2025 MMC-POR ED Stroke Packet

ISCHEMIC STROKE

1. Guidelines for **ACTIVATION** of **ED & ENDO CODE STROKES**
2. **FAST-ED Score** with **TIPS & TRICKS** for difficult to examine patients
3. **Posterior Circulation Stroke** Recognition

Redesign Posterior Stroke Recognition

4. ED CODE STROKE PATHWAY
5. ENDOVASCULAR TRANSFER PATHWAY **WITH D2IR OPTION**
6. INPATIENT CODE STROKE PATHWAY
7. ED TIA & MINOR STROKE PATHWAY

LVO from BID/SAN or BAO < 6hr LKW

Thrombolysis resources

8. TNK Eligibility Criteria
9. Pre- and Post-TNK and EVT Blood Pressure Management Guidance
10. Management of Post-TNK Complications

INTRACRANIAL HEMORRHAGE

11. Intracerebral Hemorrhage (ICH) Pathway
12. ICH Imaging Guidance
13. ICH Blood Pressure Management Guidance
14. ICH Reversal of Antithrombotics Guidance

Focus on ICH METRICS
Time to BP control
Time to AC Reversal

STROKE PACKET eSUPPLEMENT (available in on-line versions only)

See EM CLINICAL GUIDELINES – under Neurology/Neurosurgery

e1. APPENDIX: Code Stroke Paging Matix & Roles and Responsibilities

e2-e4. IMAGING PATHWAYS APPENDICES: D2CT, non-D2CT and D2MR

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.

Reviewed and Revised March 2025

Guidelines for Activation of ED CODE STROKES

For patients thought to be candidates for **thrombolysis**[¥] or **acute endovascular intervention** for stroke

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

T = 0

Perform **FAST-ED Score** & Identify time Last Known Well (**LKW**)

Confirm (LKW) with **PRIMARY SOURCE** as often as possible. If patient **found with deficits,** when were they *last seen without* their new deficits?

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

Obtain BP, blood glucose and answers to the **3 lytic questions** from patient/patient representative/chart review as quickly as possible

FAST-ED Score < 4 & LKW < 4.5 hr

FAST-ED Score ≥ 4 & LKW < 24h

DTA ≤ 10 min

ACTIVATE "MMC ED Code Stroke"

ACTIVATE "MMC ED Endo Code Stroke"

Call REMIS 662-2950

Use the **ED Acute Stroke** Order Set

3 Lytic Questions & if Yes, when and what?

- Any recent surgeries, procedures or trauma?
- Any history of any bleeding problems, including ICH?
- Is the patient on any blood thinners?

Refer to *TNK Eligibility Criteria* for any Yes answers

¥ Patients with obvious absolute contraindications to thrombolysis upon presentation, should NOT have an ED Code Stroke activated; *However, they may still meet criteria for an ENDO Code Stroke*

IMPORTANT NOTES:

- **NIHSS** must be performed *before* TNK and EVT and within 12 hours of arrival on all other stroke patients (a Joint Commission requirement for Comprehensive Stroke Centers)
- **§ Stroke with non-disabling symptoms: DAPT** is the preferred treatment for acute NON-disabling deficits
- **CRAO:** Sudden onset, painless, monocular blindness may be a central retinal artery occlusion should prompt an **ED Code Stroke Activation** and STAT CT/CTA, PLUS STAT ESR/CRP, Ocular U/S and Ophthalmology Consultation. Exam should include fundoscopy.
- **LVO with minor deficits:** All patients suspected of having a stroke or TIA within the last 24 hours should have an STAT CT/CTA upon arrival. **If there is no completed infarction on the head CT and an LVO is identified on CTA despite a FAST-ED score < 4, activate an MMC ED ENDO CODE STROKE.**
- **ED Boarders:** If a patient has been admitted to the hospital but is still boarding in the ED, the **ED Code Stroke process should be followed**, NOT the Inpatient Code Stroke process, **with one addition** that the patient's bedside RN will **notify the patient's Primary Team** and they will need to come to bedside to assist with care.

See MMC EM Clinical Guidelines online 2025 ED Stroke Packet
e1 Appendix: Code Stroke Paging Matrix &Roles and Responsibilities

FAST-ED Score and FAST-ED Tips and Tricks

FAST-ED Score: **F**ield **A**ssessment **S**troke **T**riage for **E**mergency **D**estination

A score of **greater than or equal to 4** has a sensitivity of 0.61 and a specificity of 0.89 (PPV 0.72) for **large vessel occlusion.**

		0	1	2	Score
F	**Facial palsy**	Normal or mild facial asymmetry	Obvious droop on one side of the mouth	N/A	
A	**Arm weakness** Extend the **weak arm** with palm facing down x 10 seconds	No drift down x 10 seconds	Drifts, but not all the way down	Drifts all the way down or no movement at all	
S	**Speech changes** Includes dysarthria or aphasia (abnormal expression or comprehension)	Normal speech	Impaired but comprehensible speech, and/or unable to name any of the items, and/or unable to follow the command	Incomprehensible speech and/or complete lack of understanding or mute	
T	**Time LKW***	N/A	N/A	N/A	
E	**Eye deviation** Test horizontal eye movement	Normal horizontal eye movements	Eyes tend to only move to one side	Eyes both forced over to one side	
D	**Denial/Neglect** 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?"	Able to sense touch on both sides at the same time and recognizes the weak hand as their own	Unable to feel one side of the touch but can recognize their hand as their own	Unable to feel one side of touch and does not recognize their hand as their own	
	TOTAL SCORE				

***Time is documented for decision making purposes and is not scored.

FAST-ED Score: TIPS and TRICKS

	Coma = patient is not alert or interactive despite verbal or noxious stimuli (includes sedation)	Difficult patient to examine, aphasic or confused
F	**Default score:** 1	Use noxious stimulation to elicit grimace. **Score:** 0 = symmetric grimace 1 = asymmetric grimace
A	**Default score:** 2	Observe spontaneous arm movements, hold up arms and note any effort against gravity or asymmetry of drop, note asymmetry of withdrawal to noxious stimuli. **Score:** 0 = symmetric movements 1 = some movement against gravity 2 = no movement against gravity
S	**Default score:** 2	Choose score based on ability for the examiner to understand any attempts at communication and whether patient is following any commands or not. **Score:** 1 = impaired but comprehensible speech, and/or unable to follow commands 2 = incomprehensible speech and/or complete lack of understanding or mute
E	Hold eyes open and note if eyes are deviated to one side. Then swiftly turn head side-to-side (Doll's eyes maneuver) and note if eyes can cross midline to both sides or not. **Score** based on positioning and movement of the eyes: 0 = no deviation, crosses midline in both directions 1 = eyes won't cross midline in one direction 2 = forced eye deviation	Note if eyes are deviated to one side. Make eye contact and move your face from side to side and note if the patient tracks you across the midline to both sides or perform Doll's eyes maneuver. **Score** based on positioning and movement of the eyes: 0 = no deviation, crosses midline in both directions 1 = eyes won't cross midline in one direction 2 = forced eye deviation
D	**Default score:** 0	**Score** only if present: 0 = patient seems to attend to stimuli coming from both directions 1 = patient tends to only respond to stimuli from one side (typically the left hemispace) 2 = patient only orients eyes and attention to one hemifield

Field Assessment Stroke Triage for Emergency Destination; A Simple and Accurate Prehospital Scale to Detect Large Vessel Occlusion Strokes. *Stroke*.2016;47:1997-2002.

POSTERIOR CIRCULATION STROKE RECOGNITION

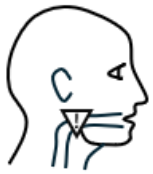
5 D'S

IF A PATIENT COMPLAINS OF **ANY 1** OF THE 5 D'S, **ASK** ABOUT THE **OTHER 4**
(along with other typical stroke symptoms, i.e. weakness, numbness, aphasia, etc.)
≥1 5 D'S that is **ACUTE ONSET, UNPROVOKED** and **UNEXPLAINED** by another process
= CONCERN FOR POSTERIOR CIRCULATION STROKE!
WITHIN 4.5 HOURS = **ED CODE STROKE**
WITHIN 24 HOURS, IF FASTED ≥ 4 or LVO on CTA = ENDO CODE STROKE
(per usual ED Code Stroke protocol)

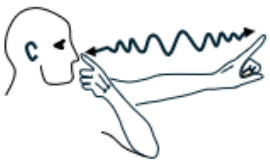
DIZZINESS OR VERTIGO	Sudden onset, unprovoked, persistent vertigo without position change suggests a **central** causes of vertigo	Perform **HINTS-plus** exam *only if vertigo **persists** at the time of the assessment*

DIPLOPIA OR VISION LOSS	Assess horizontal and vertical eye movements	Check visual fields with **each eye tested separately** Patterns of vision loss concerning for brain or retinal stroke HEMIANOPIA  QUADRANTANOPIA  MONOCULAR VISION LOSS 

DYSARTHRIA (slurred speech)	Listen to the quality of pt's speech, note palate elevation, check for tongue deviation, look for facial palsy	



DYSPHAGIA (difficulty swallowing)	Ask about drooling, difficulty swallowing or change in voice	



DYSTAXIA (difficulty controlling your limbs)	Test finger-to-nose, heal-to-shin and gait ataxia	Some gait ataxia is common with all vertigo, however, the **inability to walk unaided** is unusual in peripheral vertigo and should raise concern for cerebellar stroke.

