroke Patient Direct to CT”

Patient is evaluated in the ambulance bay by ED physician & RN (See D2CT Pathway)

ED Acute Stroke Alert is NOT activated

Patient taken to directly to CT

CT/CTA/CTP performed as directed by the NI; NI reviews scans and evaluates patient after scans complete

The NI will involve the Neurologist if needed

The NI will communicate with the NCC Team regarding the final disposition of the patient following the assessment for potential EVT

Patient admitted to the appropriate level of care

Yes

EVT candidate?

Yes

Patient is taken to NIR Suite STAT

NCC to use the appropriate Ischemic Stroke ICU Order Sets

NI to use the Cerebral Thrombectomy Post-Procedural Order Set

No

Use the Ischemic Stroke ICU Order Sets for ICU admissions

Use the Gen Med Ischemic Stroke Admission Order Set for floor admissions

Use the ED Acute Stroke Order Set

T = 0

T ≤ 15 min

T ≤ 60 min

Created Jan 2018
In-Patient experiences symptoms concerning for acute stroke

Patient is hospitalized at MMC
RN/Clinical staff suspects stroke symptoms

REMIS pages:
“Possible Inpatient Stroke,
Room ___. APP to call xxx-xxxx”
- Neurology APP 580-5621 (7AM – 7PM)
- NCC Care APP 741-3091 (7PM – 7AM)
AND Code White
- SCU coordinator
- Respiratory Therapist

An Inpatient Stroke Alert is NOT activated.
N.APP discusses the case with an appropriate attending and documents the encounter in Epic.

REMIS pages:
“Inpatient Acute Stroke Alert,
Room ___, Neurologist to call xxx-xxxx STAT”
- Neurologist
- Phlebotomist
- CT technologist
- Pharmacist
- Radiologist
- Nursing Supervisor
- ED & SCU Coordinators
- R2 Charge Nurse & Float Nurse
- Stroke Program Manager
- Stroke Data Coordinator

If the pt is a tPA candidate based on initial information and exam, tPA should be ordered immediately after head CT excludes hemorrhage and pharmacy STAT line (662-3333) should be called to expedite mixing and delivery if pharmacist is not available in the ED.

Patient's RN:
- Establishes time LKW
- Check VS and FSBG
- Ensures 2 large bore IVs in place
- Attaches patient to cardiac monitor
- Prepares patient for STAT transport to CT
Primary Team:
- Comes to the bedside STAT
- Assesses patient
- Helps provide history to the N.APP

Next:
RN calls REMIS and states “Possible Inpatient Stroke” AND notifies the patient’s primary team of concern for stroke

N.APP & Code White team evaluate the patient;
NIHSS performed

LKW/Onset of symptoms

T = 0

CT/CTA +/- CTP performed;
Neurologist reviews scans and evaluates/reevaluates patient after scans complete

Yes

CT/CTA +/- CTP ordered STAT; pt transported ASAP and is accompanied by an ICU nurse and the N.APP

No

T ≤ 20 min

T ≤ 45 min

T ≤ 90 min

If the pt is a tPA candidate based on initial information and exam, tPA should be ordered immediately after head CT excludes hemorrhage and pharmacy STAT line (662-3333) should be called to expedite mixing and delivery if pharmacist is not available in the ED.

Neurologist reviews scans and evaluates/reevaluates patient after scans complete

TPA CANDIDATE:
TPA ordered STAT and initiated in the ED CC area;
Patient is managed and monitored there by an ED RN until an ICU bed is available or pt is taken to NIR Suite for EVT
BP controlled per Pre and Post tPA BP Guidelines

EVT CANDIDATE:
The Neurologist will contact the Neurointerventionalist
The Neurointerventionalist will activate the NIR team and anesthesia
Patient is taken to NIR Suite STAT

Post tPA or EVT, the patient will need to be bedded in an ICU
If pt is not already on a service that manages patient in an ICU, transfer of care to an ICU service requires and attending-to-attending phone call and the Primary Team will maintain management of the patient until the ICU team is able to assume care.

*If the Neurologist is in house initial evaluation will occur in the patient’s room; After hours, the evaluation may occur in a CC bay following the CT scan

Patient is either transported back to their original room or change in bed placement is made as clinically indicated with ongoing management by the Primary Team.

Created Jan 2018
tPA Eligibility Criteria, Page 1

EMS and/or ED physician asks these 3 tPA eligibility questions and documents responses.

