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.

Revised Jan 2019
J. Morris, MD
MMC ED Guidelines for Activation of an ED CODE STROKE
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 improving

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 (See tPA Eligibility Criteria, page 1)

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

Patient has symptoms of LVO* and/or FAST-ED Score greater than or equal to 4?

No

Yes

Activate ED Code Stroke 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 Code Stroke.

Proceed with expedient work up. Page Neurology for consult.

STAT CT/CTA +/- CTP and page the on call Neurointerventionalist (NI) and 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>
</tr>
</thead>
<tbody>
<tr>
<td>Right hemiparesis</td>
<td>Left hemiparesis</td>
<td>Sudden-onset depressed LOC or coma</td>
</tr>
<tr>
<td>Right hemianesthesia</td>
<td>Left hemianesthesia</td>
<td>Quadriplegia or hemiplegia</td>
</tr>
<tr>
<td>Left gaze deviation</td>
<td>Right gaze deviation</td>
<td>Hemianopia</td>
</tr>
<tr>
<td>Aphasia</td>
<td>Inattention/neglect of the left side</td>
<td>Ocular palsies, nystagmus, diplopia</td>
</tr>
<tr>
<td>Right side visual field cut</td>
<td>Left side visual field cut</td>
<td>Ataxia, vertigo, nausea/vomiting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dysarthria, dysphagia</td>
</tr>
</tbody>
</table>

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.
   b. Perfusion imaging has not yet been proven to be an effective or safe screening mechanism for selection for treatment with IV tPA outside the 4.5 hour time window.
II. While the efficacy for endovascular therapies for stroke (EVT) is less likely to be of benefit beyond 6-8 hours from time LKW, benefits can be seen in select patients up to 24 hours from last known well. 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.

Jan 2019
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 en route and in the CT scanner, not in the ambulance bay)
- Confirm LKW and performs a FAST-ED Score: If FAST-ED Score is greater than or equal to 4 the Neurointerventionalist (NI) is 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 CODE STROKE (See Guidelines for Activation of an ED Code Stroke)
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 Code Stroke sticker
- Attach patient to cardiac monitor

ED Code Stroke page is sent to:
- Neurologist
- Neurology APP
- Radiologist
- SCU coordinators
- Stroke nurse coordinator
- Stroke data coordinator
- CT technologists
- Lab tech
- ED Pharmacist

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 Code Stroke page by phone within 5 minutes and is at bedside ASAP (max less than or equal to 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 Code Stroke 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 NEUROINTERVENTIONALIST (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

Jan 2019
Patient experiences symptoms concerning for acute stroke

**ED CODE STROKE PATHWAY**

- Patient is in the community and transported to MMC via POV
  - Patient arrives at MMC via ED walk-in
    - Triage RN performs BE-FAST Screen
  - BE-FAST Screen +
    - Patient is triaged to the CC bay and met by an ED physician & RN; NIHSS performed
    - Acute Stroke Suspected; ED Acute Stroke Order Set is used; ED Code Stroke is activated
      - CT/CTA +/- CTP ordered STAT; pt transported ASAP
      - Patient taken to CT (See D2CT Pathway)
  - Patient is evaluated in the en route to CT by an ED physician & RN for medical stability and signs of stroke
    - ED Acute Stroke Order Set is used; ED Code Stroke is NOT activated
    - Patient taken to CT (See D2CT Pathway)

**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 Neurologist and NI via REMIS and the patient is accepted for transfer; Endo Stroke Alert
    - A “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
  - Patient arrives at MMC ED via transfer; REMIS announces overhead “Endo Stroke Patient Direct to CT”
  - Patient is evaluated in route to CT by an ED physician & RN for medical stability and signs of stroke
  - Patient is evaluated en route to the CT by the Neurologist if the Neurologist is in house
  - Acute Stroke Suspected
  - CT/CTA +/- CTP ordered STAT; pt transported ASAP
  - CT/CTA +/- CTP performed; Neurologist/NI reviews scans and evaluates/reevaluates patient after scans complete
  - tPA ordered STAT and initiated ASAP
    - BP controlled per Pre and Post tPA BP Guidelines
    - Patient requires ICU level monitoring post tPA
    - tPA candidate? Yes →
      - Yes or No
        - EVT candidate? Yes →
          - LVO confirmed, Favorable penumbral pattern;
            - Patient is taken to NIR Suite STAT
            - Patient requires ICU level monitoring post EVT

