

2026 MMC 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

CODE STROKE PATHWAYS

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

NEW EXTENDED
TNK WINDOW

IVT no longer
recommended for
suspected CRAO

THROMBOLYSIS RESOURCES

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

Revised TNK
Eligibility Criteria

INTRACRANIAL HEMORRHAGE

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

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

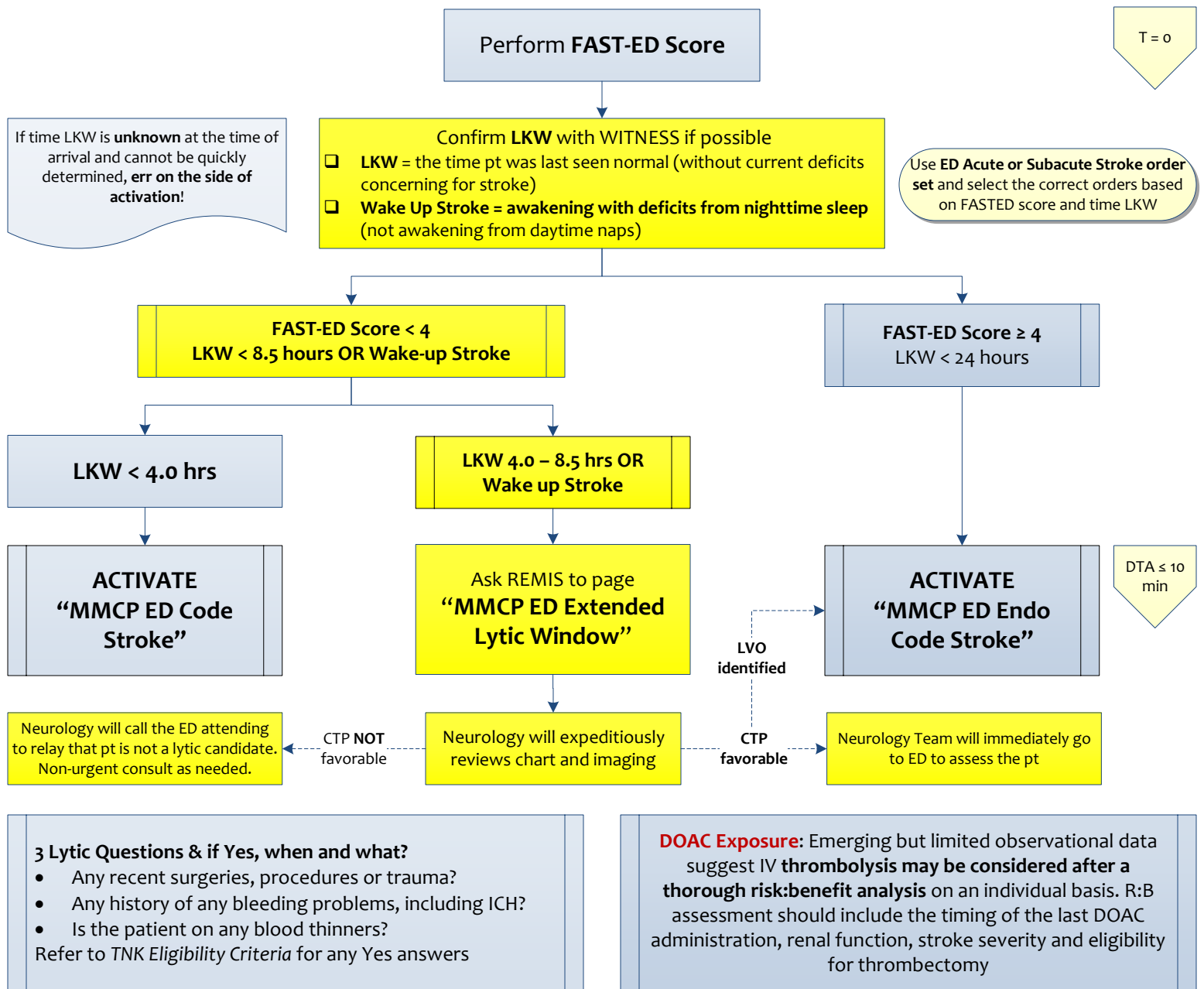
See EM CLINICAL GUIDELINES – under Neurology/Neurosurgery

- 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.