Know that **BASILAR ARTERY OCCLUSION** can present with sudden LOC with convulsive-like motor activity that **can mimic seizure**.
Clues to stroke include ocular palsies, pupil asymmetry, hemi/quadriparesis, positive Babinski sign and no history of prior seizures.

ED CODE STROKE PATHWAY

For patients who **present to the MMC-POR ED** with **suspected acute stroke within 24 hours** of time LKW

LKW/Onset of symptoms

Arrives **with** pre-notification
(i.e. EMS with pre-notification or ENDO transfer)

Arrives **without** pre-notification
(i.e. EMS without pre-notification or POV)

T = 0

Direct-to-CT Pathway (D2CT)

Non-Direct to CT Pathway
(BEFAST required)

Use the **ED Acute or Subacute Stroke** Order Set

Appropriate Code Stroke Process is Activated

DTA
≤ 10 min

STAT Head CT with CTA head & neck + CTP if FAST-ED ≥ 4

DTCT
≤ 15 min

TNK candidate?

No

Consider if pt is appropriate for DAPT:
(see TIA/Minor Stroke Pathway)

Yes

See *TNK Eligibility Criteria*

TNK 0.25 mg/kg, Max 25 mg IV push

Use **STROKE - Acute Treatment with Thrombolytic** Order Set

DTN
≤ 30 min

Goal CTA to TNK order (CTO) ≤ 10 min
Goal order to TNK administration ≤ 5 min

Yes or No

LVO with favorable CTP?

No

If an ED Code Stroke was activated due to FAST-ED Score of < 4, but CTA shows and LVO, an **ENDO Code Stroke** should be activated at this time

Yes

Patient admitted to the appropriate level of care based on TNK administration and clinical condition (floor or ICU)

No

EVT candidate?

Yes

Floor admission:
Gen Med Ischemic Stroke Admission Order Set

ICU admission no TNK:
Ischemic Stroke NON-Thrombolysis ICU Order Set

ICU admission after TNK:
Ischemic Stroke POST- thrombolysis ICU Order Set

Post-EVT:
Cerebral Thrombectomy Post-Procedure Order Set

Patient transported STAT to IR suite

Keep HOB at zero degrees
unless patient is vomiting or unable to tolerate head down position due difficulty breathing or other medical condition in which case put HOB at 30°

Time to groin puncture minimized

DTP
≤ 60 min

Time to reperfusion minimized
Once reperfusion attained,
HOB no longer needs to be kept at 0°

Goal: single pass TICI 2b or greater reperfusion

DTR
≤ 90 min

See MMC EM Clinical Guidelines online 2025 ED Stroke Packet
e1 Appendix: Code Stroke Paging Matrix &Roles and Responsibilities

References: AcT Trial. *Lancet* 2022;400: 161–69. **Renal Safety of CT Angiography and Perfusion Imaging in the Emergency Evaluation of Acute Stroke**. *AJNR*. 2008;29:1826-1930. **Time to Treatment** With Intravenous Tissue Plasminogen Activator and Outcome From Acute Ischemic Stroke. *JAMA*.2013; 309:2480-2488. **Ultra-early Thrombolysis in Acute Ischemic St**roke Is Associated With Better Outcome and Lower Mortality. *Stroke*.2010;41:712-716. ***ARAMIS***.*JAMA*.2023;29 (24):2135-2144

ENDOVASCULAR STROKE TRANSFER PATHWAY WITH D2IR OPTION

For patients at an **Outside Hospital (OSH)** with a suspected or confirmed acute stroke secondary to **large vessel occlusion (LVO)**

REMIS pages the MMC-P **Neurologist** (or TeleStroke a TeleStroke Consult is requested) **AND** the **Neurointerventionalist (NI)** for an **"Urgent Stroke" question**

LKW/Onset of symptoms

OSH D2IR pathway

Large Vessel Occlusion is clinically suspected or imaging confirmed?

No → The **Neurologist** considers whether there are other acute stroke treatment options and if there is need for transfer and triages as appropriate

Yes

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

No → The **Neurologist** considers whether there are other acute stroke treatment options and if there is need for transfer and triages as appropriate

Yes

Select pts with **LVO** from **MMC-BID/SAN** or patients with basilar artery occlusion **(BAO) who are < 6h LKW** may be taken D2IR at the discretion of the NI

The **NI** accepts patient for evaluation & clarified if **D2CT, D2IR** or **D2MR (BAO > 6h)** pathways are to be used

NI APP enters imaging orders into Neuro Urgent Stroke Transfer/**LVO Order Set**

REMIS "**ENDO Direct-to-IR**" with pt info & ETA

REMIS "Endo Stroke, [name of OSH]" with Patient information & ETA

Tell OSH to put **HOB at 0° *** (can be lateral decubitus position) **AND** start maintenance rate **IVF** with crystalloid to maintain cerebral perfusion pressure (keep BP < 180 if post-lytic)

*****unless patient is vomiting or unable to tolerate the **0°** position due difficulty breathing or other medical condition in which case put HOB at 30°

ED-to-ED transfer to MMC-POR STAT via EMS

Patient arrives at MMC-P ED via inter-facility transfer

ED RN Releases the LVO Order Set upon pt arrival

T = 0

Patient will **NOT go to CT,** but will be brought by EMS directly to the NIR Suite

Patient access will escort EMS to the Neuro IR Suite if they do not know the way

See eSupplement *D2MR if applicable*

Pt taken D2CT

Do **NOT** activate an ED Code Stroke

CT/CTA/CTP performed **per LVO Order set** as directed by the NI

DTCT ≤ 15 min

EVT candidate?

No → 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

Yes → Patient is taken to NIR Suite STAT keeping **HOB at 0°** as above until thrombectomy is complete

DTP ≤ 60 min

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

DTR ≤ 90 min

See MMC EM Clinical Guidelines online 2025 ED Stroke Packet
e1 Appendix: Code Stroke Paging Matrix &Roles and Responsibilities

References: Time to Treatment With Endovascular Thrombectomy and Outcomes From Ischemic Stroke. *JAMA*.2016;316:1279-88. **Thrombectomy within 8 Hours after Symptom Onset in Ischemic Stroke**. *NEJM*.2015;372:2296-2306. **Thrombectomy 6 to 24 hours after Stroke with a Mismatch between Deficit and Infarct**. *NEJM*.2017;378:11-21.

INPATIENT CODE STROKE PATHWAY

For patients **admitted to MMC-POR** who develop symptoms concerning for acute stroke

LKW/Onset of symptoms

Clinical staff calls **662-2345** and states **"Possible Inpatient Stroke"**
AND **notifies the pt's primary team** of possible stroke

Neurology/NCC & **Code White** team evaluates the patient; **NIHSS performed**

Acute stroke suspected?

No → An Inpatient Stroke Alert is **NOT** activated.
Case discussed with an appropriate attending and the encounter is documented in Epic by the Neuro responder.

Yes

Note: ED BOARDERS
The **ED Code Stroke** process should be followed, with the addition that the ED RN will page the **primary team** who must come to the ED to assist with care

NIHSS is ≥ 6 in a pattern c/w an LVO?

No → **ACTIVATE "Inpatient Code Stroke"**

Yes → **ACTIVATE "Inpatient Endo Code Stroke"**

Use the **Inpatient Stroke Alert** Order Set

Call REMIS 662-2950

If labs will be necessary for the decision for thrombolysis, they should be drawn **PRIOR** to the patient being taken to CT
A **phlebotomist** is dispatched to the pt's location to do this.

Alert
T = 0

CT/CTA +/- CTP performed STAT

ATCT
≤ 15 min

Acute stroke intervention Indicated?

No → 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.