**ED physician** will review the patient’s clinical presentation/medical history and document specifics of any “Yes” answer to the 3 tPA questions.

**Clinical presentation/medical history**

- **Higher risk**
  - tPA is contraindicated
    - LKW greater than 4.5h
    - Sx concerning for SAH
  - tPA is not recommended/potentially harmful
    - BP cannot be lowered to less than 185/110
    - Sx concerning for endocarditis
    - Known or suspected aortic dissection
    - Age less than 18
    - Ischemic stroke within 3 mo
    - NIHSS greater than 25
      - In the 3-4.5 hr window
  - tPA may be considered/may be reasonable, especially if moderate to severe stroke
    - Pregnancy
    - Myocardial infarction within 3 months
    - Acute pericarditis or LV/LA thrombus

- **Lower risk**

**Have you had any recent trauma, surgeries or procedures?**
- Severe head trauma within 3 months
- Intracranial or intra-spinal surgery within 3 months
- Major non-cranial surgery or trauma within 14 days with uncontrollable bleeding site (e.g. internal organs)
- Arterial puncture at a non-compressible site within 7 days
- Lumbar puncture within 7 days
- Major non-cranial surgery or trauma within 14 days with controllable bleeding site (e.g. limb)

**Have you had any bleeding problems?**
- History of intracranial hemorrhage
- Structural GI malignancy or GIB within 21 days
- Arterial puncture at a non-compressible site within 7 days
- GI or GU bleeding more than 21 days ago
- Hemorrhagic ophthalmologic condition
- Menorrhagia*

**Are you taking any blood thinners?**
- Warfarin use with INR greater than 1.7
- UFH use with an elevated aPPT
- Therapeutic dose LMWH within 24 hours
- NOAC use within 48 hours

**NOACs:**
- Dabigatran (Pradaxa)
- Rivaroxaban (Xarelto)
- Apixaban (Eliquis)
- Edoxaban (Savaysa)

*If there is a history of recent or active vaginal bleeding causing clinically significant anemia, then emergency consultation with a gynecologist is recommended before a decision about tPA is made.

The ED physician will relay any potential contraindications to the Consulting Neurologist.

Created Jan 2018
ED work up includes STAT labs and imaging

**Higher risk**
- tPA is contraindicated

**tPA is not recommended/potentially harmful**

Safety and efficacy of tPA is not well established

**Lower risk**
- tPA may be considered/may be reasonable, especially if moderate to severe stroke

**Imaging**
- Head CT
  - Acute intracranial hemorrhage
  - Completed infarct (obvious hypodensity on CT)
  - Intra-axial intracranial neoplasm (not extra-axial intracranial neoplasm, i.e., meningioma)
  - Intra-cranial arterial dissection (not extra-cranial arterial dissection)
  - Unruptured or untreated intracranial vascular malformation
  - Cerebral aneurysm more than 1 cm in size

**Labs**
- Platelets less than 100,000
- PT greater than 15 sec or INR greater than 1.7
- aPTT greater than 40 sec
- BG less than 50 or greater than 400 and neurological deficits persist 15 min after correction to euglycemia

*Do not delay tPA administration waiting for lab results if the pt has no history or reason to suspect anticoagulant use, and has no h/o abnormal bleeding.

If the above abnormalities are unexpectedly found on labs after initiation of tPA, further tPA infusion should be stopped.

NOTE: These conditions may be historical and CTA is not needed for decisions regarding the use of tPA
Pre and Post tPA and EVT Blood Pressure Management Protocol

Patient identified as an appropriate IV tPA candidate (See tPA Eligibility Criteria) or an EVT candidate without tPA

BP less than 185/110?

Yes

Proceed with IV tPA Administration/EVT.

Maintain BP less than 180/105 during and for 24 hours after tPA administration/thrombectomy.

No

BP less than 185/110 within 5 min of IV labetalol x2?

Yes

Continue BP checks every 15 min during the infusion and for 2 hours after the infusion is complete or perfusion restored. If further BP management is needed, continue monitoring every 15 min or less.

No

BP less than 185/110 after titration of nicardipine?

Yes

Start labetalol* 5-10 mg IV x1 STAT
May repeat x1 if not at goal

*If pt has bradycardia or bronchospasm, do not use labetalol, go straight to nicardipine gtt.

