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.
2021 Guidelines for Activation of ED Code Strokes
To be used with the ED Code Stroke Pathway

Patient presents to the Emergency Department with **potentially disabling acute onset focal neurological deficits**

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?

**Identify time last known well (LKW)**
Confirm with PRIMARY SOURCE as often as possible

**Time LKW:** _____:_____

**Perform FAST-ED Score**

**FAST-ED Score ≥ 4 & LKW < 24h**
**ACTIVATE “MMC ED Endo Code Stroke”**
via REMIS 662-2950

**FAST-ED Score < 4 & LKW < 4.0 hours**
**ACTIVATE “MMC ED Code Stroke”**
via REMIS 662-2950

While awaiting Neurology arrival, please obtain pt’s BP, blood glucose and answers to the **3 lytic questions** if possible

**Current BP:** _____/_____
**Blood glucose:** _______

**3 lytic Questions:**
- Any recent surgeries, procedures or trauma? Yes No
- Any history of any bleeding problems, including ICH? Yes No
- Is the pt on any blood thinners? Yes No

**MMC ED Endo Code Stroke 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

If time LKW is **unknown** at the time of arrival and cannot be quickly determined, err on the side of activation!

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EMDR Pre-Hospital Care:

- Patients picked up in the field: (Direct-to-CT Stroke Alert)
  - Perform OPSS, FAST-ED Score and document results and time Last Known Well (LKW)
  - Ask the 3 lytic 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

Arrival:

- Patient is met ON ARRIVAL 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: (Assess pts en route to and in the CT scanner, not in the ambulance bay)
  - Perform FAST-ED Score and identify time LKW (See Guidelines for Activation of ED Code Strokes)
  - Identify any clear contraindications to thrombolysis (See Thrombolysis Eligibility Criteria, Clinical)
  - Activate appropriate Code Stroke (MMC ED Code Stroke vs. MMC ENDO 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
- Neurointerventionalist: Responds to ED Code Stroke/Endo Stroke Alert by phone within 5 minutes and is at bedside ASAP (max less than 30 min) for lytic candidates (this may be via telestroke between the hours or 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 Technician: Processes Code Stroke labs STAT (goal door-to-result time less than 30 min) and calls the ED with results
- ED Pharmacist: Orders and mixes thrombolytic once head CT excludes hemorrhage in thrombolysis-eligible patients (goal CTA initiated-to-order (CTO) less than 10 min)

Assessment & Plan:

- Neurologist: Reviews scans and patient presentation and recommends thrombolysis 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-thrombolysis BP Management) prior to initiation of thrombolytic
- ED RN: Administers lytic ASAP once eligibility has been determined, even if the patient is still in the CT scanner

Endovascular Patients:

- Neuro IR Nurse: Transports the patient to the Neuro IR suite directly from CT
  - If thrombolysis is also indicated, lytic 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
Radiologist provides prelim results on scans focusing on excluding signs of hemorrhage or completed stroke and presence or absence of any large vessel occlusions and calls results to the ED attending
- Goal CTA complete to prelim read by Radiologist ≤ 5 min
MMC Direct-to-MRI (D2MR) Pathway

For patients being transferred from an outside hospital (OSH) with KNOWN BASILAR ARTERY THROMBOSIS AND TIME LKW > 6 hours

OUTSIDE HOSPITAL CARE:
- Case discussed with Neurologist/Neurointerventionalist (NI) through REMIS
- Pt accepted by the NI
- REMIS pages an “Endo Stroke Alert, [name OSH], Direct-to-MR protocol”
- NI calls the MR technologists 662-4028
- If the OSH is able to export images to IMPAX, NI asks the OSH to obtain CXR and KUB to screen for metal as long as it does not delay transfer
- REMIS obtains Next of Kin and enters it into the ED-to-ED accept note

PRIOR TO ARRIVAL:
MR TECHNOLOGIST:
- Plans for MR scanner to be open around the time of patient arrival
- Contacts patient’s Next of Kin to complete MRI screening form
- If MRI screening form cannot be completed, MR notifies NI
  - If CXR/KUB was able to be obtained at the OSH prior to transfer, these are reviewed for MR clearance
  - If CXR/KUB were NOT able to be obtained at the OSH or are not able to be viewed in Impax, the patient will go D2CT and get a head CT with a CT scanogram to screen for metal
  - If no metal is identified, pt can then be taken to MR