**INPATIENT CODE STROKE PATHWAY**

- Patient hospitalized at MMC RN/Clinical staff suspects stroke
  - Possible Inpatient Stroke is activated
    - Code White team and N.APP evaluates the patient
    - NIHSS performed
    - If stroke is still suspected:
  - Patient is in the community and transported to MMC via EMS
  - Patient arrives at MMC via ED walk-in
    - Triage RN performs BE-FAST Screen
    - Inpatient Code Stroke is called
    - Inpatient Acute Stroke Order Set is used
    - Patient is evaluated in their room or en route to CT by the Neurologist if the Neurologist is in house
    - Acute Stroke Suspected
    - CT/CTA +/- CTP ordered STAT; pt transported ASAP
    - CT/CTA +/- CTP performed; Neurologist/NI reviews scans and evaluates/reevaluates patient after scans complete
    - tPA ordered STAT and initiated ASAP
      - BP controlled per Pre and Post tPA BP Guidelines
      - Patient requires ICU level monitoring post tPA
      - tPA candidate? Yes →
        - Yes or No
          - EVT candidate? Yes →
            - LVO confirmed, Favorable penumbral pattern;
              - Patient is taken to NIR Suite STAT
              - Patient requires ICU level monitoring post EVT

Jan 2019

* D2CT pathway: DTCT goal ≤ 15 min; Endo Stroke Pathway: DTP goal ≤ 60 min

LKW/Onset of symptoms

Patient location

T = 0

T ≤ 20 min*

T ≤ 45 min

T ≤ 90 min*
ED CODE STROKE PATHWAY

**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 FAST-ED Scores

**Acute Stroke is suspected → ED CODE STROKE is activated**

- Walk-in T ≤ 20 min
- 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*

**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**

**Patient triaged to the appropriate level of care**
BP should not be lowered unless over 220/110 unless there is another compelling medical reason to do so

**tPA candidate?**
- tPA ordered STAT and initiated ASAP; See Pre and Post tPA BP Protocol

**EVT candidate?**
- Patient is taken to NIR Suite STAT

**Use the ED Acute Stroke Order Set**

**Use the Ischemic Stroke NON-thrombolysis ICU Order Set** for ICU admissions
**Use the Gen Med Ischemic Stroke Admission Order Set** for floor admissions

**NI Team to Use the Cerebral Thrombectomy Post-Procedure Order Set**

**Jan 2019**

*After hours, the Neurologist may evaluate the pt via TeleStroke following the CT scan*
Patient experiences symptoms concerning for acute stroke

Provider at an Outside Hospital (OSH) identifies a patient with a suspected stroke

OSH provider calls REMIS 662-2050 and asks to speak with the on call MMC Neurologist for an Urgent Stroke Matter

Neuroimaging will be pushed to Impax and reviewed by the Neurologist whenever possible. Large Vessel Occlusion is clinically suspected or imaging confirmed. Clinical features including age, time LKW, baseline functional status and family wishes will be taken into consideration prior to recommending transfer.

