2020 MMC ED Stroke Packet Table of Contents

Pathways & Protocols

1. Guidelines for Activation of ED Code Strokes
2. Direct-to-CT (D2CT) Pathway
3. Non-Direct-to-CT Pathway
4. ED Code Stroke Pathway
5. Endovascular Stroke Transfer Pathway
6. Inpatient Code Stroke Pathway
7. tPA Eligibility Criteria, Clinical
8. tPA Eligibility Criteria, Imaging and Labs
9. Management of Pre- and Post-tPA and EVT Blood Pressure
10. Management of Post-tPA Complications: Hemorrhage and Angioedema
11. Aspirin and Clopidogrel in Acute Stroke Management

Resources

13. BE-FAST & FAST-ED Score
14. Guidelines for the Administration of IV tPA for Treatment of Suspected Acute Stroke
15. Stroke Packet References
16. Patient Selection for CHARM Study

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.

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**2020 Guidelines for Activation of ED Code Strokes**

To be used with the 2020 ED Code Stroke Pathway

1. Are the symptoms consistent with stroke? (i.e. acute onset focal deficits)
   - Yes → Are the symptoms potentially disabling?
   - No → STOP. Do not activate ED Code Stroke. Consult Neurology if needed.

2. When was the patient last known well (LKW)?
   - Confirm LKW with PRIMARY SOURCE as often as possible
   - If witnessed onset, who witnessed it at what time?
   - If pt found with deficits, who found the patient and when were they last seen without their current deficits?
   - LKW unclear or ≥ 4.5 hours?
     - No → 3. Perform FAST-ED Score & ask the 3 tPA Questions

3. Perform FAST-ED Score & ask the 3 tPA Questions
   - 3 tPA Questions:
     - Any recent surgeries, procedures or trauma?
     - Any history of any bleeding problems, including ICH?
     - Is the pt on any blood thinners?
   - Potential endovascular patient? (FAST-ED Score ≥ 4, LKW <24h)
     - Yes → ACTIVATE "Endo Code Stroke, MMC ED" via REMIS 662-2950
     - No → Contraindications to tPA identified?
     - Yes → ACTIVATE "MMC ED Code Stroke" via REMIS 662-2950
     - No → Only one of these pathways should be activated in any given patient (i.e. Neurology will be alerted with the Endo Code Stroke and will evaluate for tPA candidacy)

**Examples of non-focal symptoms:**
- Non-specific dizziness/lightheadedness
- Confusion/disorientation (more likely encephalopathy)
- Bilateral numbness
- Isolated dysarthria (very non-specific and other etiologies such as encephalopathy, drug side-effects and intoxication should be considered)

**NOTE:** Non-focal symptoms could be due to a stroke, especially if:
- Accompanied by other localizing signs/symptoms of stroke
- Are acute in onset
- Are in a patient with significant vascular risk factors

**Examples of non-disabling symptoms:**
- Isolated sensory loss
- Mild dysarthria
- Mild weakness of a limb that does not impair hand function or gait
- Mild aphasia that does not impair a pt’s ability to effectively communicate
- Speech that is slow, but other wise intact (no dysarthria, no aphasia)

**Endo Code Stroke, MMC ED pages:**
- Neurointerventionalist
- Neurosurgery PA
- Neurocritical care APP
- NIR lab staff
- Anesthesiologist
- CICU & SCU Coordinators
- ED Nurse Coordinator
- ED pharmacist
- Neurologist
- Neurology APP
- CT technologists
- Radiologist
- Lab technician
- Stroke Program Manager
- Stroke Data Coordinator

**MMC ED Code Stroke pages:**
- ED Nurse Coordinator
- ED pharmacist
- Neurologist
- Neurology APP
- CT technologists
- Radiologist
- Lab technician
- Stroke Program Manager
- Stroke Data Coordinator