Start nicardipine gtt at 5 mg/hr,
Increase by 2.5 mg/hr every 5 min to max 15 mg/hr

IV-tPA is contraindicated
EVT is not contraindicated

If BP remains stable for 2 hours with BP checks every 15 min, checks can be changed to every 30 min x 6 hours. If BP remains stable for 6 hours with BP checks every 30 min, checks can be changed to every hour x 16 hours. Frequency of BP checks thereafter should be individualized to meet the patient’s needs.

NCC team to use POST-thrombolysis Stroke Admission Order Set
NI team to use Cerebral Thrombectomy Post Procedure Order Set and specify BP parameters per the NI

Ischemic stroke patients who are NOT tPA candidates should NOT have BP lowered unless it is greater than 220/120 unless there is another compelling medical reason to do so such as acute coronary event, acute heart failure, aortic dissection, or preeclampsia/eclampsia or if they are more than 48-72 hours post onset of stroke.

HYPotension is rare in acute stroke and should prompt rapid assessment for possible etiologies, such as hypovolemia, internal bleeding, myocardial ischemia, arrhythmias or sepsis. Hypotension should be treated immediately with volume replacement with normal saline, correction of any arrhythmias and consideration of pressors in select patients (discuss with Neurology). Maintain euvolesmia in all stroke patients (patient’s made NPO should be given maintenance rate normal saline).

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Management of Post-tPA Complications

Monitor all patients given tPA closely for **clinical worsening** and **orolingual swelling** during and a minimum of 24 hours after tPA infusion.

- **Patient develops severe headache, acute hypertension, nausea, vomiting or has a worsening neurological status**
  - Stop tPA infusion immediately
  - Use Post-tPA Hemorrhage Order Set
    - STAT CBC and Coag panel, Bleeding patient
    - Type & Cross (if not already done)
    - STAT head CT
  - CT confirms hemorrhage
    - Administer 10 units cryoprecipitate infused over 10-30 min STAT
    - Administer Tranexamic acid 1000 mg IV infused over 10 min OR e-aminocaproic acid 4 gm IV over 1hr, followed by 1 gm/hr every 8hr IV until bleeding is controlled
    - Maintain BP less than 160/100
    - Consider Neurosurgical and Hematology consults
  - CT excludes hemorrhage
    - Resume tPA infusion
  - If there is further increase in angioedema after these measures, or if stridor or eminent respiratory compromise develops, administer
    - 0.1% epinephrine 0.3mL subcutaneously or by nebulizer 0.5 mL

- **Patient develops edema of the tongue, lips, mouth or oropharynx**
  - Stop tPA infusion immediately
  - Use Post-tPA Orolingual Edema Order Set
    - Hold
      - ACE inhibitors
      - Administer:
        - Diphenhydramine 50 mg IV x1
        - Famotidine 20 mg IV x1
        - Methylprednisolone 125 mg IV x1
      - Provide
        - Close monitoring of respiratory status
    - If there is further increase in angioedema after these measures, or if stridor or eminent respiratory compromise develops, administer
      - 0.1% epinephrine 0.3mL subcutaneously or by nebulizer 0.5 mL

- **Fibrinogen less than 200**
  - Administer another 10 units cryoprecipitate

- **Platelets less than 100,000**
  - Administer 1 unit pheresis platelets

- **INR Greater than or equal to 1.5**
  - Use Warfarin-Associated CNS Hemorrhage Order Set in Epic

Revised Jan 2018

Icatibant 3 mL (30 mg) subcutaneously in abdominal area; additional injection of 30 mg may be administered at intervals of 6h not to exceed total of 3 injections in 24 h; and plasma-derived C1 esterase inhibitor (20 IU/kg) have been successfully used in hereditary angioedema and ACEI-related angioedema and may be considered if edema is severe and persists despite the above measures.
Patient diagnosed with acute non-traumatic intracranial hemorrhage (ICH or SAH)

Monitor blood pressure every 10 minutes
- **ICH GOAL BP less than 160/100**
- **SAH GOAL BP less than 140/90**

Review history of anti-coagulation use and obtain **STAT Coagulation Panel**

- **Warfarin** (Coumadin, Jantoven)
- Direct thrombin inhibitor
  - Dabigatran (Pradaxa)
- Direct FXa inhibitor
  - Rivaroxaban (Xarelto)
  - Apixaban (Eliquis)
  - Edoxaban (Savaysa)
- **IV Unfractionated Heparin**
- **Low Molecular Weight Heparin**