ARRIVAL:
- Patient is met UPON ARRIVAL by registration, ED CC RN and ED physician
- The patient is quickly assessed for any signs of medical instability
- If the pt is medically stable, proceed directly to the MR scanner; if unstable, pt taken to CC bay for stabilization & MR technician notified of delay 662-4028

REGISTRATION:
- Register the patient in the system
ED RN/FLOAT RN:
- Checks the IVs, Draws and sends acute stroke labs, Attaches patient to cardiac monitor
- Accompanies patient to MR
ED PHYSICIAN:
- Enters stat orders for FAST-SCAN MRI (DWI, FLAIR, SWI) for D2MR OR head CT with CT scanogram; if unable to get MRI discuss with NI
- Completes FAST-ED Score/any further assessment en route to scanner

PATIENT TRANSPORTED DIRECTLY TO MR:
MR TECHNOLOGIST:
- Ensures MR screening form/screening imaging is complete
- Checks patient for hairpins, hearing aids, dentures, jewelry, patches, etc.
- Scans patient as quickly as possible
RADIOLOGIST:
- Interprets the FAST-SCAN MRI ASAP (goal less than or equal to 5 min post processing)
- Calls the NI with results
NEUROINTERVENTIONALIST:
- Ultimately is responsible for determining if the patient is a good EVT candidate and obtaining and documenting consent for the procedure

ENDOVASCULAR PATIENTS:
NEURO IR NURSE:
- Transports the patient to the Neuro IR suite directly from MR
ANESTHESIOLOGIST:
- Patient is most likely already intubated, but if not, will intubate the pt
NEUROINTERVENTIONALIST:
- Door-to-groin 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
REMEMBER: Only one of these pathways should be activated in any given patient

**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 met in the Ambulance Bay by ED physicians & Critical Care RN
  - If the pt is medically stable, pt taken directly to the CT scanner; if unstable, pt taken to CC bay for stabilization

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

- Potential endovascular candidate?
  - No
    - Patient eligible for lytics?
      - No
        - Consult Neurology if needed
      - Yes
        - Lytic administered ASAP
        - See Pre and Post Thrombolysis BP Protocol
        - Use the ED Acute Stroke - Treatment with Thrombolitics Order Set
        - Neuro IR nurse transports the patient to the Neuro IR suite directly from CT
          - If pt also a lytic candidate, lytic should be initiated prior to transport to IR
          - Time to groin puncture minimized
        - T ≤ 30 min
        - Use the Ischemic Stroke POST-thrombolysis ICU Order Set
        - GOAL TICI 2b or greater reperfusion
        - Time to reperfusion minimized
        - T ≤ 90 min
  - Yes
    - Activate “MMC ED Endo Code Stroke”
      - T ≤ 10 min
    - Activate “MMC ED Code Stroke”
      - T ≤ 15 min

**Pt transported STAT to CT and CT/CTA +/- CTP performed**

- Neurologist/NI reviews scans and evaluates/reevaluates the pt after scans complete*

- Lytic candidate?
  - Yes
    - Lytic administered ASAP
    - See Pre and Post Thrombolysis BP Protocol
  - No
    - EVT candidate?
      - Yes
        - Neuro IR nurse transports the patient to the Neuro IR suite directly from CT
          - If pt also a lytic candidate, lytic should be initiated prior to transport to IR
          - Time to groin puncture minimized
        - T ≤ 30 min
        - Use the Ischemic Stroke POST-thrombolysis ICU Order Set
        - GOAL TICI 2b or greater reperfusion
        - Time to reperfusion minimized
        - T ≤ 90 min
      - No
        - Patient triaged to the appropriate level of care
        - BP should not be lowered unless over 220/120 unless there is another compelling medical reason to do so

*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.

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

**ED Nurse Evaluation:**
- Ensures 2 large bore IVs in place
- Check FBS if not already done
- Send 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 lytic questions, clarifies any “Yes” answers
- Performs FAST-ED Score

**Activation of ED Code Strokes**
- Use the ED Acute Stroke Order Set
- Use the ED TIA/SubAcute Stroke Order Set

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Patient presents to the ED with transient focal neurological or retinal symptoms lasting less than 24 hours thought secondary to ischemia

Immediate triage & physician assessment

- CT head with CTA head and neck performed STAT, though ED Code Stroke not activated at this time

Deficits confirmed as resolved?

- Yes
  
  Large artery occlusion or intravascular thrombus identified?