2026 GUIDELINES FOR MMCP ED and MMCP ED ENDO CODE STROKE ACTIVATION

For pts presents to the MMC ED with **acute onset potentially disabling neurological deficits**



IMPORTANT NOTES:

- Non-disabling deficits and no vascular occlusion:** **DAPT** is the preferred treatment
 - Non-disabling deficits **with** vascular occlusion or perfusion deficit: **TNK** may be considered if CTP favorable
- Potentially disabling deficits and no vascular occlusion and no perfusion abnormality:** **TNK** if **posterior circulation** symptoms LKW < 9 hours or **lacunar syndrome** LKW < 4.5 hours; if neither, consider dx other than stroke
- Medium vessel occlusions (MeVO):** If the occluded vessel does not provide the majority of blood flow to the hemisphere and there are no contraindications for thrombolysis, **TNK is preferred over EVT**
- LVO with minor deficits (NIHSS ≤6):** **TNK only if LKW < 4.5h; NCC monitoring** and **EVT** if pt clinically worsens
- LVO with disabling deficits that is a candidate for EVT:** **TNK only if LKW < 4.5h** followed by immediate **EVT**
- CRAO:** In adults with concern for central retinal artery occlusion (CRAO) the usefulness of treatment with IVT within 4.5 hours of time last known well is uncertain and will no longer be recommended at MMCP

FAST-ED Score and FAST-ED Tips and Tricks

FAST-ED Score: Field Assessment Stroke Triage for Emergency Destination

A score **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 facial droop	N/A	
A	Arm weakness Extend the weak arm with palm facing down x 10 sec	No drift down x 10 seconds	Drifts, but not all the way down to bed	Drifts all the way down or no movement at all	
S	Speech changes Includes dysarthria or aphasia (expression or comprehension)	Normal speech	Impaired but comprehensible speech, and/or unable to name all items, and/or follow all commands	Incomprehensible speech and/or complete lack of understanding or mute	
T	Time LKW	Time is documented for decision making purposes and is not scored.			N/A
E	Eye deviation	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 both arms at the same time to see if pt feels both sides. Show pt their hand ipsilateral to weakness and ask, "Whose hand is this?"	Able to sense simultaneous touch on both sides and recognizes the weak hand as their own	Unable to feel one side of the touch but can recognize their own hand	Unable to feel one side of touch and does not recognize their own hand	
	TOTAL SCORE				

FAST-ED Score: TIPS and TRICKS

	Coma = patient is not alert or interactive despite verbal or noxious stimuli (including sedation)	Difficult patient to examine, aphasic or confused
F	Score: 1	Use noxious stimulation to elicit grimace. Score: 0 = Symmetric grimace 1 = Asymmetric grimace
A	Score: 2	Observe spontaneous arm movements, hold up arms and note any effort against gravity or any asymmetry of drift. Note any asymmetry of withdrawal to noxious stimuli to limbs. Score: 0 = Symmetric movements or drift 1 = Asymmetric movements or drift 2 = No movement against gravity on one side
S	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: 0 = No abnormality 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 to one side
D	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 hemisphere) 2 = Patient only orients eyes and attention to one hemifield

Reference: 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!**
(See Guidelines for Activation of MMC ED and ENDO Code Strokes)



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

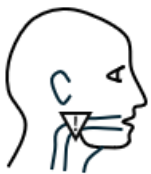
Assess horizontal and vertical eye movements

Check visual fields with **each eye tested separately**



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, heel-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.

Patterns of vision loss concerning for brain or retinal stroke

HEMIANOPIA



QUADRANTANOPIA



MONOCULAR VISION LOSS



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/quadruparesis, positive Babinski sign and no history of prior seizures.

ED CODE STROKE PATHWAY

For patients who **present to the MMC-POR ED** with acute onset potentially disabling neurological sx

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)

Direct-to-CT Pathway (D2CT)

Non-Direct to CT Pathway
(BEFAST required)

Appropriate Code Stroke process is activated
based on **FAST-ED** and **Time LKW**

Use **ED Acute Stroke Order Set**

STAT Head CT with CTA head & neck +/- CTP
(CTP added FAST-ED ≥ 4 or FAST-ED < 4 in the 4.5-8.5hr window)

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

No

TNK candidate?

Yes

See **TNK Eligibility Criteria**

No contraindications identified

Administer **TNK 0.25 mg/kg,**
Max 25 mg IV push STAT

Patient admitted to the appropriate level of
care based on TNK administration and clinical
condition (Stroke Unit, IMC or ICU)

≤ 4.5 h LKW

OR

LKW ≤ 9 h AND
favorable CTP

+ LVO-

EVT candidate?