Patients with signs/symptoms of increased intracranial pressure

Transfer to Neurocritical Care and Neurosurgery

- **Labetalol** 5-10 mg IV every 5-10 min, up to 2 doses. If BP not at goal:
- **Nicardipine** gtt start at 5 mg/hr, ↑ by 2.5 mg/hr every 5 min to attain goal; Max 15 mg/hr

**Initiate administration of reversal agents **

**Use Warfarin-Associated CNS Hemorrhage Order Set in Epic**
1. **Vitamin K 5 mg IV x1**
2. **4-Factor PCC (Kcentra)** IV x1
   - INR 1.6-1.9 give 15 units/kg
   - INR greater than or equal to 2.0 give 25 units/kg
3. Repeat INR 30 min post-PCC dose. If INR greater than 1.5, give additional 10 units/kg

- **Idarucizumab** 2.5 gm IV x2, given 15 min apart; **Pharmacy c/s required** 741-7933.
- Activated charcoal at standard doses if last dose was within 1-2 hours
- Maintain adequate diuresis with fluid replacement and hemodynamic support
- PCC, FFP and FVIIa do not appear to be effective & should not be administered
- Hemodialysis can be considered

<table>
<thead>
<tr>
<th>Protamine dose</th>
<th>Heparin dose</th>
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<tr>
<td>1 mg protamine</td>
<td>1 mg protamine</td>
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<tr>
<td>per 100 units of heparin given over last 2 hours (ex. 1000 units/hr infusion x 2 hours = 2000 units UFH = 20 mg protamine); Max 50 mg</td>
<td></td>
</tr>
<tr>
<td>If last administration less than 8 hours ago: 1 mg protamine per 1 mg LMWH; Max 50 mg</td>
<td></td>
</tr>
<tr>
<td>If last administration more than 8 hours ago: 0.5 mg protamine per 1 mg LMWH; Max 50 mg</td>
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- **Transfuse 1pheresis unit of platelets**
- **Transfuse cryoprecipitate 1 unit per 10 kg body weight**

**Use Brain Herniation and ICP Crisis Order Set in Epic**
- Administer mannitol 1 gm/kg IV x1
- Keep head of bed greater than 30 degrees
- Appropriate use of ventilator support and use end-tidal CO2 monitoring

**Note:** Prophylactic anti-seizure medication is NOT indicated for primary ICH.
- **Phenobarbital 15-20 mg PE/kg IV over 100-150 mg PE/min x1 OR**
- **Levetiracetam 1000 mg IV x1**

A. **OPTIONS TO KCENTRA:**
- 3-factor PCC (Profilnine) IV at 10 ml/min
  - INR 1.6-4.0
  - Profilnine dose 25 units/kg
- Cross-matched FFP 2 units IV x1
- Factor VIIa 20 mcg/kg IV x1

B. **Signs/symptoms of increased intracranial pressure:**
- Headache, nausea, vomiting, diplopia, anisocoria, increased blood pressure, slow heart rate, altered respiratory pattern, seizures, confusion, depressed level of consciousness, coma

C. **PE = Phenytoin Equivalent: fosphenytoin 1.5 mg = phenytoin 1 mg**
Dysphagia Screen Protocol
To be performed in ALL patients with symptoms or diagnosis of stroke
PRIOR TO ANY PO intake (including meds)

Yes  No
☐  ☐ Patient has a depressed level of consciousness or is unable to sit upright for testing
☐  ☐ Patient is currently eating a modified diet secondary to dysphagia
☐  ☐ Patient has an existing PEG tube or other abdominal feeding tube
☐  ☐ Patient has a tracheotomy tube

Proceed with 3 oz Water Swallow Screen Protocol:

Step 1:
- Sit patient upright at 80-90 degrees
- Ask the patient to drink a teaspoon of water and assess for the following during or immediately after completion of drinking:
  - Coughing
  - Choking
  - Wet voice
- If any of the above observed patients fails the screen

Step 2:
- If none of the above observed repeat step 1
- If none of the above is observed after two teaspoons of water continue to step 3

Step 3:
- Ask patient to drink the entire 3-ounces (90mL) of water from a cup or with a straw, in sequential swallows, and slow and steady but without stopping.
  (Note: Cup or straw can be held by screener or patient)
- Assess patient for coughing or choking during or immediately after completion of drinking
- If any of the above is observed the patient fails the screen