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

Yes

The Neurologist request REMIS page the Neurointerventionalist (NI) to discuss the patient with the OSH provider

The NI accepts patient for endovascular therapy (EVT) evaluation REMIS sends an Endo Stroke Alert Page “Heads Up” page with the patient’s estimated time of arrival (ETA)

ED-to-ED transfer to MMC STAT commences EMS transports patient to MMC ED REMIS 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 en route to CT by ED physician & RN (See D2CT Pathway). An 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

Patient admitted to the appropriate level of care

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

The Neurologist considers whether there are other acute stroke treatment options and if there is need for transfer and triages as appropriate

Endo Stroke Alert Page sent to:
- Neurointerventionalist (NI)
- Neurosurgery PA
- Neurologist
- Neurology APP
- Neurocritical care attending
- Neurocritical care APP
- Radiologist
- CICU & SCU Coordinators
- Stroke Program Manager
- Stroke data coordinator
- CT techs
- ED nurse coordinator
- Anesthesiologist
- NIR lab staff

T = 0

T ≤ 15 min

T ≤ 60 min

The OSH ED physician will need to speak with an MMC ED attending to accept the patient in transfer

Use the ED Acute Stroke Order Set

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

NCC to use the appropriate Ischemic Stroke ICU Order Sets NI to use the Cerebral Thrombectomy Post-Procedure Order Set

Jan 2019
**Inpatient Stroke Alert**

Inpatient 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 580-562 (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 CODE STROKE, 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

**N APPROACH:**
- RN calls 662-2345 and states “Possible Inpatient Stroke” AND notifies the pt’s primary team of possible stroke
- N.APP & Code White team evaluate the patient; NIHSS performed

**N APPROACH:**
- Acute Stroke suspected?
  - No
  - Acute Stroke still suspected?
    - Yes
      - **CT/CTA +/- CTP ordered STAT; pt transported ASAP and is accompanied by an ICU nurse and the N.APP**

**N APPROACH:**
- **Patient is evaluated in their room or en route to CT by the Neurologist***
  - **Acute Stroke still suspected?**
    - Yes
      - **CT/CTA +/- CTP performed**
        - Neurologist reviews scans and evaluates/re-evaluates patient* after scans complete

**N APPROACH:**
- tPA or EVT candidate?
  - Yes
    - 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 Neurointerventional
    - The Neurointerventionalist will activate the NIR team and anesthesia
    - Patient is taken to NIR Suite STAT

**N APPROACH:**
- 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.

**N APPROACH:**
- 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.

**N APPROACH:**
- *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*

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**January 2019**

3c
tPA Eligibility Criteria, Page 1

1. Pt presents with potentially disabling symptoms thought most likely to be secondary to ischemic stroke

2. The ED physician will review the patient’s clinical presentation/medical history and communicate any “Yes” answer to the 3 tPA questions to the Neurologist

- Higher risk
  - tPA is contraindicated
    - LKW greater than 4.5h
    - Sx concerning for SAH
    - 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 is not recommended/potentially harmful
    - History of intracranial Hemorrhage (consider the etiology and timing of hemorrhage)
    - Structural GI malignancy or GIb within 21 days
    - Arterial puncture at a non-compressible site within 7 days
    - Parturition within 14 days*
    - Known bleeding diathesis

- Lower risk
  - Safety and efficacy of tPA is not well established
    - 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
    - tPA may be considered/may be reasonable, especially if moderate to severe stroke

- In every case, the risk of bleeding complications from tPA should be weighed against the potential benefit from tPA given the severity of deficits

3. tPA eligibility questions

Have you had any recent trauma, surgeries or procedures?

Have you had any bleeding problems?

Are you taking any blood thinners?
tPA Eligibility Criteria

**tPA Eligibility Criteria**

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

**Labs**
- INR greater than 1.7
- PT greater than 15 sec
- aPTT greater than 40 sec
- Platelets less than 100,000

**Cerebral microbleeds (CMB)**
For pts with previously demonstrated CMB on MRI:
- 1-10 CMB: administration of tPA is reasonable
- >10 CMB: administration of tPA may be a/w an increased risk of sICH. Tx may be considered in the setting of moderate to severe stroke.