  - Yes
    
    See Guidelines for activating an ED Code Stroke
  
  - No
    
    CT head with CTA head and neck performed STAT, though ED Code Stroke not activated at this time

Note: If deficits recur at any time while the patient is in the ED, the time pt was last documented to have symptoms resolved is the new time last known well (the clock resets with full resolution of deficits)

- No
  
  TIA still suspected as etiology of presenting symptoms

  TIA Duration

  - Unilateral weakness
  - Speech impairment
  - Unilateral weakness
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ABCD2 Score

<table>
<thead>
<tr>
<th>Score</th>
<th>Age &gt; 60</th>
<th>Blood Pressure ≥ 140/90</th>
<th>Clinical Features of TIA</th>
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<tr>
<td></td>
<td>1</td>
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<td>• Unilateral weakness +/- speech impairment</td>
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<td>• Speech impairment w/o unilateral weakness</td>
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<td>• TIA duration ≥ 60 minutes</td>
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<td>• TIA Duration 10-59 minutes</td>
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|       |         |                        | Diabetes | 1

Use of the ABCD2 Score is to determine candidacy for DAPT based on the CHANCE and POINT trials

*Criteria for CDU observation:
- no high-risk features
- pt must be able to safely ambulate unassisted to the bathroom and back
- must have passed their dysphagia screen
- must not have baseline severe dementia, neurological or medical co-morbidities

Page Neurology to discuss appropriate patient disposition

- Official consult may occur the following day depending on time of day and demands of the neurology service

Neurology recommends observation in the CDU

CDU admission:
- MRI brain w/o gad
- Continuous telemetry monitoring
- TTE with bubble study
- Fasting lipid panel
- Fasting blood glucose/HbA1c

*specific testing may vary depending on input from neurology

Use the ED CDU TIA Protocol Observation Order Set

* The Neurologist may also feel admission/observation is not indicated & will document the reasons for this in a note in Epic

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LKW/Onset of symptoms

Provider at an Outside Hospital (OSH) identifies a patient with a suspected or confirmed acute stroke secondary to large vessel occlusion

OSH provider calls REMIS 662-2950
- REMIS pages the MMC Neurologist (or TeleStroke Neurologist if a Telestroke Consult is requested) AND the Neurointerventionalist (NI) for an "Urgent Stroke" question
- 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

The NI accepts patient for endovascular therapy (EVT) evaluation

"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

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

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

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

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

T = 0

Use the ED Acute Stroke Order Set

T ≤ 15 min

T ≤ 60 min

T ≤ 90 min

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REMIS pages: "Possible Inpatient Stroke, Room ___, Neuro 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 • 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.

REMIS pages: "Inpatient Endo Code Stroke 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 lytic 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

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Lytic Eligibility Criteria, Clinical\textsuperscript{1,2}

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 lytic questions, then communicate any “Yes” answer to the Neurologist

3 lytic eligibility questions

- Have you had any recent trauma, surgeries or procedures?
- Have you had any bleeding problems?
- Are you taking any blood thinners?

Clinical presentation/medical history

Lytic 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
- History of intracranial hemorrhage (consider the etiology and timing of hemorrhage)
- Structural GI malignancy or GIB within 21 days
- UFH use with an elevated aPPT
- Warfarin use with INR greater than 1.7

Lytic is not recommended/potentially harmful

- BP cannot be lowered to less than 185/110
- Sx concerning for endocarditis
- 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
- Therapeutic dose LMWH within 24 hours
- DOAC use within 48 hours

Safety and efficacy of lytic is not well established

- Known or suspected aortic dissection
- Known bleeding diathesis
- Known bleeding diathesis
- Arterial puncture at a non-compressible site within 7 days
- Parturition within 14 days*
- Lumbar puncture within 7 days
- DOACs: Dabigatran (Pradaxa) Rivaroxaban (Xarelto) Apixaban (Eliquis) Edoxaban (Savaysa)

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

- 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
- GI or GU bleeding more than 21 days ago
- Hemorrhagic ophthalmologic condition
- Menorrhagia*

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

*If pt is pregnant, peripartum or has a history of recent or active vaginal bleeding causing clinically significant anemia, then emergency consultation with a gynecologist is recommended before a decision about lytic is made

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Lytic Eligibility Criteria, Imaging & Labs

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

Imaging

- Lytic is contraindicated
  - Acute intracranial hemorrhage
  - Completed infarct (obvious hypodensity on CT)