Yes

SCU Coordinators will identify a critical care bed if pt was not in one

Use **STROKE – Acute Treatment with Thrombolytic** Order Sets

<u>TNK CANDIDATE</u>:
TNK ordered STAT and initiated in the CT or CC area;
Patient is managed and monitored in the ED until an ICU bed is available OR pt is taken to the IR Suite

ATN
≤ 30 min

*unless patient is vomiting or unable to tolerate the zero degree position due difficulty breathing or other medical condition in which case put HOB at 30 degrees

<u>EVT CANDIDATE</u>:
Patient is taken to IR Suite directly from CT following administration of TNK (if indicated) **with HOB zero degrees*** until thrombectomy is complete

ATP
≤ 60 min

ATR
≤ 90 min

Use the **Cerebral Thrombectomy Post-Procedure** Order Set

Use the **Ischemic Stroke ICU Order Sets** for ICU admissions

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

See MMC EM Clinical Guidelines online 2025 ED Stroke Packet
e1 Appendix: Code Stroke Paging Matrix &Roles and Responsibilities

Reference: Identifying Best Practices to Improve Evaluation and Management of In-Hospital Stroke:. A Scientific Statement From the American Heart Association. Stroke.2022;53 (4)

TIA and MINOR STROKE PATHWAY

For patient who presents to the ED with **transient** focal neurological or retinal symptoms or **minor non-disabling¥ symptoms** thought to be due to ischemic stroke

Immediate triage & physician assessment

CT head with CTA head and neck performed STAT, (STAT b/c LVOs can present as TIAs or minor strokes)

Use the ED Acute or Subacute Order Set and select **ED Subacute Stroke Order Set**

For **transient or persistent monocular blindness** add **ocular U/S** and **fundoscopy**, and if pt > 50 yo, add **ESR and CRP** to labs

LVO identified?

Yes → Activate ED Endo Code Stroke
Keep HOB 0° unless concern for aspiration

No

Further clinical evaluation & monitoring (Imaging, ECG, labs, UA) – consider the DDx of sx

TIA/Stroke still suspected as etiology of presenting sxs?

Yes

Neurology Consult

Neurology consult may be via telehealth or in the morning on nights when no inhouse coverage is available

Assess for high-risk features

High-risk features:
- High-risk vascular finding (moderate- or high-grade stenosis, plaque rupture or thrombus in a symptomatic cerebral artery, dissection, vasospasm, etc.)
- ECG/telemetry shows a significant dysrhythmia or ischemia (new AF)
- BP persists > 180/100 or other abnormal or unstable vital signs
- Recurrent symptoms concerning for stuttering TIA
- Co-morbid high-risk medical condition
- Concerning lab abnormalities
- Known hypercoagulable state, including cancer-associated hypercoagulability
- Concern for infective endocarditis

+ high risk feature

Use the **Gen Med Stroke Admission Order Set**

Admission to Telemetry, Stroke Unit (R2) preferred

No high-risk features

Calculate ABCD2 scores for TIA patients
Assess patients for appropriateness for Stroke/TIA clinic
If so, Neurology will send an In Basket message to the Stroke Clinic and Cardiology clinic to ensure appointment are appropriately scheduled within 1 week

Criteria for TIA/ Stroke Hosp F/U clinic:
- ABCD2 Score 0-3 with pt preference for outpt work up
- ABCD2 Score 4-6 **with** no high risk features and **negative MRI**
- Pt safe for discharge after formal Neurology Consult awaiting TTE/MRI (weekends/Holidays)
- Isolated posterior circulation symptom in whom delayed MRI (48-72 hours) is preferred after Neurology has confirmed the exam and with no high risk features
- Small vessel infarcts observed for at least 12 h after onset/ LKW to assess for stability
- No concern for stroke mimics that may require additional tests (seizures, encephalitis)
- Patients with clear causes of stroke in whom admission will not change management (ex: AF on OAC with minor stroke with no rehab needs)

If pt does NOT meet criteria for Stroke/TIA clinic

Assess for appropriateness for CDU admission

If pt does not meet criteria for CDU admission

Criteria for CDU observation:
- $ABCD_2$ Score 0-3 with pt preference for inhouse work up
- $ABCD_2$ Score 4-6 **with no high risk features after neurology assessment**
- **Minor non-disabling stroke** per ARAMIS criteria
- 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

Use the **ED CDU TIA Protocol Observation Order Set**

¥ Non-disabling Stroke Definition (from ARAMIS Trial):
- NIHSS <6, including:
  - Zero on LOC 1a.
  - ≤ 1 on single-item scores
- AND **deficits would not affect patients ADLs and wo**rk

ABCD2 Score

Score	
Age > 60	1
Blood Pressure ≥ 140/90	1
Clinical Features of TIA :	
• Unilateral weakness +/-speech impairment	2
• Speech impairment w/o unilateral weakness	1
Duration:	
• TIA duration ≥ 60 minutes	2
• TIA Duration 10-59 minutes	1
Diabetes	1

ABCD2 Score 0-3:
- Aspirin 81 mg po daily (load with 324 mg po x1 if aspirin naïve)

ARAMIS criteria or **ABCD2 Score ≥ 4** and/ or atherosclerotic disease in symptomatic artery (THALES):
- Clopidogrel 300 mg po x1 (unless already on clopidogrel), continue 75 mg po daily x21 days
- Aspirin 81 mg po daily (load with 324 mg po x1 if aspirin naïve)

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

Revised March 2024
Reviewed Feb 2025

References: Clopidogrel with Aspirin in Acute Minor Stroke or TIA (**CHANCE**). *NEJM*.2013;369:11-19. Clopidogrel and Aspirin in Acute Ischemic Stroke and High-Risk TIA (**POINT**). *NEJM*.2018;379:215-225.Ticagrelor and Aspirin or Aspirin Alone in Acute Ischemic Stroke or TIA (**THALES**).*NEJM*.2020;383:207-17.**ARAMIS**. *JAMA*.2023;29 (24):2135-2144 *Neurology: Clinical Practice* 2023;13:e200209. doi:10.1212

TNK Eligibility Criteria

For patients with **potentially disabling** symptoms thought *most likely* to be secondary to ischemic stroke

3 Lytic Questions

Higher risk ↑ Risk of bleeding ↓ Lower risk

	Clinical presentation/ medical history	Have you had any recent trauma, surgeries or procedures?	Have you had any bleeding problems?	Are you taking any blood thinners?	Imaging	Labs*
TNK is contraindicated	• LKW > 4.5h with unfavorable CTP • Sx of SAH	• Severe head trauma w/in 3 mo			• Acute intracranial hemorrhage • Completed infarct	
Lytic is not recommended/ potentially harmful	• BP cannot be lowered < 185/110 • Sx concerning for endocarditis • Known or suspected aortic dissection • **On anti-amyloid immunotherapy†**	• Intracranial or intra-spinal surgery w/in 3 mo • Major non-cranial surgery† or trauma w/in 14 days with uncontrollable bleeding site (e.g. internal organs)	• H/o intracranial hemorrhage§ (consider the etiology and timing of hemorrhage) • Structural GI malignancy or GIB w/in 21 days	• Warfarin w/ INR > 1.7 • UFH w/ ↑ aPPT • Therapeutic dose LMWH w/in 24 hrs • DOAC w/in 48 hrs	• Intra-axial intracranial neoplasm (not extra-axial, i.e. not meningioma)	• INR > 1.7 • PT > 15 sec • aPTT > 40 sec • Plt < 100K
Safety and efficacy of lytic is not well established	• Age < 18yo • Ischemic stroke w/ in 3 mo • NIHSS > 25 in the 3-4.5 hr window • Cerebral aneurysm > 1 cm in size	• Arterial puncture at a non-compressible site w/in 7 days • Parturition w/in 14 days*	• Known bleeding diathesis	DOACs: Dabigatran (Pradaxa) Rivaroxaban (Xarelto) Apixaban (Eliquis) Edoxaban (Savaysa)	• Intra-cranial arterial dissection • Unruptured or untreated intracranial vascular malformation	*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**
Lytic may be considered/may be reasonable, especially if moderate to severe stroke	• Pregnancy‡ • Myocardial infarction w/in 3 mo • Acute pericarditis or LV/LA thrombus	• Lumbar puncture w/ in 7 days • Major non-cranial surgery† or trauma • within 14days with controllable bleeding site (e.g. limb)	• GI or GU bleeding > 21 days ago • Hemorrhagic ophthalmologic condition • Menorrhagia‡	† Recent surgeries and procedures: Consider the risk of **bleeding at the site** of the surgery/procedure AND Consider the risk of the surgery/procedure of having caused a **silent stroke (ex: TAVR, CEA, CABG)** that could serve as a potential nidus for thrombolysis-associated hemorrhage		BG < 50 or > 400

‡ Pregnancy and vaginal bleeding:
If patient is pregnant, peripartum or has a history of recent or active vaginal bleeding causing clinically significant anemia, then emergency consultation with a Ob-gyn is recommended before a decision about lytic is made

§ Patients w/ h/o **cerebral microbleeds**:
- 1-10 CMB: administration of lytic is reasonable
- > 10 CMB: administration of lytic may be associated with an increased risk of sICH. Tx may be considered in the setting of moderate to severe stroke

- † **On active treatment with anti-amyloid immunotherapy** (IV infusions): lecanemab (Leqembi) within 2 wks; aducanumab (Aduhelm) or donanemab (Kisunlal) within 4 wks