*NOTE: These conditions may be historical and while CTA is recommended as part of every potential acute stroke work up, it is **NOT** needed for decisions regarding the use of tPA. Obtaining CTA should **NOT** delay tPA administration.*

*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.*

**Higher risk**
- tPA is contraindicated

**tPA is not recommended/potentially harmful**

**Safety and efficacy of tPA is not well established**

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

**Lower risk**

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Jan 2019
Patient identified as an appropriate IV tPA candidate (See tPA Eligibility Criteria) or an EVT candidate without tPA

BP less than 185/110?

No

Give labetalol* 5-10 mg IV x 1 STAT; May repeat x1 if not at goal.

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

No

Start nicardipine gtt at 5 mg/hr; Increase by 2.5 mg/hr every 5 min. Max 15 mg/hr.

Yes

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

BP less than 185/110 after titration of nicardipine?

No

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

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.

IV-tPA is contraindicated (EVT is not contraindicated)

Proceed with IV tPA Administration/EVT.

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

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 based on reperfusion obtained during the procedure

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. If BP lowering is required, lowering by 15% is probably safe.

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 euvolemia in all stroke patients (patient’s made NPO should be given maintenance rate normal saline).
Management of Post-tPA Complications

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

Patient develops severe headache, acute hypertension, nausea, vomiting or worsening neurological status:
- Stop tPA infusion immediately
- Use Post-tPA Hemorrhage Order Set
  - STAT head CT
  - Type & Cross (if not already done)
- CT confirms hemorrhage & tPA given within the last 24 hours:
  - Administer 10 units cryoprecipitate over 10-30 min
  - PLUS Tranexamic acid (TXA) 1000 mg over 10 min
  - Maintain BP less than 160/100
  - Consider Neurosurgical and Hematology consults
- Must use the Post-tPA Hemorrhage Order Set
- STAT CBC and Coag panel, Bleeding patient
- Draw after administration of cryoprecipitate
- Fibrinogen less than 200
  - Administer another 10 units cryoprecipitate (ordered from the Post-tPA Hemorrhage Order Set)
- Platelets less than 100,000
  - Administer 1 unit pheresis platelets
- INR greater than or equal to 1.5 in a pt on warfarin
  - Use Warfarin-Associated CNS Hemorrhage Order Set in Epic

Patient develops edema of the tongue, lips, mouth or oropharynx:
- Stop tPA infusion immediately
- Use Post-tPA Orolingual Edema Order Set
- Hold
  - ACE inhibitors
  - Diphenhydramine 50 mg IV x1
  - Famotidine 20 mg IV x1
  - Methylprednisolone 125 mg IV x1
  - Close monitoring of respiratory status
  - 0.1% epinephrine 0.3 mL subcutaneously or by nebulizer 0.5 mL

If there is further increase in angioedema after these measures, or if stridor or eminent respiratory compromise develops, administer
  - Maintain airway
    - Endotracheal intubation may not be necessary if edema is limited to anterior tongue and lips.
    - Edema involving larynx, palate, floor of mouth, or oropharynx with rapid progression (within 30 min) poses higher risk of requiring intubation.
    - Manage as Difficult Airway

‡ Alternatives to TXA: ε-aminocaproic acid 4 gm IV over 1 hr, followed by 1 gm/hr IV for 8 hr

For the rare pt on warfarin with INR 1.5-1.7 given tPA

Jan 2019
Aspirin and Clopidogrel‡ in Acute Stroke Management

For patients deemed not to be candidates for IV tPA or endovascular therapies for acute ischemic stroke

head CT and CTA head and neck¹,²

Moderate-to-large size infarction present or anticipated

Yes

Moderate or High-grade extracranial stenosis

Non-stenotic⁵ extracranial carotid or aortic plaque rupture

High-grade intracranial atherosclerotic stenosis⁶

Cervicocephalic arterial dissection or other abnormal vascular finding

• Aspirin 81 mg qd
• Do not give clopidogrel
• Patients < 65yo may be candidates for decompressive hemianectomy³
• Patient 18-85 may be candidates for CHARM study⁴
• Admit to SCU for close observation