- Lytic is not recommended/potentially harmful
  - 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

- Safety and efficacy of lytic is not well established
  - Cerebral aneurysm more than 1 cm in size

- Lytic may be considered/may be reasonable, especially if moderate to severe stroke

Labs*

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

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

Cerebral microbleeds (CMB)

Factors which are not contraindications to lytic, but are known to be associated with an increased risk of post-lytic hemorrhage:

- Older age
- Later in the time window
- Severe stroke (NIHSS > 25)
- Hyperglycemia
- Hypertension
- Severe white matter disease on head CT

An accumulation of these risk factors should be taken into consideration when making decisions regarding lytic use, especially in patients with less severe stroke symptoms.

In every case, the risk of bleeding complications from lytic should be weighed against the potential benefit from lytic given the severity of deficits.
Management of Pre and Post Thrombolysis and EVT Blood Pressure

Patient identified as an appropriate IV thrombolytic candidate
(See Thrombolysis Eligibility Criteria) or an EVT candidate without thrombolysis

- **BP less than 185/110?**
  - **Yes**
    - Proceed with thrombolytic administration/EVT.
    - Maintain BP less than 180/105 during and for 24 hours after lytic administration and/or thrombectomy.
    - 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 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/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**
            - **IV-thrombolysis is contraindicated (EVT is not contraindicated)**

- **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.

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

- **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 based on reperfusion obtained during the procedure

Ischemic stroke patients who are NOT lytic 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.

**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 lytic administration. Maintain euvolemia in all stroke patients (patient’s should be given maintenance rate normal saline unless there is a clear contraindication to doing so).
Monitor all patients given thrombolytics closely for clinical worsening and orolingual swelling during and for 24 hours after lytic infusion.

**Patient develops severe headache, acute hypertension, nausea, vomiting or worsening neurological status**

**Stop thrombolytic immediately**

*Use Post-thrombolysis Hemorrhage Order Set*

- STAT head CT
- Type & Cross (if not already done)

**CT confirms hemorrhage & lytic 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

**CT excludes hemorrhage**

- Resume lytic if administration incomplete

**Patient develops edema of the tongue, lips, mouth or oropharynx**

**Stop thrombolytic immediately**

*Use Post-thrombolysis Orolingual Edema Order Set*

**Hold**

- ACE inhibitors
  - 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 imminent 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

**Fibrinogen less than 200**

- Administer another 10 units cryoprecipitate (ordered from the Post-thrombolysis 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

© J. Morris 2013; Revised Jan 2021
For patients deemed NOT to be candidates for IV thrombolysis or EVT for acute ischemic stroke

Results of Head CT and CTA head and neck

Moderate-to-large size infarction present or anticipated

Moderate or high-grade extracranial carotid stenosis

Non-stenotic extracranial carotid or aortic plaque rupture

High-grade intracranial atherosclerotic stenosis

Cervicocephalic arterial dissection or other abnormal vascular finding

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

If pt is NPO, recommendation is at the discretion of the treating physician

Bleeding risks must also be taken into consideration when using dual antiplatelet therapy and ultimate management is at the discretion of the treating physician

* 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

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

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)

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

Deficits Resolved

ABCd2 Score < 4

Aspirin 81 mg qd

ABCd2 Score ≥ 4

Aspirin 81 mg qd

NIHSS ≤ 3

Aspirin 81 mg qd

NIHSS > 4

Aspirin 81 mg qd

Unrelated vascular disease or normal

Deficits persistent

Consider expedient outpatient TIA workup. Discuss disposition with On call Neurologist

Admit to CDU

Use TIA CDU Order Set

Consult Neurology

Admit to telemetry, R2 preferred

Use Gen Med Ischemic Stroke Order Set

Consult Neurology

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Alternatives to clopidogrel include:
- Ticagrelor 180 mg load, 90 mg bid
- Cilostazol 100 mg bid

† Alternatives to clopidogrel include:
- Ticagrelor 180 mg load, 90 mg bid
- Cilostazol 100 mg bid

‡ Ticagrelor.
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

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

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)

A. OPTIONS TO KCENTRA:
- 3-factor PCC (Prothrombin) IV at 10 ml/min:
  - INR 1.6-4.0 to 25 units/kg
  - INR greater than 4.0 to 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

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

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; Maximum 15 mg/hr
Alternative: Start Clevidine IV at 1-2 mg/h, increase by doubling the dose every 2-5 minutes as needed; Maximum 21 mg/hr

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Alternative: Start Clevidine 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) 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 is not available for use at Maine Health hospitals due to insufficient efficacy and safety data
- 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 = 2000 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 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

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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)

### BE-FAST\(^1\)

<table>
<thead>
<tr>
<th>B Balance</th>
<th>E Eyes</th>
<th>F Face</th>
<th>A Arm</th>
<th>S Speech</th>
<th>T Time</th>
</tr>
</thead>
<tbody>
<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

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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.