Yes

Patient transported STAT to IR suite

Time to groin puncture minimized

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

LKW/Onset of
symptoms

T = 0

DTA
 ≤ 10 min

DTCT
 ≤ 15 min

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

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

DTN
 ≤ 30 min

For New or Worsening stroke
deficits in a pt in the ED, see the
IP Code Stroke Pathway

If an ED Code Stroke was activated due to FAST-ED
Score of < 4 but CTA shows an LVO or proximal MeVO
activate an **ED ENDO Code Stroke** at this time

LVO: intracranial ICA, MCA M1, proximal dominant or co-
dominant M2; BA
MeVO: Distal M2, non-dominant M2, A1, A2, P1, P2
Dominant = the majority of blood supply, not language
dominance

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°

DTP
 ≤ 60 min

Goal: single pass TIC1 2b or
greater reperfusion

DTR
 ≤ 90 min

Floor admission:
Gen Med Ischemic Stroke Admission Order Set

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

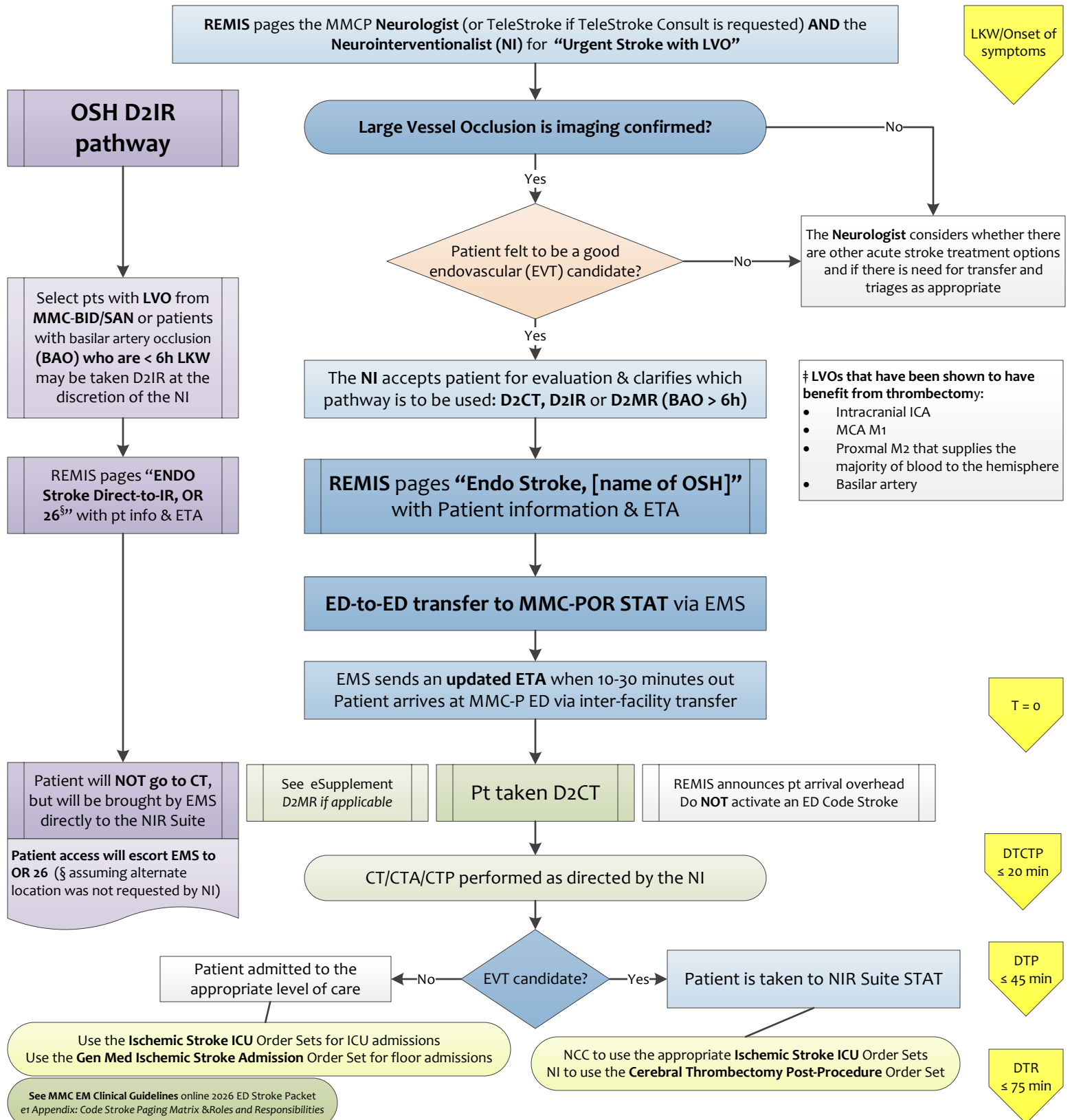
ICU admission after TNK:
Ischemic Stroke POST- thrombolysis ICU Order Set