**Time LKW:** ______ : ______

**FAST-ED Score:** ______

**Current BP:** _____/_____  
**Blood glucose:** ______
MMC Direct-to-CT (D2CT) Pathway

For patient being brought to MMC by EMS directly from the field with suspected stroke
Or patients being transferred from an outside hospital (OSH) with suspected LVO

### Direct-to-CT Stroke Alert

**CT technologists**
- CT technologists
- ED Attending
- ED Critical Care RN
- ED Nurse Coordinator
- ED Triage Nurse
- Registration

**Endo Stroke Alert, [name of OSH]

**Endo Code Stroke, MMC ED

**CT technologists**
- Neurointerventionalist
- Neurosurgery PA
- Neurocritical care APP
- NIR lab staff
- Anesthesiologist
- CICU & SCU Coordinators
- ED Attending
- ED Nurse Coordinator
- Neurologist
- Neurology APP
- CT technologists
- Stroke Program Manager
- Stroke Data Coordinator

**MMED Code Stroke pages:

- ED nurse coordinator
- Neurologist
- Neurology APP
- CT technologists
- ED Pharmacist
- Lab tech
- ED nurse coordinator
- Stroke Program Manager
- Stroke Data Coordinator

**Endo Code Stroke, MMC ED

**Endo Stroke Alert, [name of OSH]

**EMSS PRE-HOSPITAL CARE:**
- Patients picked up in the field: (Direct-to-CT Stroke Alert)
- Perform CPSS, FAST-ED Score and documents results and time Last Known Well (LKW)
- Ask the 3 TPA questions and document answers (must be reported to the ED physician)
- Obtain contact name and phone number to confirm LKW and provide consent for treatment if needed
- Review the Pre-Hospital Stroke Checklist for EMS Direct-to-CT (D2CT) Activation: 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
- Check vital signs and FSBS and 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

**Patients transferred from OSH for suspected LVO:** (Endo Stroke Alert, OSH)
- Use EMS Inter-Facility Transfer of Acute Stroke Patients & EMS Stroke Inter-Facility Orders
- Once 10 minutes out from MMC, notify REMIS to send a “Endo stroke patient, ETA 10 min” page

**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
- CT techs call 662-4237 8am-5pm M-F and 662-4517 at all other times to notify the radiologist that an acute stroke patient is on the way to or in the scanner

**ARIVAL:**
- 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:** (Asses pts en route to and in the CT scanner, not in the ambulance bay)
- For NON-Endo Stroke Alert Pts:
  - If FAST-ED Score is greater than or equal to 4 activate an Endo Code Stroke, MMC ED
  - Confirm LKW note any clear contraindications to tPA (See tPA Eligibility Criteria, Clinical)
  - If the patient appears to be having a stroke and no clear contraindications to tPA are identified but the FAST-ED Score is less than 4, activate an MMC 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)
- Checks the IVs and draws blood; checks FSBG if not done by EMS
- Labels blood with chart labels and send to lab in a blue top conical container labeled with a Code Stroke sticker
- Attaches patient to cardiac monitor

**PATIENT TRANSPORTED DIRECTLY TO CT:**

**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

**RADIOLOGIST:** Interprets the CT/CTA/CTP ASAP (goal less than or equal to 5 min post processing) and calls the ED Physician with results

**LABTECHNICIAN:** Processes Code Stroke labs STAT (goal door-to-lab result time less than 30 min) and calls the ED Pharmacist with results

**ED PHARMACIST:** Orders and mixes tPA once head CT excludes hemorrhage in tPA-eligible patients (goal CTA initiated-to-order (CTO) less than 10 min)

**ASSESSMENT & PLAN:**

**NEUROLOGIST:** Reviews scans and patient presentation and recommends tPA if indicated and communicates with the Neurointerventionalist if pt is a potential EVT candidate

**ED PHARMACIST:** Ensures BP is at goal with input from the ED Physician and Neurologist (See Pre and Post tPA BP Management) prior to initiation of tPA