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

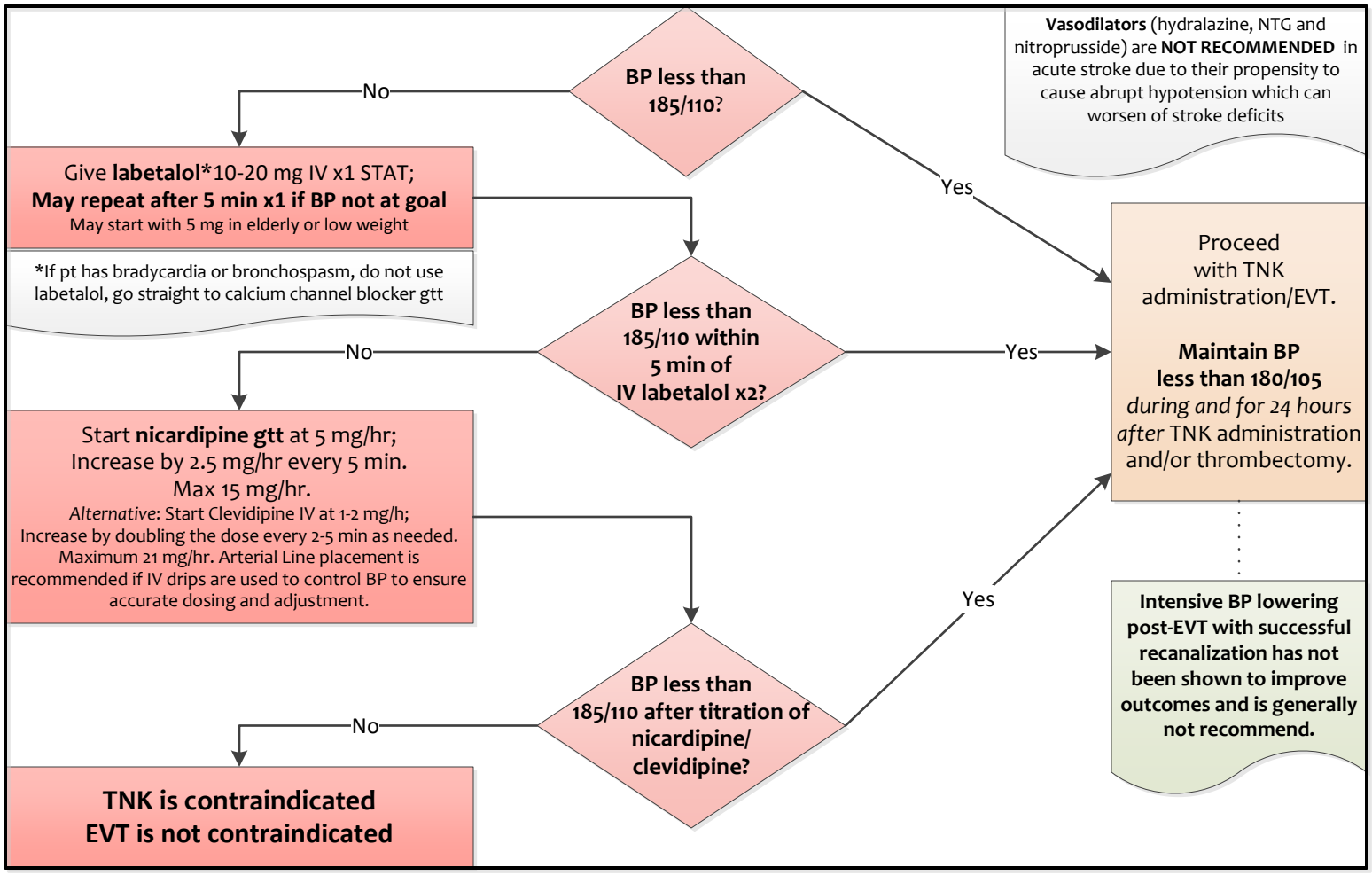
Factors which are not contraindications to lytic, but are known to be associated with an increased risk of post-lytic hemorrhage:
- Older age (> 80 yo)
- Later in the time window (> 3 hr from time LKW)
- Severe stroke (NIHSS > 25)
- Hyperglycemia (BG > 140)
- Hypertension (BP > 180/100)
- Severe white matter disease on head CT (Fazekas grade 3)

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.

Reference: Scientific Rationale for the Inclusion and Exclusion Criteria for Intravenous Alteplase in Acute Ischemic Stroke.
American Heart Association/American Stroke Association Scientific Statement. *Stroke*.2016;47:581-641. HOPE Trial. 2025

Pre- and Post-TNK and EVT Blood Pressure Management Guidance

For patient identified as an appropriate **TNK** candidate or an **EVT** candidate with or without TNK



Post-TNK/EVT management:

Use the **Ischemic Stroke POST-thrombolysis ICU** Order Set

- Admit to an ICU for close neurological and blood pressure monitoring for a minimum of 24 hours
- Continue BP and neuro checks every 15 minutes for 2 hours after TNK is administered, then every 30 minutes x 6 hours, then every 1 hour x 16 hours. The frequency of BP checks thereafter should be individualized to meet the patient's needs
- Avoid the following for 24 hours post-TNK: Arterial or central venous punctures/lines, IM injections, nasogastric tubes
- Foley catheter placement should be avoided in stroke patients unless there is a compelling medical reason to do so
- Avoid antiplatelet or anticoagulant medications x24 hours after TNK unless there is another compelling reason to do so (such as intravascular stenting required for mechanical thrombectomy)

If TNK-associated hemorrhage suspected, use **Post-thrombolytic Hemorrhage** Order Set
If patient developed perioral or lingual edema use, **Post-thrombolytic Orolingual Edema** Order Set

See *Management of post-TNK Complications*

Note: 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: HYPOtension 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 (potentially complicated by infective endocarditis causing stroke). **Hypotension should be treated immediately** with non-dextrose containing crystalloid fluid repletion, correction of any arrhythmias and consideration of pressors in select patents (discuss with Neurology). Consideration for additional acute work up should include cardiac markers, blood cultures, CTA chest prior to lytic administration if aortic dissection is clinically suspected. **Maintain euvolemia** in all stroke patients and ensure patients who are NPO are placed on maintenance rate normal saline unless there is a clear contraindication to doing so until they are able to take adequate hydration PO.

References: Guidelines for the Early Management of Patients with Acute Ischemic Stroke: 2019 Update American Heart Association/ American Stroke Association. *Stroke*.2019 (12);50:e344-e418. **OPTIMAL-BP**. JAMA.2023. doi:10.1001/jama.2023.14590; **BP-TARGET** *Lancet Neurol*. 2021; doi:10.1016/S1474-4422(20)30483-X **ENCHANTED2/MT** *Lancet*. 2022. doi:10.1016/S0140-6736(22)01882-7

Management of Post-TNK Complications

All patients given TNK must be monitored closely for **clinical worsening** and **orolingual swelling** for 24 hours after TNK administration

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

Use **Post-thrombolytic Hemorrhage** Order Set

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

CT confirms hemorrhage & lytic given within the last 24 hours

CT excludes hemorrhage → Continue post-TNK care

- **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

- **STAT CBC** and **Coag panel, Bleeding patient**
- Draw *after* administration of cryoprecipitate

Fibrinogen less than 150 → 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

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

Use **Post-thrombolytic 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 imminent respiratory compromise develops, administer
- **Berinert (C1 esterase inhibitor) 20 units/kg IV**
- +/- 0.3 mL (0.3 mg) of 1 mg/mL epinephrine IM or 0.5 mL of 2.25% racepinephrine nebulized (caution in HTN)

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

Risks of Reversal Agents

Cryoprecipitate	Transfusion reaction, TRALI
Platelets	Transfusion reaction, TRALI, volume overload
FFP	Transfusion reaction, TRALI, volume overload
PCC	Thrombosis
TXA	Thrombosis
Aminocaproic acid	Thrombosis
Vitamin K	Anaphylaxis

TRALI = transfusion-related lung injury

References: Guidelines for the Early Management of Patients with Acute Ischemic Stroke: 2019 Update American Heart Association/American Stroke Association. *Stroke.*2019 (12);50:e344-e418. **AHA/ASA Scientific Statement. Treatment and Outcome of Hemorrhagic Transformation after Intravenous Alteplase in Acute Ischemic Stroke.***Stroke.*2017;48e. Angioedema Following TNK for AIS. *Stroke.*2024;55:e242-244

MMC INTRACEREBRAL HEMORRHAGE (ICH) PATHWAY

For patients who **present to the MMC ED** with suspected stroke found to have ICH on initial imaging

Pre-imaging process is the same as **ED CODE STROKE PATHWAY**

Arrival

Non-contrast Head CT
See *ICH Imaging Guidance*

Obtain clinical information:
- Time LKW
- Document **GCS Score** on arrival
- Anticoagulation use and time last taken