Load with clopidogrel 300 mg, followed by 75 mg qd ⁸,¹⁰
Aspirin 81 mg qd* ⁷
High-intensity statin ⁸,¹⁰
Consult Vascular Surgery for possible vascular intervention if pt < 80 ¹¹
Stop clopidogrel following revascularization
Continue aspirin 81 mg qd

Load with clopidogrel 300 mg, followed by 75 mg qd
Aspirin 81 mg qd*
High-intensity statin
Consult Vascular Surgery only if recurrent symptoms on maximal medical management
Continue clopidogrel 75 mg qd x 21d
Continue aspirin 81 mg qd

Load with clopidogrel 300 mg, followed by 75 mg qd
Aspirin 81 mg qd*
High-intensity statin
Consult Neurointerventional only if recurrent symptoms on maximal medical management
Continue clopidogrel 75 mg qd x 3 mo
Continue aspirin 81 mg qd

Options for treatment include aspirin monotherapy, aspirin and clopidogrel or IV heparin⁴⁺
Urgent stenting and thrombectomy is sometimes required
Discuss with Neurology and Neurointerventional

If pt > 80yo in otherwise good health, surgery may be considered in select patients⁴⁺

If pt is NPO and clopidogrel and statin are recommended
* recommendation will be the discretion of the treating physician
‡ Bleeding risks must also be taken into consideration when using clopidogrel and ultimate recommendation will be the discretion of the treating physician
* Consider loading with aspirin 325 mg in pts who are aspirin naive
If pt is NPO; give aspirin 300 mg PR
If the pt is NPO and clopidogrel and statin are recommended, place an NGT for administration
All antiplatelets should be administered within 12 hours of presentation to the ED

Unrelated vascular disease or normal

Deficits Resolved

ABCD² Score (risk stratification for TIA)
• Age > 60 (1 point)
• BP ≥ 140/90 (1 point)
• Clinical features:
  • Unilateral weakness with or without speech impairment (2 points)
  • Speech impairment without unilateral weakness (1 point)
  • Neither motor nor speech impairment (0 points)
• Duration
  • ≥ 60 min (2 points)
  • 10-59 min (1 point)
  • < 10 min (0 points)
• Diabetes (1 point)

ABC²D Score³ (risk stratification for TIA)

ABCD² Score < 4
Aspirin 81 mg qd*
Consider expedient outpatient TIA work up. Discuss disposition with On call Neurologist⁴⁰

ABCD² Score ≥ 4
Aspirin 81 mg qd*
Clopidogrel 300 mg load, followed by 75 mg qd *x21d⁴,³⁹

NIHSS ≤ 3
Admit to CDU
Use TIA CDU Order Set
Consult Neurology

NIHSS > 4
Aspirin 81 mg qd*
Clopidogrel 300 mg load, followed by 75 mg qd *x21d⁴,³⁹

Admit to telemetry, R2 preferred
Use Gen Med Ischemic Stroke Order Set
Consult Neurology

Deficits persistent

Jan 2019
Patient diagnosed with acute non-traumatic intracranial hemorrhage (ICH or SAH)

Monitor blood pressure every 15 minutes or less
- SAH GOAL BP is less than 140/less than 90
- ICH GOAL BP is less than 160/less than 100

Review history of anti-thrombotics
- Warfarin (Coumadin, Jantoven)
  - Direct thrombin inhibitor within 24 hrs (an normal renal function)
    - Dabigatran (Pradaxa)
- Direct FXa inhibitor within 18 hrs
  - Rivaroxaban (Xarelto)
  - Apixaban (Eliquis)
  - Edoxaban (Savaysa)

IV Unfractionated Heparin
- Low Molecular Weight Heparin

Platelets less than 100,000
Fibrinogen less than 200 mg/dL

Patients with signs/symptoms of increased intracranial pressure

Non-traumatic subarachnoid hemorrhage (SAH)