**EDRN:** Administers tPA ASAP once eligibility has been determined, even if the patient is still in the CT scanner

**ENDOVASCULAR PATIENTS:**

**NEURO INTERVENTIONALIST:** Transports the patient to the Neuro IR suite directly from CT
- If tPA is also indicated, tPA should be initiated prior to transfer to the NIR Suite

**ANESTHESIOLOGIST:** Evaluates the patient and consents for anesthesia

**NEUROINTERVENTIONALIST:** Ultimately is responsible for determining if the patient is a good EVT candidate and obtaining and documenting consent for the procedure
- Door-to-grain puncture (DTP) time minimized (goal less than or equal to 60 min)
- Door-to-reperfusion (DTR) time minimized (goal less than or equal to 90 min)
- Goal recanalization: TICI 2b or greater reperfusion

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2020 ED CODE STROKE PATHWAY

Patient in the community experiences symptoms concerning for acute stroke

Patient transported to MMC via POV or brought in by EMS without pre-notification

See Non-D2CT Pathway

BE-FAST screen by Triage RN is (+) pt triaged to CC bay

Patient is evaluated in the CC bay by ED physicians & Critical Care RN

Potential endovascular candidate?

No

No

Consult Neurology if needed

Yes

REMEmBER: Only one of these pathways should be activated in any given patient

Yes

Patient eligible for tPA?

No

T ≤ 10 min

T ≤ 15 min

T ≤ 30 min

T ≤ 60 min

T ≤ 90 min

GOAL TICI 2b or greater reperfusion Time to reperfusion minimized

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

ED Nurse Evaluation:
Ensures 2 large bore IVs in place
Check FSBS if not already done
Sends labs
Keep pt NPO with HOB at 30 degrees

ED Physician Evaluation:
Confirms presentation is consistent with acute stroke with potentially disabling deficits
Establishes time LKW
Asks 3 tPA questions, clarifies any “Yes” answers
Performs FAST-ED Score

Use the ED Acute Stroke Order Set

CT techs:
M-F 8am-5pm: call 662 4237
All other times: call 662 4517
To alert radiologist of acute stroke patient

ED Pharmacist:
Mixes tPA once no hemorrhage on head CT confirmed

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

Patient is met in the Ambulance Bay by ED physicians & Critical Care RN

Patient is eligible for tPA?

No

EVT candidate?

Yes

Neuro IR nurse transports the patient to the Neuro IR suite directly from CT
• If pt also a tPA candidate, tPA should be initiated prior to transport to IR
Time to groin puncture minimized

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

Use the Ischemic Stroke POST-thrombolysis ICU 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

Patient is in the community experiences symptoms concerning for acute stroke

Patient transported to MMC via EMS without pre-notification

See Non-D2CT Pathway

Patient is in the community experiences symptoms concerning for acute stroke

Patient transported to MMC via EMS with pre-notification of suspected stroke

See D2CT Pathway

Patient is met in the Ambulance Bay by ED physicians & Critical Care RN

Patient eligible for tPA?

No

EVT candidate?

Yes

Neuro IR nurse transports the patient to the Neuro IR suite directly from CT
• If pt also a tPA candidate, tPA should be initiated prior to transport to IR
Time to groin puncture minimized

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

Use the Ischemic Stroke POST-thrombolysis ICU Order Set

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Patient is evaluated in the CC bay by ED physicians & Critical Care RN

Potential endovascular candidate?

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No

Consult Neurology if needed

Yes

REMEmBER: Only one of these pathways should be activated in any given patient

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Patient eligible for tPA?

No

T ≤ 10 min

T ≤ 15 min

T ≤ 30 min

T ≤ 60 min

T ≤ 90 min

GOAL TICI 2b or greater reperfusion Time to reperfusion minimized

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

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

Patient is in the community experiences symptoms concerning for acute stroke

Patient transported to MMC via EMS with pre-notification of suspected stroke

See D2CT Pathway

Patient is met in the Ambulance Bay by ED physicians & Critical Care RN

Patient eligible for tPA?