RESULTS OF DYSPHAGIA SCREEN: ☐ PASS ☐ FAIL
RESULTS OF THE DYSPHAGIA SCREEN MUST BE DOCUMENTED IN EPIC PRIOR TO ANY PO INTAKE

Revised Jan 2018
NIH Stroke Scale

| 1a. Level of Consciousness: | 0 = Alert (eyes open spontaneously)  
1 = Arousable (requires minor stimulation to obey, answer, or respond)  
2 = Obtunded (requires repeated stimulation to attend)  
3 = Coma (responds only with reflex motor or autonomic effects or totally unresponsive) |
| 1b. LOC Questions: | 0 = Answers both questions correctly  
1 = Answers one question correctly. Intubation, orotracheal trauma, severe dysarthria and language barrier also score 1.  
2 = Answers neither question correctly, including aphasic and stuporous patients who do not comprehend the questions. Coma = 2 |
| 1c. LOC Commands: | 0 = Performs both tasks correctly  
1 = Performs one task correctly  
2 = Performs neither task correctly. Coma = 2 |
| 2. Best Gaze: | 0 = Normal; Congenital strabismus, vertical gaze palsy, nystagmus; skew deviation.  
1 = Gaze palsy that can be overcome by voluntary or reflexive (Doll's maneuver) eye movement. Isolated cranial nerve palsy also scores 1.  
2 = Forced deviation that cannot be overcome by voluntary or reflexive eye movement |
| 3. Visual fields: | 0 = No visual loss or monocular vision loss  
1 = Partial hemianopia, quadrantanopia or visual neglect  
2 = Complete hemianopia  
3 = Bilateral blindness (blind including cortical blindness) |
| 4. Facial Palsy: | 0 = Normal symmetrical movements  
1 = Minor paralysis (flattened nasolabial fold, asymmetry on smiling)  
2 = Partial paralysis (total or near-total paralysis of lower face)  
3 = Complete paralysis of one or both sides (upper and lower face). Coma = 3 |
| 5. Motor Arm: | 0 = No drift; arm held at 90 (or 45 if lying down) degrees x 10 sec  
1 = Drifts, but does not touch bed x 10 sec  
2 = Drifts down to bed in less than or equal to 10 sec, but has some effort against gravity  
3 = No effort against gravity; arm falls to bed immediately  
4 = No movement or coma  
UN = Amputation or joint fusion, explain: |
| 6. Motor Leg: | 0 = No drift; leg held at 30 degrees x 5 sec  
1 = Drifts, but does not touch bed x 5 sec  
2 = Drifts to bed in less than or equal to 5 sec, but has some effort against gravity  
3 = No effort against gravity; leg falls to bed immediately  
4 = No movement or coma  
UN = Amputation or joint fusion, explain: |
| 7. Limb Ataxia: | 0 = Absent. Ataxia is absent in the patient who cannot understand or is paralyzed. Coma = 0  
1 = Present in one limb  
2 = Present in two limbs  
UN = Amputation or joint fusion, explain: |
| 8. Sensory: | 0 = Normal sensation  
1 = Decreased sensation; pinprick feels less sharp on the affected side. Neglect = 1.  
2 = Absent sensation or bilateral sensory loss. Coma = 2 |
| 9. Best Language: | 0 = No aphasia; normal.  
1 = Mild-to-moderate aphasia; some obvious loss of fluency or facility of comprehension, without significant limitation on ideas expressed or form of expression.  
2 = Severe aphasia; all communication is through fragmentary expression. Range of information that can be exchanged is limited.  
3 = Mute, global aphasia; no usable speech or auditory comprehension. Coma = 3 |
| 10. Dysarthria: | 0 = Normal. Intubated also scores 0.  
1 = Mild-to-moderate dysarthria; patient slurs at least some words and, at worst, can be understood with some difficulty.  
2 = Severe dysarthria; patient’s speech is so slurred as to be unintelligible in the absence of or out of proportion to any dysphasia or is mute/anarthric. Coma = 2.  
UN = Intubated or other physical barrier, explain: |
| 11. Extinction and Inattention (formerly Neglect): | 0 = No abnormality detected.  
1 = Visual, tactile, auditory, spatial, or personal inattention or extinction to bilateral simultaneous stimulation in one of the sensory modalities.  
2 = Profound hemi-inattention or extinction to more than one modality; does not recognize own hand or orients to only one side of space. Coma = 2. |
| TOTAL | |
# R.A.C.E. Score