Post-EVT:
Cerebral Thrombectomy Post-Procedure Order Set

See MMC EM Clinical Guidelines online 2026 ED Stroke Packet
et Appendix: Code Stroke Paging Matrix & Roles and Responsibilities

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)**[‡]



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 concern for acute stroke

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

Note: New or Worsening stroke deficits in a pt in the ED = an IP Code Stroke:
The **ED Code Stroke** process should be followed **even if the pt had an earlier Code Stroke activation** (new/worsening deficits = new code stroke!)
If the pt has already been admitted (ED Boarders) activate the appropriate ED Code Stroke with the addition that the ED RN will page the **Primary Team** who must come to the ED to assist with care

An Inpatient Stroke Alert is **NOT** activated.
Case discussed with an appropriate attending and the encounter is documented in Epic by the Neuro responder.

Acute stroke suspected?

NIHSS is ≥ 6 in a pattern c/w an LVO?

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.

ACTIVATE
“Inpatient Code Stroke”

Use the **Inpatient Stroke Alert Order Set**
Call REMIS 662-2950

ACTIVATE
“Inpatient Endo Code Stroke”

Alert
T = 0

CT/CTA +/- CTP performed STAT

ATCT
 ≤ 15 min

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**

Acute stroke intervention Indicated?

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

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

TNK CANDIDATE:
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

EVT CANDIDATE:
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

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 pt is not already on a service that manages patients 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

ATR
 ≤ 90 min

See MMC EM Clinical Guidelines online 2026 ED Stroke Packet
e1 Appendix: Code Stroke Paging Matrix & Roles and Responsibilities

TIA and MINOR STROKE PATHWAY

For patient who presents to the ED with **transient** focal neurological 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 ED Subacute Stroke Order Set

NOTE: TNK will no longer be recommended for patients presenting with acute onset painless monocular blindness concerning for central retinal artery occlusion (THEIA, TenCRAOS)

Activate **MMC ED Endo Code Stroke**
Keep HOB o° unless concern for aspiration

LVO identified?

Yes

No

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

TIA/Stroke still suspected as etiology of presenting sx?

Yes

Neurology Consult

Assess for high-risk features

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

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

If pt does not meet criteria for CDU admission

Criteria for CDU observation:

- TIA with ABCD₂ 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
- Anticipate d/c to home

Use ED CDU TIA Order Set

Assess for appropriateness for CDU observation admission

If pt does NOT meet criteria for Stroke/TIA clinic

- 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)

✖ 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 work

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

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 x 1 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

TNK ELIGIBILITY CRITERIA

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

3 Lytic Questions					
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*
IVT is contraindicated	- Sx c/w infective endocarditis - Known or suspected aortic dissection - On anti-amyloid immunotherapy†	- Moderate to severe TBI w/in 14 days - Neurosurgery w/in 14 days - Major trauma w/in 14d - Acute spinal cord injury w/in 3mo	- Warfarin w/ INR > 1.7 - UFH w/ ↑ aPPT - Therapeutic dose LMWH w/in 24 hrs	- Hemorrhage or completed infarct on CT Intra-axial intracranial neoplasm LKW > 4.5h with unfavorable CTP	Coagulopathy - INR > 1.7 - PT > 15s - aPTT > 40s - Plt < 100K
Relative Contraindication due to potential for increased harm or benefits vs. risks are uncertain	BP cannot be safely lowered to < 185/110 Pre-existing disability and/or frailty - Ischemic stroke w/in 3 mo (timing & size of prior stroke vs. pot'l benefit) - STEMI* w/in 3 mo (risk of hemopericardium vs potential benefit)	- Major trauma* b/w 14d – 3mo - Major surgery* w/in 10 days with uncontrollable bleeding site (e.g. internal organs) - Arterial puncture at a non-compressible site w/in 7 days	- H/o intracranial hemorrhage§ (consider the etiology and timing of hemorrhage) - GI or GU bleeding* w/in 21 days	DOAC < 48hs - Apixaban (Eliquis) - Rivaroxaban (Xarelto) - Dabigatran (Pradaxa) - Edoxaban (Savayas, Lixiana)	Intra-cranial arterial dissection - Unruptured or untreated intracranial vascular malformation In pts w/o recent use of warfarin or heparin, and no h/o abnormal bleeding, tx with IVT can be initiated before availability of coagulation test results
Relative contraindication but IVT may be considered if benefits outweigh risks	- Acute pericarditis or LV/LA thrombus* - Active systemic malignancy* - Pregnancy and post-partum*	- Dural puncture w/in 7 days - Moderate to severe TBI* 14d – 3mo - Neurosurgery* 14d – 3mo	§ 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 with informed pt consent. Cortical superficial siderosis was associated with higher risk of severe hemorrhage, disability, and death in the AcT trial		
Benefits of IVT generally are greater than risks of bleeding	- H/o MI - Recreational drug use - Uncertainty of stroke diagnosis/stroke mimics - Moyamoya	Angiographic procedural stroke	GI or GU bleeding > 21 days ago	Extra-cranial cervical dissections Extra-axial intracranial neoplasms - Unruptured or treated intracranial aneurysms	