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EVT candidate?

Yes

Neuro IR nurse transports the patient to the Neuro IR suite directly from CT
• If pt also a tPA candidate, tPA should be initiated prior to transport to IR
Time to groin puncture minimized

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

Use the Ischemic Stroke POST-thrombolysis ICU 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

*After hours the Neurologist may evaluate the pt via video in a CC bay following the CT scan, though an in person consult is preferred. If the Neurologist does not feel video evaluation will add value to patient care, it is not required.
2020 ENDOVASCULAR STROKE TRANSFER PATHWAY

Patient experiences symptoms concerning for acute stroke and is first brought to an outside hospital (OSH)

Provider at an Outside Hospital (OSH) identifies a patient with a suspected stroke eligible for acute stroke therapies (IV-tPA or mechanical thrombectomy)

OSH provider: Calls REMIS 662-2950 and requests
- A TeleStroke Consult (if calling from TeleStroke Hospital)
- OR to page the on call MMC Neurologist for an Urgent Stroke Matter (if a non TeleStroke Hospital)
- Neuroimaging will be pushed to Impax whenever possible

Large Vessel Occlusion is clinically suspected or imaging confirmed

Clinical features including age, time LKW, baseline functional status and patient/family wishes will be taken into consideration prior to recommending transfer

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

“Endo Code Stroke, OSH” pages:
- Neurointerventionalist
- Neurosurgery PA
- Neurocritical care APP
- NIR lab staff
- Anesthesiologist
- CICU & SCU Coordinators
- ED Attending
- ED Nurse Coordinator
- Neurologist
- Neurology APP
- CT technologists
- Stroke Program Manager
- Stroke Data Coordinator

“Endo Stroke Alert, [name of OSH]”
REMIS sends a “Heads Up” page with the patient’s name, DOB, current location and 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, OSH “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 taken to directly to CT (See D2CT Pathway)
Patient is evaluated en route to CT by ED physician & RN
An ED Acute Stroke Alert is NOT activated

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

Patient is taken to NIR Suite STAT
Door-to-puncture goal ≤ 60 min
Door-to-reperfusion goal ≤ 90 min

EVT candidate?

No

The NI to use the Cerebral Thrombectomy Post-Procedural Order Set

Yes

NI to use the Ischemic Stroke ICU Order Sets

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

CT technicians:
M-F 8am-5pm: call 662.4237
All other times: call 662.4517
To alert radiologist of acute stroke patient en route to CT

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

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REMIS pages:
“Possible Inpatient Stroke, Room ___; APP to call xxx-xxxx”
Neuro APP (N.APP) • Neurology APP 580-5621 (7AM – 7PM)
• NCC Care APP 741-3091 (7PM – 7AM)
AND Code White Team • 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”
• ED Nurse Coordinator
• ED Pharmacist
• Neurologist
• Neurology APP
• CT technologist
• Phlebotomist
• Nursing Supervisor
• R2 Charge Nurse
• Float Nurse
• Stroke Program Manager
• Stroke Data Coordinator

REMIS is called back and a “Stand Down” page is sent to the appropriate paging tree

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

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.

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.

REMIS pages:
“Endo Code Stroke, MMC Inpatient Room ___; Neurologist and NI to call xxx-xxxx STAT”
• The same people listed in the Inpatient Code Stroke paging tree, plus:
  • Neurointerventionalist
  • Neurosurgery PA
  • Neurocritical care APP
  • NIR lab staff
  • Anesthesiologist
  • CICU & SCU coordinators