ICH identified

DTCT ≤ 15 min

Initiate reversal of anticoagulation as indicated
See ***ICH Reversal of Anticoagulation Protocol***

Use **appropriate anticoagulation reversal** Order Set

AND

Based on current SBP, time LKW and size of hematoma initiate BP management as per the ***ICH BP Management Protocol***

Reversal of AC ordered ≤ 30 min

BP tx initiated ≤ 30 min

Use **ED Intracerebral hemorrhage (ICH)** Order Set

Monitor BP q10 – 15min

Monitor patient for signs of increased ICP, seizures and other intervention as per the ***Additional Acute Management Measures in ICH***

Reversal of AC initiated ≤ 60 min

BP at Target ≤ 60 min

Indications for urgent Neurosurgical Consultation:
Patient with pre-stroke mRS ≤ 3, reasonable prognosis and ≥1 of:
- GCS ≤ 13
- Supratentorial ICH volume ≥ 20 mL
- Posterior fossa ICH
- Obstruction of the 3rd and/or 4th ventricle(s)
- Evidence of tumor or AVM on imaging

Continued ED Care after imaging and stabilization:
- 12-lead ECG
- CXR if indicated
- Dysphagia screen and aspiration precautions if not intubated
- Continue q10-15 min BP monitoring and neuro assessments

Use **Intracerebral hemorrhage (ICH) Admission** Order Set

- Admit to Neurocritical Care Unit
- Ensure **ICH Score** is documented
- Repeat head CT at 6-24 hours to assess for hematoma stability and STAT for any clinical deterioration

Revised March 2024
Reviewed Feb 2025

Reference: 2022 American Heart Association/American Stroke Association Guidelines for the Management of Spontaneous Intracerebral Hemorrhage Stroke. *Stroke*.2022;53.

MMC INTRACRANIAL HEMORRHAGE IMAGING GUIDANCE[1]

For patients who undergo STAT head CT for symptoms of stroke and are found to have an intracranial hemorrhage

Review patient characteristics and imaging findings

INITIAL IMAGING (FIRST 24HRS)

CTA recommended for the following
- Age < 70 years with lobar hemorrhage
- Age < 45 years with deep/posterior fossa ICH
- Age 45-70 years with deep/posterior fossa ICH **without** a history of hypertension‡

‡ Hypertension is defined as:
- PMH of HTN
- pt on anti-HTN medications
- evidence of LVH on admission ECG

CTV recommended for the following
- Hyperattenuation within dural venous sinus or cortical vein along the path of drainage of ICH
- Patient with exogenous estrogen use or other risk factors for dural venous thrombosis

Repeat Head CT recommended in all patients: unless not in line with goals of care
- Follow up head CT at approximately 6 and 24 hours to assess for hematoma expansion and document final ICH volume

ADDITIONAL IMAGING

MRI/MRA is reasonable in the following:
- Patients with a negative initial work up to establish a non-macrovascular cause of ICH (such as cerebral amyloid angiopathy, hypertensive arteriopathy, cavernous malformation or malignancy)

Cerebral angiography is recommended for:
- Primary intraventricular hemorrhage (no detectable parenchymal component)
- Abnormal CTA or MRA suggestive of a macrovascular cause

Cerebral angiography is reasonable for:
- Etiology unclear following appropriate work up and non-invasive imaging (CTA/CTV and MRI/MRV)

Repeat cerebral angiography in 3-6 months may be reasonable for:
- Patients with negative initial DSA in whom no clear microvascular diagnosis or other defined structural lesion was identified

Secondary ICH (sICH) Score[2]

sICH Score

Age
- 18-45 +2
- 46-70 +1
- ≥ 70 +0

Sex
- F +1
- M +0

Probability of vascular cause on NCCT¥
- High +2
- Indeterminate +1
- Low +0

Absence of BOTH hypertension‡ AND impaired coagulation§
- Yes +1
- No +0

¥ Probability of vascular cause defined as:

High
- Enlarged vessels or calcifications along the margins of the ICH **OR**
- Hyperattenuation within a dural venous sinus or cortical vein along the presumed venous drainage path of the ICH

Low
- No high-probability findings AND
- ICH located within the basal ganglia, thalamus, or brain stem

Indeterminate
- Does not meet criteria for a high- or low-probability NCCT (most commonly, lobar or cerebellar ICH)

§ Impaired coagulation defined as:
- INR > 3 or direct oral anticoagulant use
- aPTT > 80 seconds
- Platelets < 50,000 or daily antiplatelet use

Probability of vascular cause of ICH:

Points	~ % Positive CTA
0	0
1	2
2	4
3	20
4	40
5	80
6	100

References: **2022 American Heart Association/American Stroke Association Guidelines for the Management of Spontaneous Intracerebral Hemorrhage Stroke.** *Stroke.*2022;53. Am J Neuroradiol. 2010 Oct; 31(9): 1653–1660.

ICH Blood Pressure Management Protocol

For patients with spontaneous (non-traumatic) Intracerebral Hemorrhage

SBP < 130

- **Bolus with crystaloid fluid**
- Continue IVF at maintenance rate once euvolemic
- Work up for potential causes of hypotension as clinically indicated

SPB 130-150

- **Do not initiate BP lowering**
- Initiate maintenance rate IVF while NPO to maintain euvolemia
- Continue to closely monitor BP and treat as needed

SBP 150-220 mm Hg

Time LKW < 6 hours and mild to moderate hematoma size **(≤ 30 mL)**

→ **Target SBP 130-150 mm Hg**

Time LKW > 6 hours
OR
large hematoma size **(>30 mL)**
OR
Pt requiring surgical decompression

→ **Target SBP 140-160 mm Hg**

SBP > 220

- Aggressive BP lowering may be associated with **worse outcomes**
- Target SBP less 40-60 mm Hg during the first 12-24 hours
- **Avoid acute drops of > 60 mm Hg**

NOTE:
Acute lowering of BP to < 130 mm Hg is potentially harmful!

Goal arrival to Initiation of BP lowering ≤ 30 min

Use the **ED ICH** Order Set

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.
Max 21 mg/hr;
Arterial line placement recommended for accurate dosing if IV drips used for BP control

NOTE:
High BP variability in the acute phase of ICH is associate with poor outcomes!

Continue close monitoring and careful titration to ensure continuous, smooth and sustained control of BP
Avoid peaks and large BP swings

Goal arrival to BP target ≤ 60 min

Use the **ICH Admission** Order Set

After 24-48 hours, BP should be further reduced by the gradual introduction of **oral medications** to **target BP <130/<80 to prevent recurrent ICH**

Reference: 2022 American Heart Association/American Stroke Association Guidelines for the Management of Spontaneous Intracerebral Hemorrhage. *Stroke*.2022;53.

ICH Reversal of Anticoagulation Protocol

For patient with spontaneous intracerebral hemorrhage (ICH) on antithrombotics

All Patients:
- Review history of **anti-coagulation** and/or **antiplatelet use** AND **time dose last taken**
- Review results of **STAT coagulation profile, platelets** and **renal function**
- Hold any blood thinning agents and initiate appropriate reversal protocol if indicated based on agent below

Goal arrival to reversal of AC initiated ≤ 60 min

Vitamin K antagonist
- Warfarin (Coumadin, Jantoven)

→ Use **Neuro Crit Care – Warfarin Associated CNS Hemorrhage Order Set**

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

→ Use **Pulm/Crit Care – Management of Bleeding on Dabigatran Order Set**

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

→ Use **Pulm/Crit Care – Management of Bleeding on Rivaroxaban or Apixaban Order Set**

IV Unfractionated Heparin (UFH)

→
- 1 mg IV **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

Low Molecular Weight Heparin
- Enoxaparin (Lovenox)

→
- If last administration ≤ 8 hours ago: 1 mg IV **protamine** per 1 mg LMWH; Max 50 mg
- If last administration > 8 hours ago: 0.5 mg IV protamine per 1 mg LMWH; Max 50 mg

Antiplatelets
- Aspirin & aspirin containing products
- Clopidogrel (Plavix)
- Ticagrelor (Brilinta)
- Presurgrel (Effient)

→
- Platelet transfusion is **potentially harmful** and **should not be administered** in the absence of plan for emergent neurosurgical intervention or severe thrombocytopenia (<10,000) in which case it *may be considered* (1 unit of apheresis platelets *prior to surgery*)
- The effectiveness of desmopressin to reduce hematoma expansion is uncertain

Reference: 2022 American Heart Association/American Stroke Association Guidelines for the Management of Spontaneous Intracerebral Hemorrhage. *Stroke*. 2022;53:e282–e361.Points to Consider When Evaluating Andexxa for Formulary Addition. Peled, H., Dau, N.Q. & Lau, H. *Neurocrit Care* (2019).