NOTES:

- * Consult appropriate subspecialty service for bleeding risk assessment
- † **On active treatment with anti-amyloid immunotherapy** (IV infusions): lecanemab (Leqembi) within 2 wks or donanemab (Kisunla) within 4 wks
- Definition of moderate to severe TBI: > 30 min LOC, GCS < 13, OR hemorrhage, contusion, or skull fracture
- Pts with concurrent STEMI + AIS: Tx with **stroke dose IVT** if indicated

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

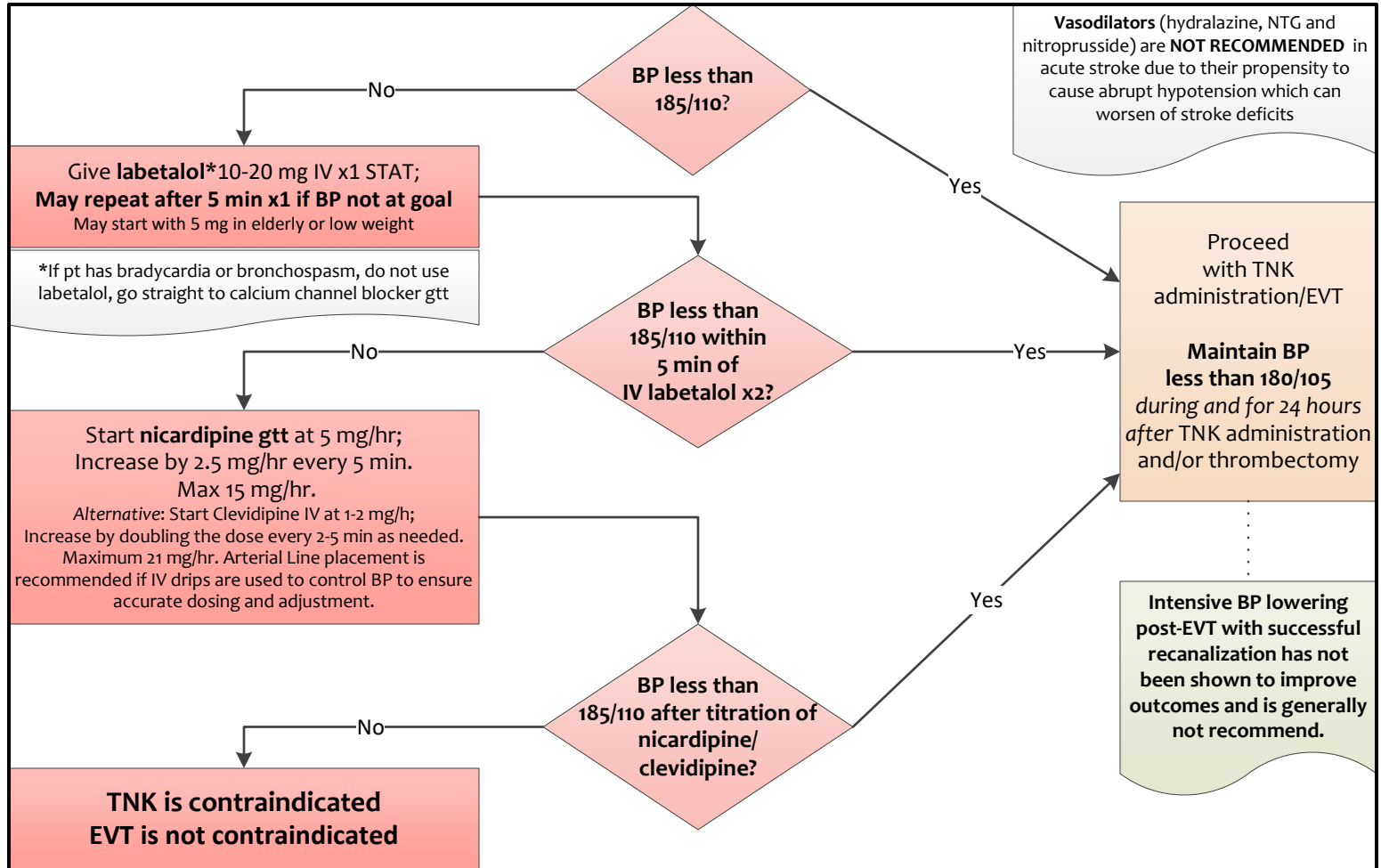
Factors which are not contraindications to lytic, but are known to be associated with an increased risk of post-lytic hemorrhage:

- 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.

PRE- and POST-TNK and EVT BLOOD PRESSURE MANAGEMENT

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



Post-TNK/EVT management:

- 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)

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

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

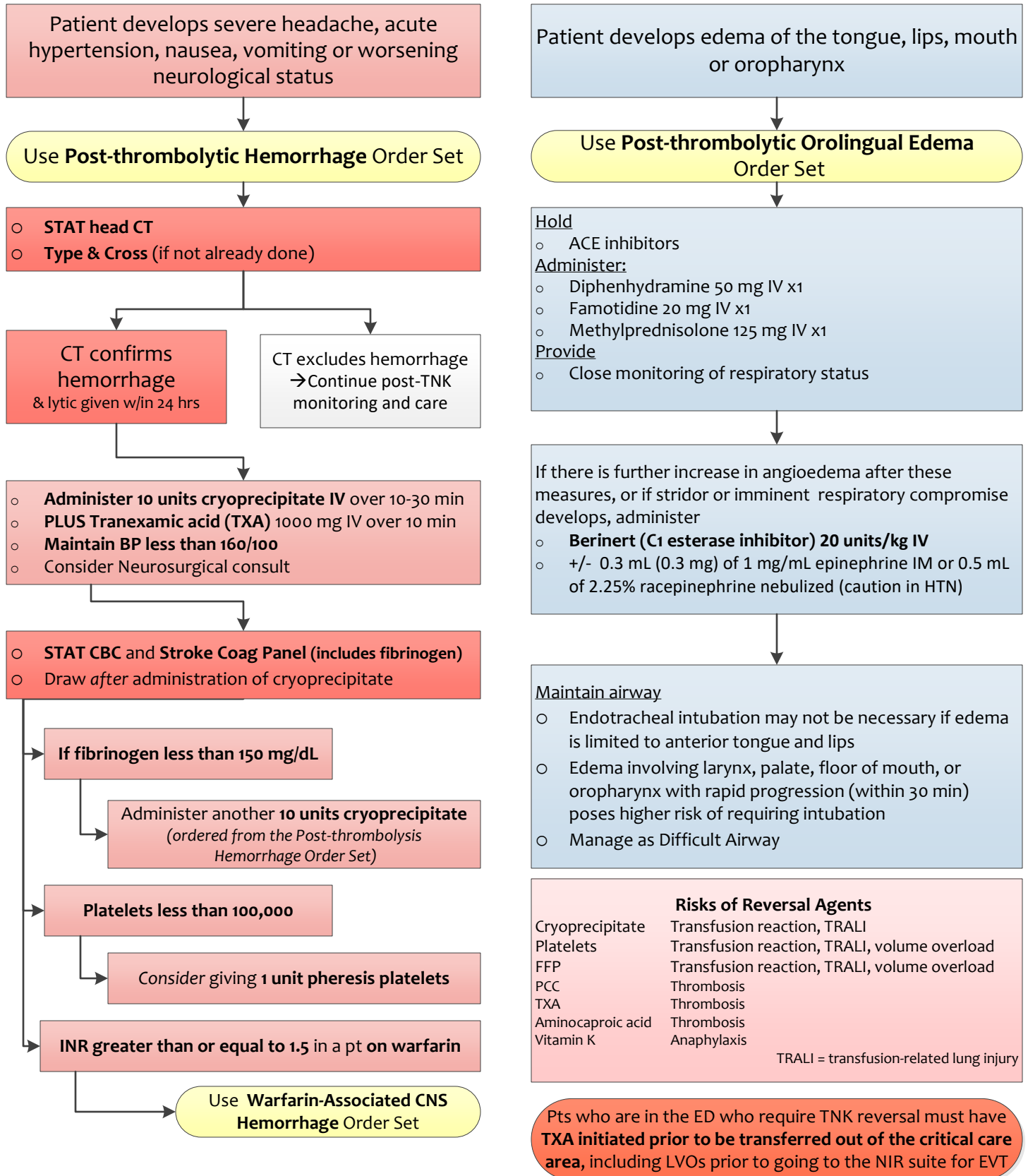
See *Management of post-TNK Complications*

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 euvoemia** 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.