**Rapid Arterial Occlusion Evaluation Scale.**

Used to predict large vessel occlusion (LVO)^2

<table>
<thead>
<tr>
<th>Item</th>
<th>Instruction</th>
<th>Interpretation</th>
<th>Score</th>
</tr>
</thead>
</table>
| Facial palsy      | Ask the patient to show their teeth                                        | • Symmetric facial movement  
|                   |                                                                           | • Slight asymmetry  
|                   |                                                                           | • Obvious facial droop                                                      | 0     |
|                   |                                                                           |                                | 1     |
|                   |                                                                           |                                | 2     |
| Arm motor         | Extend the paretic arm 90 degrees (if sitting) or 45 degrees (if supine) x10 sec | • Limb does not fall  
|                   |                                                                           | • Limb drifts, but some effort against gravity  
|                   |                                                                           | • Patient unable to lift arm against gravity                                  | 0     |
|                   |                                                                           |                                | 1     |
|                   |                                                                           |                                | 2     |
| Leg motor         | Extend the paretic leg 30 degrees (when supine) x5 sec                    | • Limb does not fall  
|                   |                                                                           | • Limb drifts, but some effort against gravity  
|                   |                                                                           | • Patient unable to lift leg against gravity                                  | 0     |
|                   |                                                                           |                                | 1     |
|                   |                                                                           |                                | 2     |
| Head/gaze deviation* | Observe for eyes and/or head deviation to one side | • No deviation, horizontal eye movements intact  
|                   |                                                                           | • Eyes and/or head deviated to one side                                      | 0     |
|                   |                                                                           |                                | 1     |
| Aphasia*          | Ask the patient to follow 2 verbal commands:  
|                   | • Close your eyes  
|                   | • Make a fist                                                 | • Performs both tasks  
|                   |                                                                           | • Performs one task  
|                   |                                                                           | • Performs neither task                                                     | 0     |
|                   |                                                                           |                                | 1     |
|                   |                                                                           |                                | 2     |
| Agnosia           | Ask the patient, “Who’s arm is this?” while showing the patient his/her paretic arm and “Can you move your arm?” | • Recognizes their deficits and that the arm is their own  
|                   |                                                                           | • Either unable to recognize their deficit or their arm  
|                   |                                                                           | • Unable to recognize their deficit and their own arm                       | 0     |
|                   |                                                                           |                                | 1     |
|                   |                                                                           |                                | 2     |

**RACE SCORE TOTAL**

* Presence of gaze deviation or global aphasia (mute and does not follow commands) or any score greater than or equal to 5 = high likelihood of an LVO

Reviewed Jan 2018
# Stroke Severity Scores

## PRE-STROKE Modified Rankin Scale: ALL STROKE

<table>
<thead>
<tr>
<th>Score</th>
<th>Score Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No disability</td>
</tr>
<tr>
<td>1</td>
<td>No disability, but symptoms</td>
</tr>
<tr>
<td>2</td>
<td>Slight disability</td>
</tr>
<tr>
<td>3</td>
<td>Moderate disability</td>
</tr>
<tr>
<td>4</td>
<td>Moderately severe disability</td>
</tr>
<tr>
<td>5</td>
<td>Severe disability</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No disability, no symptoms</td>
</tr>
<tr>
<td>1</td>
<td>No significant disability despite symptoms; able to carry out all usual duties and activities</td>
</tr>
<tr>
<td>2</td>
<td>Unable to carry out all previous activities, but able to look after own affairs without assistance</td>
</tr>
<tr>
<td>3</td>
<td>Requiring some help, but able to walk without assistance (assist devices, i.e. cane or walker, are allowed)</td>
</tr>
<tr>
<td>4</td>
<td>Unable to walk without personal assistance and unable to attend to own bodily needs without assistance</td>
</tr>
<tr>
<td>5</td>
<td>Bedridden, incontinent and requiring constant nursing care and attention</td>
</tr>
</tbody>
</table>

## Glasgow Coma Scale: ALL INTRACRANIAL HEMORRHAGE

<table>
<thead>
<tr>
<th>Eyes</th>
<th>Verbal</th>
<th>Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spontaneous</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Voice</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Pain</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