STAT consult to Neurocritical Care and Neurosurgery
Document severity scores within 6 hours of presentation
Use ICH or SAH Admission order sets

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, increase by 2.5 mg/hr every 5 min to attain goal BP; Max 15 mg/hr

1. Vitamin K 5 mg IV x1
2. 4-Factor PCC (Kcentra) 4 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 more than 1.5, give additional 10 units/kg

- Idarucizumab 2.5 gm IV x2, given 15 min apart (Consult anticoagulation pharmacist)
- Activated charcoal at standard doses if last dose was within 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 after transfer

- Andexanet alfa currently is not available for use at MaineHealth hospitals
- Kcentra 25 units/kg to help with clot formation at the site of bleeding
- Activated charcoal at standard doses if last dose was within 1-2 hours
  - Maintain adequate diuresis with fluid replacement and hemodynamic support
  - Hemodialysis is not indicated

1 mg protamine per 100 units of heparin given over last 2 hours (ex. 1000 units/hr infusion x 2 hours = 2,000 units UFH = 20 mg protamine); Max 50 mg protamine

If last administration less than 8 hours ago: 1 mg protamine per 1 mg LMWH; Max 50 mg
If last administration greater than 8 hours ago: 0.5 mg protamine per 1 mg LMWH; Max 50 mg

Transfuse 1 pheresis unit of platelets
Transfuse cryoprecipitate 1 unit per 10 kg body weight

- 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.
- fosphenytoin 15-20 mg PE/kg² 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 à 25 units/kg
  - INR greater than 4.0 à 50 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, anosmia, 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)

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
| ☐    | ☐   | 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

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**Results of Dysphagia Screen**

- □ PASS  □ FAIL

**Results of the Dysphagia Screen Must Be Documented in Epic Prior to Any PO Intake**

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**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

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Jan 2019
**BE-FAST**

For **Triage Nurse** evaluation of **Walk-In Patients** to screen for **symptoms of stroke**

Symptoms due to stroke are usually **sudden** in onset and otherwise **unexplained** (i.e. by trauma, intoxication, pre-existing condition)

<table>
<thead>
<tr>
<th>B</th>
<th>E</th>
<th>F</th>
<th>A</th>
<th>S</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance</td>
<td>Eyes</td>
<td>Face</td>
<td>Arm</td>
<td>Speech</td>
<td>Time</td>
</tr>
<tr>
<td>Sudden unexplained loss of balance, dizziness or vertigo</td>
<td>Loss of vision in one eye or one side of vision or Double vision</td>
<td>Smile is asymmetric</td>
<td>Arm/hand (or leg) weakness</td>
<td>Slurred speech or trouble speaking or understanding speech</td>
<td>Time to notify an ED physician for stat evaluation*</td>
</tr>
</tbody>
</table>

*If acute stroke is the suspected cause of symptoms, ED physician would then activate an ED Code Stroke

**FAST-ED**

Field Assessment Stroke Triage for Emergency Destination

For **EMS** and **ED** providers to screen for symptoms of **large vessel occlusion**