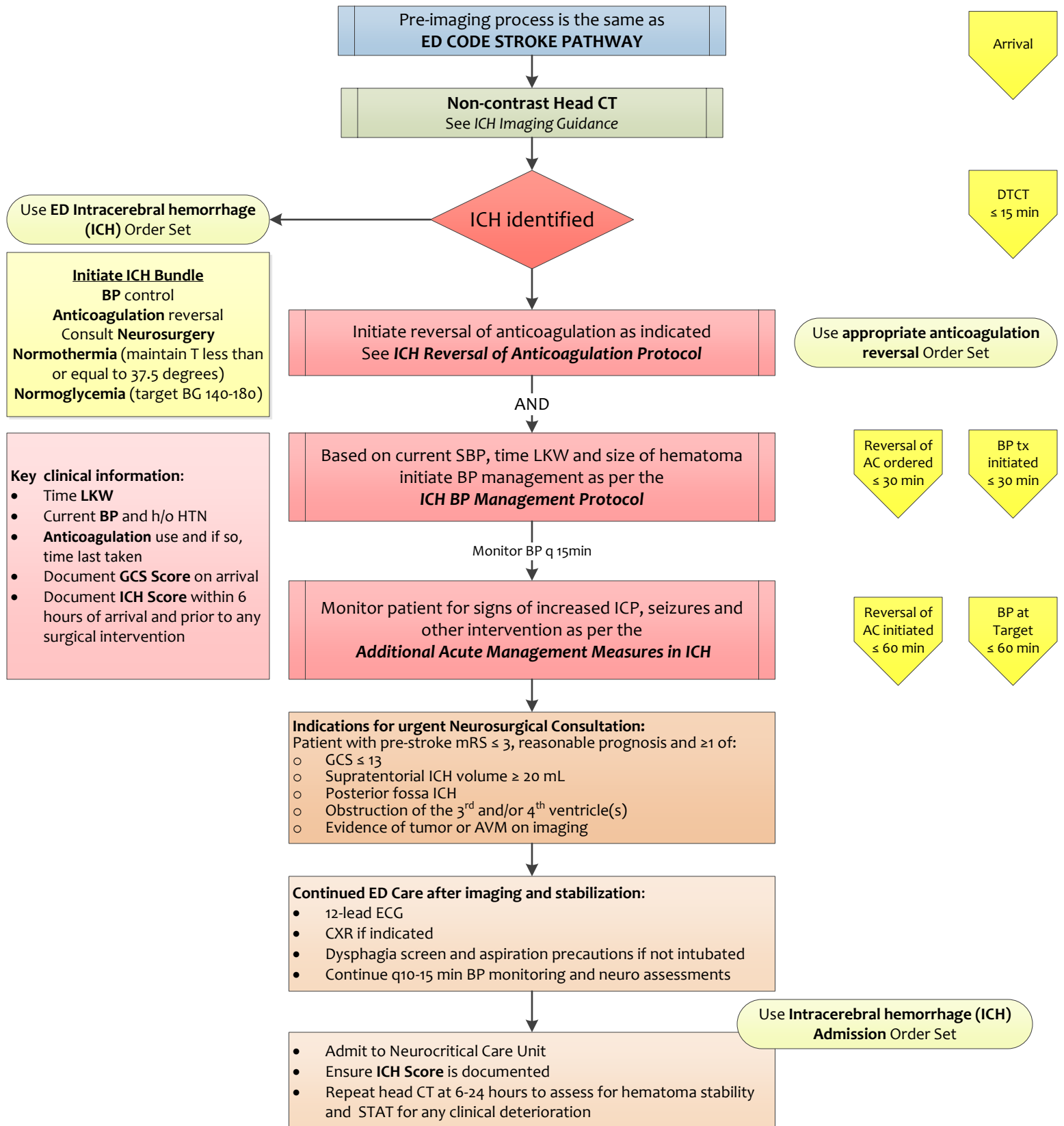
MANAGEMENT of POST-TNK COMPLICATIONS

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



MMC INTRACEREBRAL HEMORRHAGE (ICH) PATHWAY

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



MMC INTRACRANIAL HEMORRHAGE IMAGING GUIDANCE

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 prior to ordering vascular imaging