2025 MMC ED STROKE PACKET

Electronic supplement

e1. APPENDIX. CODE STROKE PAGER MATRIX

	D2CT Stroke Alert (from EMS)	**Endo** Stroke Alert, Outside Hospital (**OSH**)	**Endo** Stroke Alert, OSH, **D2MR**	**MMC ED** Code Stroke	**MMC ED Endo** Code Stroke	**Code White** - ***Possible*** **Inpatient** Stroke	**Inpatient** Code Stroke	**Inpatient Endo** Code Stroke
CT technologists	X	X	X	X	X		X	X
Radiology Resident				X	X		X	X
EM Attending	X	X	X					
EM Resident	X	X	X					
ED Critical Care RN	X							
ED Nurse Coordinator	X	X	X	X	X		X	X
ED Triage Nurse	X							
ED Pharmacist	X			X	X		X	X
Registration	X	X						
Lab technician				X	X			
Charge RT			X					
Nursing supervisor			X				X	X
MRI technologist			X					
Neurointerventionalist		X	X		X			X
Neurosurgery APP		X	X		X			X
Neurocritical care APP		X	X		X		X	X
NIR lab staff		X	X		X			X
Anesthesiologist		X	X		X			X
CICU & SCU coordinators		X	X		X			X
Neurology attending		X	X	X	X		X	X
Neurology resident	X	X	X	X	X	X	X	X
Neurology/NCC APP	X	X	X	X	X	X	X	X
Stroke program manager		X	X	X	X		X	X
Stroke data coordinator	X	X	X	X	X	X	X	X
Code White Team						X		
Phlebotomist							X	X
Float Nurse							X	X

e1 APPENDIX: CODE STROKE ROLES AND RESPONSIBILITIES

EMS PROVIDERS:

FROM THE FIELD:

- Perform a Cincinnati pre-hospital stroke score (**CPSS) and** if positive perform a **FAST-ED Score**
- Minimizes On-Scene time as able
- Documents time last known well (**LKW**) and witness, **obtain name(s) & phone number(s) for witness(es)/caregiver(s)** who can confirm time LKW and can provide further medical history and consent for treatment
- Check **vital signs** and **FSBS** and treats abnormalities as indicated per Maine EMS guidelines
- Asks the patient/caregiver the **3 lytic questions,** document answers and relay responses to EM physician
- Transport patient in accordance with the **Stroke Triage Algorithm for Maine EMS**
- Provides **pre-notification** of suspected stroke per Maine EMS protocols with the results of the stroke scores, time LKW an ETA
- 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
- Hand-off upon arrival to MMC should include results of the CPSS, FAST-ED, LKW, and "yes" responses to the 3 lytic questions and **witness/caregiver contact name and phone number** to the EM providers

INTERFACILITY TRANSFERS:

- Use of the **EMS Stroke Interfacility Orders** is encouraged
- Use of the **EMS Interfacility Transfer of Acute Stroke Documentation** sheet is encouraged
- Target BP: <220/110 for non-lytic patients, < 180/100 for post-lytic patients, < 160/100 for ICH, < 140/90 for aneurysmal SAH
- For **D2IR** patients, EMS will transport the patient to the Neuro IR suite (escorted by **Patient Access** if they do not know the way)

REMIS:

FROM THE FIELD:

- Sends "**EMS D2CT"** when notified by EMS that patient meets criteria for field activation of the CT scanner

IN THE MMC-POR ED

- Sends "**MMC ED Code Stroke**" or "**MMC ED Endo Code Stroke**" when notified by the EM physician to activate and which page to send

INTERFACILITY TRANSFERS for ENDOVASCULAR THERAPY:

- Sends ETA page once a patient accepted in transfer by the NI, **"Endo stroke, [OSH]"** with the patient's name, DOB, current location and ETA
- Once notified by EMS that ETA is 10-30 minutes out from MMC, sends an **"Endo stroke, ETA xx min"** page
- When patient arrives at MMC, overhead announces "**Endo Stroke Patient Direct-to-CT**"

ENDO TRANSFER, D2IR:

- Same as above for Endo stroke alert, however adds **"Direct-to-MR Protocol"** to the page

ENDO CODE STROKE, D2MR:

- Same as above for Endo stroke alert, however adds **"Direct-to-IR Protocol"** to the page

INPATIENT CODE STROKE:

- Sends "**Possible Inpatient Stroke**" when notified by in-house staff of patient with symptoms concerning for stroke and includes the patient's name, DOB and location on the page
- Sends "**Inpatient Code Stroke**" or "**Inpatient Endo Code Stroke**" when notified by neurology or neurocritical care APP to activate an inpatient code stroke and which page to send

CT TECHNOLOGISTS:

- For any pre-notification, clears or holds one of the ED CT scanners in preparation for patient arrival
- Upon arrival in the CT, weigh patient **PRIOR** to scanning
- Initiate head CT as quickly as possible: **Goal door/alert to CT initiated (DTCT/ATCT) ≤ 15 min**
- Notify radiologist of potential acute stroke pt & expected time to scanning (M-F 8am-5pm: 662 4237; All other times: 662-4517)
- See D2MR below

REGISTRATION:

- Register the patient in the system immediately upon arrival, including patients arriving to MMC-POR and Endo transfers

TRIAGE RN:

- For pts with any neurological symptoms arriving by POV or by EMS without prenotification, **BEFAST** screen must be performed
- If BEFAST (+), overhead page "**Trigger patient to critical care**" and have patient brought to a CC room or nearest available bed

ED CC NURSE:

- D2CT:
  - Meets patients in the ambulance bay upon arrival and accompanies patient to CT
- Non-D2CT:
  - Meets patient in CC room; Places Hoyer Blue Pad on ED gurney so that it is under the patient before they are taken to CT
  - Notifies CT techs of **non-D2CT** patient & calls CT techs to see if scanner is open
  - As soon as CT scanner is open, transports patient to CT
- Prior to CT:

- Checks one set of vital signs
- Check FSBS (if not done by EMS)
- Draws and sends STAT labs
- Places/ensures 2 large bore IVs in place

- Post CT:
  - Administers TNK ASAP once eligibility has been determined, even if the patient is still in the CT scanner
  - Documents baseline neuro check and all post-TNK vital signs and neuro checks per orders
  - If pt has an LVO, place HOB at 0° unless pt vomiting or unable to tolerate position; otherwise place HOB at 30°
  - Keep pt strictly NPO until dysphagia screen is performed AND DOCUMENTED in Epic
  - 12-lead ECG should be obtained **after** imaging

EMERGENCY MEDICINE ATTENDING/RESIDENT:

- D2CT: Meets patients in the ambulance bay upon arrival and accompanies patient to CT
- Non-D2CT: Meets patient in a CC room
- Prior to CT:
  - Confirms patient is medically stable and if not, stabilizes the patient
  - Confirms clinical presentation is consistent with acute stroke
  - Performs **FAST-ED Score** and documents the score in Epic
  - Obtains initial reports of time last known well (**LKW**) – distinguish from time pt found with deficit if unwitnessed onset
  - **Calls REMIS to activate** the appropriate Code Stroke pathway bases on ED Stroke Packet Guidelines (**Goal arrival to activation ≤ 10 min**)
  - Enters orders into EPIC using the **ED Acute Stroke Order Set**
- Prior to or during CT:
  - Confirms time **LKW** with **Primary Source** if possible
  - Asks **3 lytic questions**, clarifies any "Yes" answers (from patient or patient representative as available)
  - Reviews any additional pertinent contraindications to thrombolysis (see *TNK Eligibility Criteria*)
  - Communicates any identified potential contraindications to lysis with the neurology team
- Post-CT:
  - Orders **TNK** using the **ED Acute Stroke – Treatment with Thrombolytic Order Set** as soon as lytic candidacy is determined
  - Communicates appropriate BP targets and monitoring frequency with the bedside RN
  - Performs the **NIHSS** if neurology is not in house
  - If the patient is not a candidate for thrombolysis, discusses further management recommendation with Neurology
  - Contacts the appropriate service for admission
- Endo Transfers:
  - 40-60% of Endo Transfers will not be candidates for intervention and will not be taken to the Neuro IR suite
  - Emergency Medicine providers will need to assist in further care of these patients in the Emergency Department until correct disposition is determined based on whether pt received lytics, any complications, severity of stroke, other active medical issues, comorbidities, goals of care, etc.