Neurologist/NI: Calls back within 5 min and discusses case with N.APP or designated provider.
Anesthesiologist/NIR staff/NCC are on notice of a potential endo case
Primary Team: Remains available to assist in patient care; provides Neuro team a pager if they need to leave the bedside
SCU Coordinator/Nursing supervisor: Identifies resources for stat transport to CT
Phlebotomist: Labs should be drawn prior to transport to CT if necessary
CT techs: Clear/hold the scanner, notify radiologist of acute stroke patient en route
ED Pharmacist: assists with tPA ordering and administration if indicated
Radiologist: Interprets scans as soon as they are available

Radiology numbers:
M-F 8am-5pm: 662-4237
All other times: 662-4517

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

Acute Stroke suspected?
No
Yes

NIHSS is ≥ 6 in a pattern c/w an LVO?
No
Yes

N.APP calls REMIS and states “Inpatient CODE STROKE”
N.APP calls REMIS and states “Endo Code Stroke, MMC Inpatient”

Patient is evaluated in their room or en route to CT by the Neurologist*

Use the Inpatient Acute Stroke Order Set

Pt transported to CT ASAP and is accompanied by an ICU nurse and the N.APP +/- Neurologist, +/- a primary team member

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

Use the appropriate Ischemic Stroke ICU Order Sets
Ni to use the Cerebral Thrombectomy Post-Procedure Order Set

Acute stroke intervention indicated?
No
Yes

tPA CANDIDATE:
tPA ordered STAT and initiated in the CT or 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

EVT CANDIDATE:
Patient is taken to NIR Suite directly from CT following initiation of tPA if indicated; Time to groin puncture & reperfusion is minimized

*T if the Neurologist is in house, initial evaluation will occur in the patient’s room or in the CT scanner. After hours, the evaluation may occur via video in a CC bay following the CT scan, though an in person consult is preferred. If the Neurologist does not feel video evaluation will add value to patient care, it is not required.

2020 INPATIENT CODE STROKE PATHWAY

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**tPA Eligibility Criteria, Clinical**

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 ask the 3 tPA questions, then communicate any “Yes” answer to the Neurologist

### Clinical presentation/medical history

- **tPA is contraindicated**
  - LKW greater than 4.5h
  - Sx concerning for SAH
  - 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)
  - History of intracranial hemorrhage (consider the etiology and timing of hemorrhage)
  - Structural GI malignancy or GIB within 21 days
  - Known bleeding diathesis
  - Warfarin use with INR greater than 1.7
  - UFH use with an elevated aPPT
  - Therapeutic dose LMWH within 24 hours
  - DOAC use within 48 hours

- **tPA is not recommended/potentially harmful**
  - BP cannot be lowered to less than 185/110
  - Sx concerning for endocarditis
  - Known or suspected aortic dissection
  - Major non-cranial surgery or trauma within 14 days with uncontrollable bleeding site (e.g., internal organs)
  - Structural GI malignancy or GIB within 21 days
  - Known bleeding diathesis
  - Warfarin use with INR greater than 1.7
  - UFH use with an elevated aPPT
  - Therapeutic dose LMWH within 24 hours
  - DOAC use within 48 hours

- **Safety and efficacy of tPA is not well established**
  - Age less than 18
  - Ischemic stroke within 3 mo
  - NIHSS greater than 25 in the 3-4.5 hr window
  - Arterial puncture at a non-compressible site within 7 days
  - Parturition within 14 days*
  - Lumbar puncture within 7 days
  - Major non-cranial surgery or trauma within 14 days with controllable bleeding site (e.g., limb)
  - GI or GU bleeding more than 21 days ago
  - Hemorrhagic ophthalmologic condition
  - Menorrhagia*

### tPA Eligibility questions

- **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)
  - History of intracranial hemorrhage (consider the etiology and timing of hemorrhage)
  - Structural GI malignancy or GIB within 21 days
  - Known bleeding diathesis

- **Have you had any bleeding problems?**
  - Arterial puncture at a non-compressible site within 7 days
  - Major non-cranial surgery or trauma within 14 days with controllable bleeding site (e.g., limb)
  - 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
  - DOAC use within 48 hours