<table>
<thead>
<tr>
<th>F</th>
<th>A</th>
<th>S</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facial palsy</strong>&lt;br&gt;Ask the patient to smile</td>
<td>Normal or mild facial asymmetry</td>
<td>Obvious droop of one side of the mouth</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Arm weakness</strong>&lt;br&gt;Extend the weak arm with palm facing down to 90° (if sitting) or 45° (if supine) and ask them to hold it there for 10 seconds</td>
<td>No drift down x 10 seconds</td>
<td>Drifts, but not all the way down to the bed</td>
<td>Drifts all the way down to the bed or no movement at all</td>
</tr>
<tr>
<td><strong>Speech changes</strong>&lt;br&gt;Note spontaneous speech; ask the patient to name 3 common items; ask the patient to show you 2 fingers without demonstrating this visually to the patient</td>
<td>Normal speech</td>
<td>Impaired but comprehensible speech, and/or unable to name any of the items, and/or unable to follow the command</td>
<td>Incomprehensible speech and/or complete lack of understanding or mute</td>
</tr>
<tr>
<td><strong>Time</strong>&lt;br&gt;Time LKW is documented for decision making purposes and is not scored</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Eye deviation</strong>&lt;br&gt;Observe the patient’s eye position; ask the patient to track your hand all the way to the left and then all the way to the right</td>
<td>The patients eyes are not deviated to one side and they move all way to the left and all way to the right</td>
<td>Eyes tend to only move to one side (make note of the side)</td>
<td>Eyes both forced over to one side (make note of the side)</td>
</tr>
<tr>
<td><strong>Denial/Neglect</strong>&lt;br&gt;With eyes closed, touch the patient on both arms at the same time and ask if they feel both sides; Show the patient the hand on the side of their weakness and ask them “Whose hand is this?”</td>
<td>Able to sense touch on both sides at the same time and recognizes the weak hand as their own</td>
<td>Unable to feel one side of the touch but can recognize their hand as their own</td>
<td>Unable to feel one side of touch and does not recognize their hand as their own</td>
</tr>
</tbody>
</table>

**TOTAL SCORE**

A score of **greater than or equal to 4** is indicative of possible large vessel occlusion.

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**BE-FAST** was developed by Intermountain Healthcare, as an adaptation of the FAST model implemented by the American Stroke Association. Reproduced with permission from Intermountain Healthcare.
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>
2019 MMC ED Stroke Packet References

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. ECASSII. Thrombolysis with Alteplase 3 to 4.5 Hours after Acute Ischemic Stroke. NEJM.2008;359:1317-29.
29. https://clinicaltrials.gov/ct2/show/NCT02864953
41. Stratified, Urgent Care for Transient Ischemic Attack Results in Low Stroke Rates.Stroke.2010;41:2601-2605.
Patient Selection for CHARM

18-85yo patient with clinical diagnosis of acute ischemic stroke in the MCA territory (+/- ACA or PCA involvement) with an NIHSS ≥ 10
Able to receive study drug within 10 hr LKW

Study drug treatment infusion should be initiated as soon as possible but no later than 10 hrs from time LKW

Draw & send STAT Code Stroke labs upon arrival

Perform STAT head CT/CTA/CTP within 20 minutes of arrival to ED
Perform ECG after imaging is obtained

• Order IV-tPA 0.9 mg/kg STAT for appropriate candidates & initiate ASAP
  - tPA is NOT required NOR is it a contraindication for enrollment
  • Proceed with thrombectomy if clinically indicated

Review basic inclusion/exclusion criteria

Page Critical Care Research Coordinator at 741-3257

Research Coordinator ensures all inclusion/exclusion criteria are met

OBTAIN INFORMED CONSENT

For patients going to thrombectomy, consider ordering STAT MRI brain with CHARM ORDER SET to be done post procedure

CLINICAL EXCLUSION CRITERIA:
- Age < 18 or > 85
- Pre-stroke mRS ≥ 2
- Clinical signs of herniation: 1 or 2 dilated, fixed pupils; unconsciousness related to edema and/or loss of other brain stem reflexes
- Rapid Improvement to NIHSS < 10 by the time of enrollment

Research Coordinators: Ashley Eldridge, Christine Lord, Barb McCrum


Imaging inclusion
- MRI-DWI lesion 80 and 300cm³

Imaging Exclusions
- Patients unable to tolerate MRI
- Brain hemorrhage (other than small petechial/punctate hemorrhages)
- Evidence of anteroseptal/pineal shift ≥ 2 mm prior to enrollment

* Consider if thrombectomy is unsuccessful OR if the initial core lesion volume was > 50 cm³ AND the pt would likely still be in the 10 hour window following MRI. Consent must be obtained prior to MRI.

24/7 CHARM Hotline: 833-793-5298