LAB TECHNICIAN:

- Processes Code Stroke labs STAT and calls the ED with results **(Goal door-to-lab result (DTL) ≤ 30 min)**

RADIOLOGIST:

- Provides prelim results of CT/CTA focusing on excluding signs of hemorrhage or completed stroke and presence or absence of any large vessel occlusions and calls results to the EM attending (**Goal CTA complete to *prelim* read by Radiologist/resident ≤ 5 min**)
- After 20:00 (8 pm) the radiology resident will provide preliminary reads with final read by Synergy (**Imaging must be read by ≤ 45 min per Joint Commission standards**)

ED PHARMACIST:

- Pulls TNK from Pyxis and **brings it to the CT scanner, but does not mix it until it is decided to be given**
- Helps with management of hypertension if needed prior to TNK administration
- Prepares TNK once order is received for appropriate candidates – can be given in the CT scanner if it is ready to be given
- **Goal TNK order-to-administration ≤ 5 min**

NEUROLOGY TEAM

- **ED Code Strokes:** (Attending, resident, APP):
  - Responds to all Stroke Alerts by phone (**Goal ≤ 5 minutes**) and is at bedside ASAP (**Goal ≤ 20 min**) for potential TNK candidates (this may be via telestroke video assessment if pt arrives after hours, which would be done in CC after CTs are done)
  - Obtains history from EM provider
  - Confirms LKW with primary source if possible
  - Reviews scans
  - Reviews *TNK Eligibility Criteria*, including calling patient caregiver for lytic questions if needed
  - Obtains verbal consent from the patient/patient representative
  - Recommends TNK if indicated

- Communicates with the EM provider to order TNK from the **ED Acute Stroke – Treatment with Thrombolytics Order Set** (must use this order set for stroke thrombolysis)
- Communicates with the Neurointerventionalist if patient is a potential EVT candidate

- **Endo Transfers:**
  - It is the Neurohospitalist's (NH) responsibility to respond to pages Urgent Stroke or TeleStroke Consults at OSH in which potential candidates for endovascular therapy are identified
  - The NH must document Urgent Stroke calls in a Telephone Encounter and TeleStroke Consults in a TeleStroke Consult Note. Information obtained should including weather lytics were administer and if not, what the contraindication was, the time LKW and time found with deficits, baseline functional status and patient's goals of care
  - Neurology Team should be prepared to meet the pt upon arrival based on ETA and assist in acute decision making regarding EVT, though ultimately the decision whether to perform a procedure is up to the Neurointerventionalist

ONECALL:

- **For Endo Transfers, will register pt in Epic and place them on the Expected Board prior to patient arrival**

NEUROINTERVENTIONALIST (NI)

INTERFACILITY TRANSFERS:

- Discusses patient with outside hospital provider
- Obtains clinical features including age, time LKW, baseline functional status and patient/family wishes and takes this information into consideration prior to recommending transfer
- Ultimately is responsible for decision of whether patient should be transferred for evaluation for candidacy for endovascular therapy
- NI or Neurosurgery APP enter orders into the **Neuro Urgent Stroke Transfer/LVO Order Set**, signs and places them on hold
- Accepts patient in transfer and asks REMIS to send a **"Endo Stroke Alert, [OSH]"** page (specifies if the **D2MR** or **D2IR** pathways should be invoked)
- Prepares for patient arrival based on ETA

ADDITIONAL PROCESSES FOR THE D2MR PATHWAY:

- Accepts patient in transfer and asks REMIS to send a **"Endo Stroke Alert, [OSH] Direct-to-MR Protocol" page**
- If a delay in transfer is anticipated, **the NI should request** the OSH to obtain a **CXR** and **KUB** for metal screening and push to Impax
- If the NI wants an MRA head added to the MRI, **the NI must communicate** this to the EM attending so that the order will be placed
- If patient is unable to get MRI for whatever reason, **the NI will decide** whether the patient should undergo alternative imaging (**CTA/CTP**) and discuss this with the EM attending so that the correct orders will be placed
- If the patient is NOT a candidate for IR, **the NI alerts** the EM Attending that pt will be sent back to the ED for further management and disposition

ALL PATIENTS:

- Determines whether a patient is a good EVT candidate and communicates this to the IR staff ASAP
- Obtains and documents consent for the procedure in the medical record, including patient's signature, printed name, the date and the time; if an emergency thrombectomy is required and pt consent cannot be obtained, the provider should document the emergency circumstances and need for the immediate treatment in the medical record; if telephone consent of a family member is required, a witness signature of the conversation must also be obtained
- Performs procedure and appropriately documents all time stamps, TICI score and any complications of the procedure
- Following the procedure, the NI is responsible for communicating results of the procedure and any specific post-procedure instructions to the NCC team

ED NURSE:

- **Releases Neuro Urgent Stroke Transfer/LVO Order Set** which contains imaging orders

NEURO IR NURSE:

- Neuro IR staff prepares IR suite as soon as notified of a potential endovascular case
- Neuro IR nurse transports the patient to the Neuro IR suite directly from CT or MR
- Neuro IR nurse does **not** transport D2IR patients to the Neuro IR suite (EMS does)

ANESTHESIOLOGIST:

- Receives Endo Stroke pages as a "heads up" and awaits confirmation from the NI whether the case is a "go" or "no go"
- Evaluates and consents patients undergoing endovascular treatment for anesthesia
- Manages ventilation, sedation and hemodynamics for patients going to the IR suite
- Avoids hypotension and mitigates large swings in blood pressure in acute stroke patients

NEUROCRITICAL CARE TEAM:

- Receives Endo Code Stroke pages so that they are aware of potential EVT cases
- Admits post-thrombolytic and post-thrombectomy ischemic stroke patients and most hemorrhagic stroke patients
- Neurocritical care APP responds to Possible Inpatient Code Strokes from 7pm-7am when there is no Neurology Resident in-house

INPATIENT CODE STROKES ONLY

PATIENT'S RN

- Establishes time **LKW**

- Check **VS** and **FSBG**
- Ensures 2 large bore **IVs** in place
- Attaches patient to **cardiac monitor**
- Prepares patient for STAT transport to the CT scanner

PRIMARY TEAM

- **Comes to the bedside STAT & assesses patient**
- Helps provide history to the Neurology team
- May be asked to communicate with patient's family/representative regarding updates in patient's change in clinical status
- Remains available to assist in pt care OR **provides Neuro team a pager** if they need to leave the bedside to care for other pts
- **Transfers care** of the patient to the Neurocritical care team if the patient requires acute stroke therapies

SCU COORDINATRO/NURSING SUPERVISOR:

- Identifies resources for stat transport to CT

ICU NURSE who is identified as resource for transport:

- Transports to CT *after labs are drawn if these are necessary for decision regarding thrombolysis*

PHLEBOTOMIST

- Phlebotomist should draw labs PRIOR to taking pt to CT if labs are needed; **results will be called to the SCU coordinator 662-0595**

ED RN:

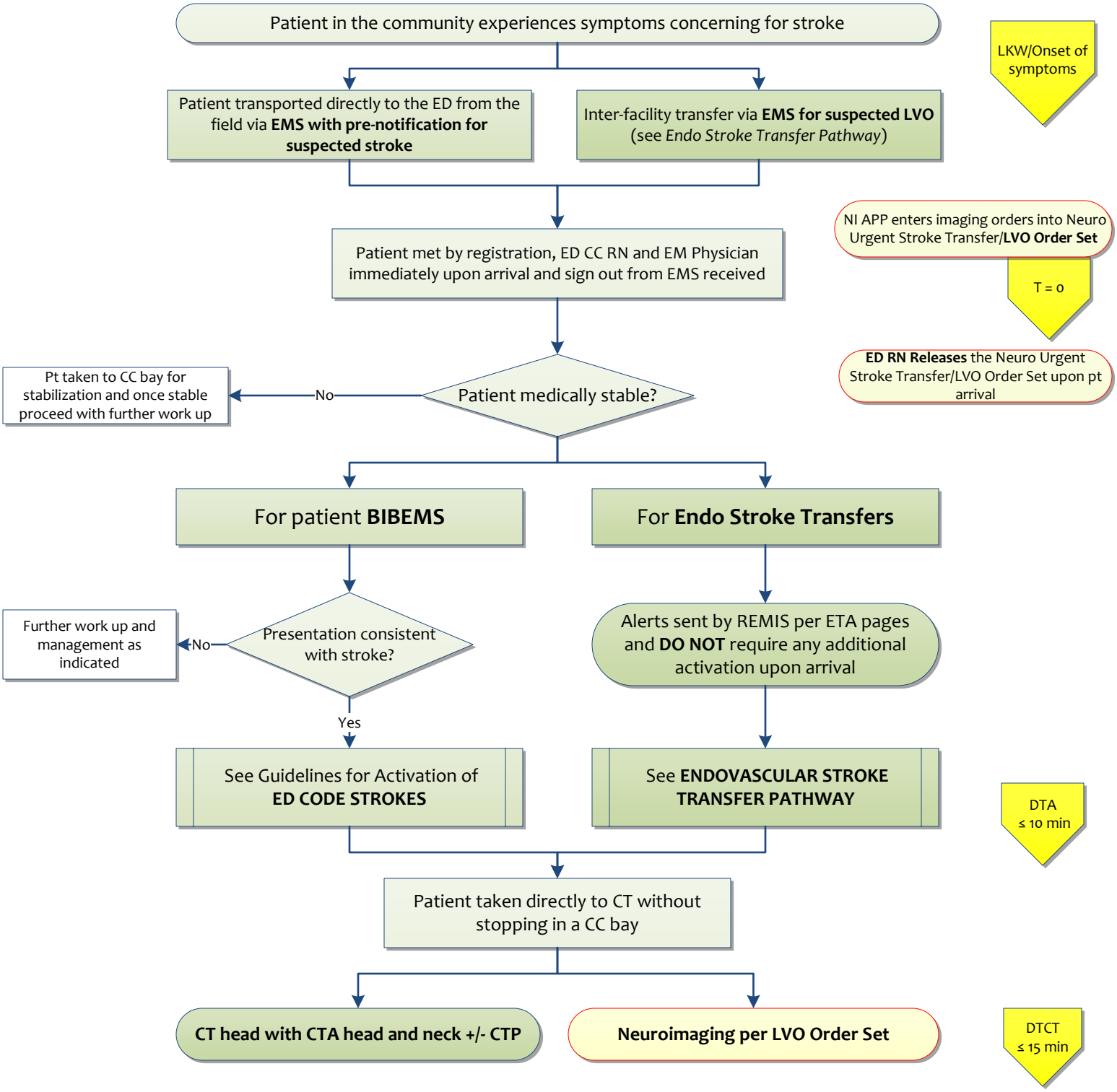
- Patient is managed and monitored there by an until an ICU bed is available or patient is taken to NIR Suite for EVT