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

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tPA Eligibility Criteria, Imaging & Labs

3. The ED physician/Neurologist will review the patient’s imaging and lab results to identify potential contraindications to tPA

**Imaging**
- tPA is contraindicated
  - Acute intracranial hemorrhage
  - Completed infarct (obvious hypodensity on CT)
- tPA is not recommended/potentially harmful
  - Intra-axial intracranial neoplasm (extra-axial intracranial neoplasm, i.e. meningioma, is NOT a contraindication)
- Safety and efficacy of tPA is not well established
  - 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**
- Head CT
- CTA*
  - INR greater than 1.7
  - PT greater than 15 sec
  - aPTT greater than 40 sec
  - Platelets less than 100,000
  - BG less than 50 or greater than 400

*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.

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

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.
Management of Pre and Post tPA and EVT Blood Pressure

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/successful thrombectomy.

No

Give labetalol!*10-20 mg IV x1 STAT; May repeat after 5 min x1 if BP not at goal
May start with 5 mg in elderly or low weight

*If pt has bradycardia or bronchospasm, do not use labetalol, go straight to calcium channel blocker gtt

Start nicardipine gtt at 5 mg/hr;
Increase by 2.5 mg/hr every 5 min. Max 15 mg/hr.
Alternative: Start Clevidipine IV at 1-2 mg/h;
Increase by doubling the dose every 2-5 min as needed. Maximum 21 mg/hr.

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

Yes

No

BP less than 185/110 after titration of nicardipine/clevidipine?

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

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.

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.

IV-tPA is contraindicated (EVT is not contraindicated)

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

Note: HYPTension is rare in acute stroke and should prompt rapid assessment for possible etiologies, such as hypovolemia, internal bleeding, myocardial ischemia, aortic dissection, cardiac 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). Further work up should include STAT cardiac markers & blood cultures. If aortic dissection suspected, obtain CTA chest prior to tPA administration. Maintain euvolemetry in all stroke patients (patient’s should be given maintenance rate normal saline unless there is a clear contraindication to doing so).
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 IV over 10-30 min
  - PLUS Tranexamic acid (TXA) 1000 mg IV over 10 min
  - Maintain BP less than 160/100
  - Consider Neurosurgical consult

  **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
  **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

  - 1 mg/mL epinephrine 0.3 mL IM or by nebulizer 0.5 mL

  **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

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‡ Alternatives to TXA: ε-aminocaproic acid 4 gm IV over 1 hr, followed by 1 gm/hr IV for 8 hr
Aspirin and Clopidogrel in Acute Stroke Management

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

Results of Head CT and CTA head and neck

Moderate-to-large size infarction present or anticipated

- Aspirin 81 mg qd
- Do not give clopidogrel due to lack of safety data of early DAPT in pts with moderate to large strokes
- Patients < 65yo may be candidates for decompressive hemicraniectomy
- Patient 18-85 may be candidates for CHARM study
- Admit to SCU for close observation

If pt is NPO and clopidogrel and statin are recommended

- Consider loading with aspirin

<table>
<thead>
<tr>
<th>Infarction Type</th>
<th>Management Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate or high-grade extracranial carotid stenosis</td>
<td>Load with clopidogrel 300 mg, followed by 75 mg qd. Aspirin 81 mg qd.</td>
</tr>
<tr>
<td>Non-stenotic extracranial carotid or aortic plaque rupture</td>
<td>Continue aspirin 81 mg qd.</td>
</tr>
<tr>
<td>High-grade intracranial atherosclerotic stenosis</td>
<td>Load with clopidogrel 300 mg, followed by 75 mg qd. Aspirin 81 mg qd.</td>
</tr>
<tr>
<td>Cervicocephalic arterial dissection or other abnormal vascular finding</td>
<td>Consult Vascular Surgery only if recurrent symptoms on maximal medical management. Continue clopidogrel 75mg qd x 21d. Continue aspirin 81 mg qd.</td>
</tr>
</tbody>
</table>