## The ICH Score: ALL SPONTANEOUS INTRACRANIAL HEMORRHAGE

<table>
<thead>
<tr>
<th>GCS score on initial presentation (or after resuscitation)</th>
<th>ICH volume on initial CT (via ABC/2 method)</th>
<th>Presence of any IVH on initial CT</th>
<th>Infratentorial origin of ICH</th>
<th>Age, yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>3–4</td>
<td>Greater than or equal to 30 mL</td>
<td>Yes</td>
<td>Yes</td>
<td>Greater than or equal to 80 years old</td>
</tr>
<tr>
<td>5–12</td>
<td>Less than 30 mL</td>
<td>No</td>
<td>No</td>
<td>Less than 80 years old</td>
</tr>
<tr>
<td>13–15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Hunt & Hess Score: ALL SUBARACHNOID HEMORRHAGE

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic, mild HA, slight nuchal rigidity</td>
<td>1</td>
</tr>
<tr>
<td>Moderate-to-severe HA, nuchal rigidity, no deficit other than cranial nerve palsy</td>
<td>2</td>
</tr>
<tr>
<td>Drowsy or confusion, mild focal deficit</td>
<td>3</td>
</tr>
<tr>
<td>Stuporous, moderate-to-severe hemiparesis</td>
<td>4</td>
</tr>
<tr>
<td>Comatose, decerebrate posturing</td>
<td>5</td>
</tr>
</tbody>
</table>

Reviewed Jan 2018
MH Clinical Practice Guidelines for the Administration of IV tPA for Treatment of Suspected Acute Ischemic Stroke

1. MaineHealth recognizes that IV tPA is the standard of care for the treatment of patients presenting with symptoms of acute stroke in whom the benefits are felt to outweigh the risk by the treating physician.

2. MaineHealth does not require written consent for the use of tPA to treat patients with presumed acute ischemic stroke within the FDA approved guidelines or within the scope of guidelines published by the American Heart Association/American Stroke Association. However, an informed discussion with the patient and/or patient representative regarding risks and benefits of tPA use for stroke is highly recommended, and written consent should be obtained where feasible. Where written consent is not feasible, documentation of this discussion in the patient’s medical record is highly recommended.

3. Patients presenting with aphasia or other cognitive impairments that do not allow for an informed discussion regarding the risks and benefits of tPA should not be denied this treatment if, to the best of the treating physician’s ability, the patient is determined to be a good candidate for tPA.

   • AHA/ASA Recommendation: “In an emergency, when the patient is not competent and there is no immediately available legally authorized representative to provide proxy consent, it is recommended to proceed with IV tPA in an otherwise eligible patient with acute ischemic stroke.”

4. There are many clinical situations where a patient presents with symptoms consistent with a stroke, but are ultimately found to have another explanation for the deficits. We call these “stroke mimics.” Differentiating stroke from another cause can be difficult, especially given the urgency of the initial work up and goal of rapid tPA administration.

   • AHA/ASA Recommendation: “The risk of symptomatic intracranial hemorrhage in the stroke mimic population is quite low; thus, starting IV alteplase is probably recommended in preference over delaying treatment to pursue additional diagnostic studies.”

5. The following language is recommended for consistent information to be provided to patients and their families regarding the risks and benefits of tPA for the treatment of stroke.

<table>
<thead>
<tr>
<th>Time frame</th>
<th>Risk (severe bleeding complications)</th>
<th>Benefit (less disability at 3 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-90 min (1.5 hours)</td>
<td>1 in 25</td>
<td>1 in 3</td>
</tr>
<tr>
<td>91-180 min (1.5 - 3 hours)</td>
<td>1 in 18</td>
<td>1 in 7</td>
</tr>
<tr>
<td>181-270 min (4.5 hours)</td>
<td>1 in 22</td>
<td>1 in 14</td>
</tr>
</tbody>
</table>

Reviewed Jan 2018
3. Thrombolysis in Patients With Mild Stroke Results From the Austrian Stroke Unit Registry. Stroke.2014;45:765-769.
10. Thrombectomy 6 to 24 hours after Stroke with a Mismatch between Deficit and Infarct. NEJM.2017;378:11-21.
21. ECASSIII. Thrombolysis with Alteplase 3 to 4.5 Hours after Acute Ischemic Stroke. NEJM.2008;359:1317-29.