NEUROLOGY

- Responds to REMIS page within 5 minutes to confirm receipt of the page and responds to bedside ASAP
- Assesses patient per the *MMC Inpatient Code Stroke Pathway*
- Is responsible for ordering the TNK when in-house
- If no neurologist is in-house, the ED physician will place the order for TNK

D2CT Pathway

For patients with suspected stroke who arrive to the ED **with pre-notification**

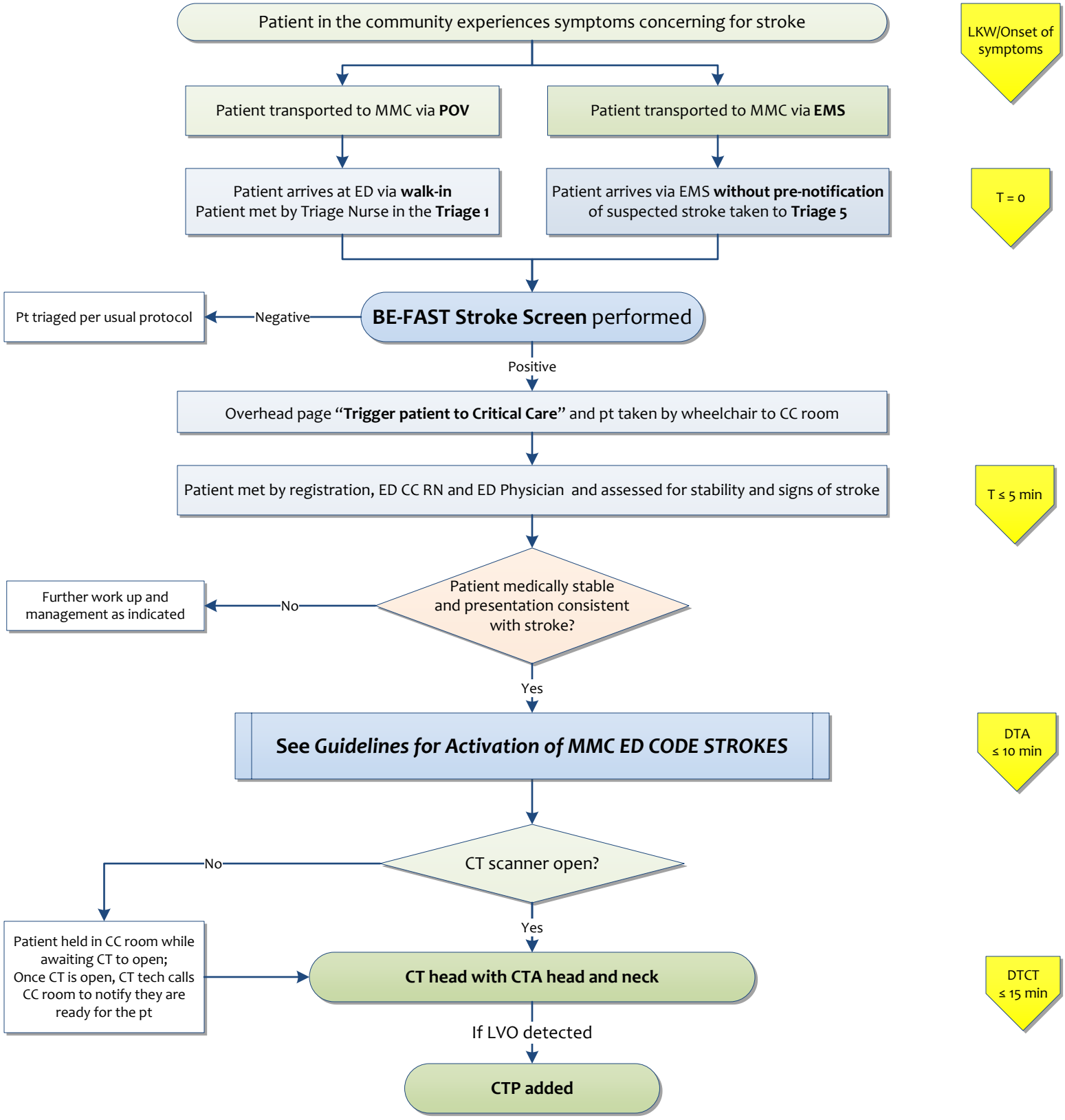


See MMC EM Clinical Guidelines online 2025 ED Stroke Packet
e1 Appendix: Code Stroke Paging Matrix &Roles and Responsibilities

References: FAST-ED Field Assessment Stroke Triage for Emergency Destination; A Simple and Accurate Prehospital Scale to Detect Large Vessel Occlusion Strokes. *Stroke.* 2016;47:1997-2002. Comparing Vessel Imaging: Noncontrast Computed Tomography/Computed Tomographic Angiography Should Be the New Minimum Standard in Acute Disabling Stroke. *Stroke.*2016;47:273-281.

Non-D2CT Pathway

For patients with suspected stroke who arrive at the MMC ED **without pre-notification**



See MMC EM Clinical Guidelines online 2025 ED Stroke Packet
e1 Appendix: Code Stroke Paging Matrix &Roles and Responsibilities

Reference: BE-FAST (Balance, Eyes, Face, Arm, Speech, Time) Reducing the Proportion of Strokes Missed Using the FAST Mnemonic. *Stroke*.2017;48:479-81.

Direct-to-MRI (D2MR) Pathway

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

Patient is accepted by the Neurointerventionalist (NI) for STAT ED-to-ED transfer to MMC

REMIS to send a **"Endo Stroke Alert, [OSH] Direct-to-MR Protocol" page**
And enters **Next-of-Kin** in the ED-to-ED accept note in Epic

If a delay in transfer is anticipated, NI requests the OSH obtain a **CXR** and **KUB** for metal screening and push to Impax

Patient transported via EMS to MMC

MRI technologist prepares for patient arrival during Inter-facility transfer, including calling **Next-of-Kin** for metal screening and **notifies the ED Attending if patient is NOT cleared for MRI**

Patient met by registration, RT, ED CC RN and ED Physician immediately upon arrival
Patient assessed for stability and **NIHSS** performed & documented in Epic

T = 0

Patient medically stable?

No → Patient taken to CC bay for stabilization **& MR technician notified of delay 662-4028**

Once patient is stabilized

Yes

Patient cleared for MR?

No → Go **D2CT** for a **head CT and CT scanogram** (AP & lat scout of neck through pelvis) to screen for metal **under separate orders**

No metal identified

If there is a delay in getting the MRI or pt is unable to get MRI, ED discusses possible alternative imaging (**CTA/CTP**) with the on-call NI

Yes

Vent management: Respiratory therapist

Patient transported to the MR scanner

MRI brain performed
+/- MRA at the discretion of the NI

DTMR
≤ 30 min

EVT candidate?

No → Vent management: Respiratory therapist → Patient taken back to CC bay for further management & to determine disposition

Yes

Vent management: Anesthesia

Patient transported directly from MR scanner to IR Suite
Time to puncture and time to reperfusion is minimized

DTP
≤ 60 min

DTR
≤ 90 min

¥Patients with **BAT < 6h from time LKW** should go D2IR without MRI or CTP **(see ENDO Transfer, OSH D2IR pathway)**

See MMC EM Clinical Guidelines online
2025 ED Stroke Packet
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Reviewed & agreed upon with
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