Unrelated vascular disease or normal

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

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

All antiplatelets should be administered within 12 hours of presentation to the ED

ABC2 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)
  - 60-159 min (1 point)
  - < 10 min (0 points)
- Diabetes (1 point)

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

- Aspirin 81 mg qd.
- Clopidogrel 300 mg load, followed by 75 mg qd x 21d.
- Admit to CDU.
- Use TIA CDU Order Set.
- Consult Neurology.

- Aspirin 81 mg qd.
- Clopidogrel 300 mg load, followed by 75 mg qd x 21d.
- Admit to telemetry, R2 preferred.
- Use Gen Med Ischemic Stroke Order Set.
- Consult Neurology.

- Aspirin 81 mg qd.
- Consider expedient outpatient TIA work up. Discuss disposition with on call Neurologist.

Deficits Resolved

NIHSS ≤ 3

- Aspirin 81 mg qd.
- Clopidogrel 300 mg load, followed by 75 mg qd x 21d.
- Admit to telemetry, R2 preferred.
- Use Gen Med Ischemic Stroke Order Set.
- Consult Neurology.

NIHSS > 4

- Aspirin 81 mg qd.
- Consider loading with aspirin 325 mg in pts who are aspirin naïve.
- If the pt is NPO, give aspirin 300 mg PR.
- If the pt is NPO and clopidogrel and statin are recommended, place an NGT for administration.

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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-coagulation use and obtain
STAT Coag Panel, Bleeding Patient

Low Molecular Weight Heparin

Platelets less than 100,000

Fibrinogen less than 200 mg/dL

Warfarin (Coumadin, Jantoven)

Direct thrombin inhibitor within 24 hrs (w/ normal renal function)
- Dabigatran (Pradaxa)

Direct FXa inhibitor within 18 hrs
- Rivaroxaban (Xarelto)
- Apixaban (Eliquis)
- Edoxaban (Savaysa)

IV Unfractionated Heparin

Labetalol 10-20 mg IV every 5-10 min, up to 2 doses
- May start with 5 mg in the elderly or low weight
- If BP not at goal: Start Nicardipine gtt at 5 mg/hr, increase by 2.5 mg/hr every 5 min to attain goal BP; Max 15 mg/hr
- Alternative: Start Clevidipine IV at 1-2 mg/h, increase by doubling the dose every 2-5 minutes as needed; Maximum 21 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 mg IV x2, given 15 min apart (Consult anticoagulation pharmacist)
- Activated charcoal at standard doses if last dose was within 12 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

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

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

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 indicated SAH, but not for primary ICH
- fosphenytoin 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 (Prothrombin) IV at 10 ml/min:
  - INR 1.6-4.0: 25 units/kg
  - INR greater than 4.0: 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, 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

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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>Balance</th>
<th>Eyes</th>
<th>Face</th>
<th>Arm</th>
<th>Speech</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>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

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.

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></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>F Facial palsy</td>
<td>Normal or mild facial asymmetry</td>
<td>Obvious droop of one side of the mouth</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>A Arm weakness</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>
<td></td>
</tr>
<tr>
<td>S Speech changes</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>
<td></td>
</tr>
<tr>
<td>T Time</td>
<td>N/A</td>
<td>N/A</td>
<td>Time LKW: ________</td>
<td></td>
</tr>
<tr>
<td>E Eye deviation</td>
<td>The patient’s eyes are not deviated to one side and they move all the way to the left and all the 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>
<td></td>
</tr>
<tr>
<td>D Denial/Neglect</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>
<td></td>
</tr>
<tr>
<td>TOTAL SCORE</td>
<td>A score of greater than or equal to 4 is indicative of possible large vessel occlusion.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reviewed Jan 2020
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>
2020 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.
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