### FAST-ED\(^1\)

**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 Facial palsy</th>
<th>A Arm weakness</th>
<th>S Speech changes</th>
<th>T Time</th>
<th>E Eye deviation</th>
<th>D Denial/Neglect</th>
<th>TOTAL SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask the patient to smile</td>
<td>Extend the weak arm <strong>with palm facing down to 90°</strong> (if sitting) or 45° (if supine) and ask them to hold it there for 10 seconds</td>
<td>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>Time LKW is documented for decision making purposes and is not scored</td>
<td>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>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 <strong>side of their weakness</strong> and ask them “Whose hand is this?”</td>
<td></td>
</tr>
<tr>
<td>Normal or mild facial asymmetry</td>
<td>No drift down x 10 seconds</td>
<td>Normal speech</td>
<td>N/A</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>Able to sense touch on both sides at the same time and recognizes the weak hand as their own</td>
<td></td>
</tr>
<tr>
<td>Obvious droop of one side of the mouth</td>
<td>Drifts, but not all the way down to the bed</td>
<td>Impaired but comprehensible speech, and/or unable to name any of the items, and/or unable to follow the command</td>
<td>N/A</td>
<td>Eyes tend to only move to one side (make note of the side)</td>
<td>Unable to feel one side of the touch but can recognize their hand as their own</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drifts all the way down to the bed or no movement at all</td>
<td>Incomprehensible speech and/or complete lack of understanding or mute</td>
<td></td>
<td>Eyes both forced over to one side (make note of the side)</td>
<td>Unable to feel one side of touch and does not recognize their hand as their own</td>
<td>TOTAL SCORE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A score of <strong>greater than or equal to 4</strong> is indicative of possible large vessel occlusion.</td>
</tr>
</tbody>
</table>

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


10. Ticagrelor and Aspirin or Aspirin Alone in Acute Ischemic Stroke or TIA (THALES). NEJM.2020;383:207-17.


J. Morris 2021
**Patient Selection for CHARM: JAN 2021 UPDATE**

18-70yo 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**

**Check**
- FSBS, CBC, CMP & G6PD if h/o hemolytic anemia; Pg test if F ≤ 50yo
- Lab exclusions:
  - FSBG < 70
  - + Pregnancy test
  - G6PD deficiency

**Medical Exclusions:**
- Known sulfonylurea allergy
- Known sulfonylurea use w/in 7 d
- Severe cardiac, pulmonary, renal or hepatic disease
- h/o clinically significant hypoglycemia, DKA or diabetic coma
- Pregnancy or nursing
- Known SARS-CoV2 infection

**Exclusion criteria:**
- Commitment to decompressive craniectomy prior to enrollment
- Evidence (clinical or imaging) of concurrent infarction in the contralateral hemisphere sufficiently serious so as to affect functional outcome
- Life expectancy <3 months not related to current stroke, or those unlikely to be compliant with follow up
- Serious local infection (e.g., cellulitis, abscess) or systemic infection (e.g., septicemia) that required hospitalization or was clinically significant in the opinion of the investigator within 3 days prior to screening
- DNR
- Unable to place peripheral IV
- Subjects with mental disability or wards of the state

**Inclusion Criteria:**
- **Known SARS-CoV2 infection**
- **Known sulfonylurea allergy**
- **+ Pregnancy test if F ≤ 50yo**

**Pregnancy or nursing**

**Severe Local Infection** (e.g., cellulitis, abscess) or systemic infection (e.g., septicemia) that required hospitalization or was clinically significant in the opinion of the investigator within 3 days prior to screening

**Clinical Exclusion Criteria:**
- Age <18 or >70
- 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

**Consenters:** Paul Muscat, Diana Goodman, Jane Morris, Dave Seder, Rich Riker, Patti Lerwick, Patrick Mailloux, Teresa May, Angie Leclerc, Pauline Boyce and Andrew Busler

**24/7 CHARM Hotline:**
833-793-5298