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

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

0

1

2

3

4

5

6

~ % Positive CTA

0

2

4

20

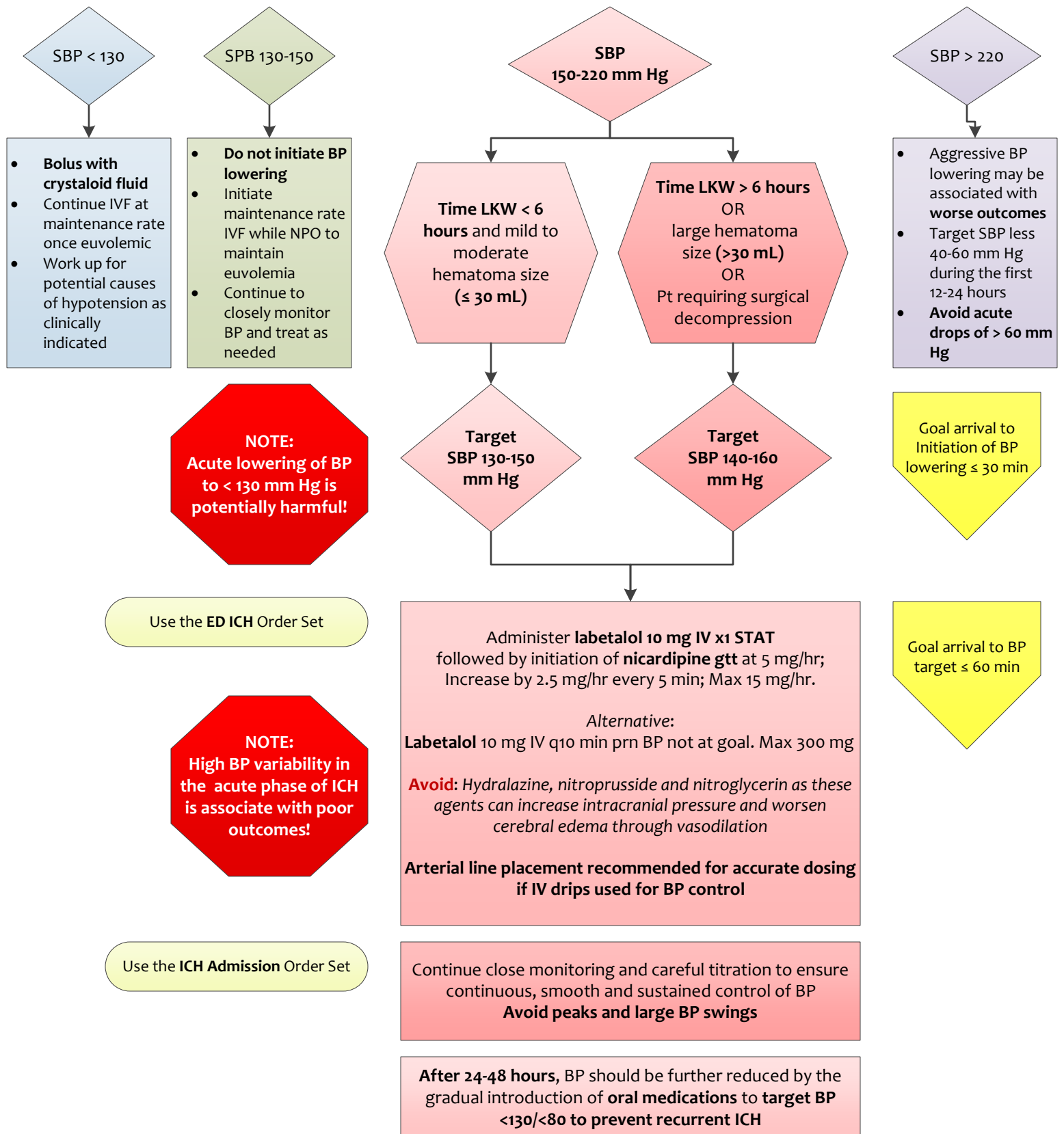
40

80

100

ICH BLOOD PRESSURE MANAGEMENT PROTOCOL

For patients with spontaneous (non-traumatic) Intracerebral Hemorrhage



ICH REVERSAL of ANTICOAGULATION PROTOCOL

For patient with spontaneous intracerebral hemorrhage (ICH) on anticoagulation

All Patients:

- Review history of **anti-coagulation** 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)
- Prasugrel (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

2026 MMCP ED STROKE PACKET

Electronic supplement

e1. APPENDIX. CODE STROKE PAGER MATRIX

[illegible]

e1 APPENDIX: CODE STROKE ROLES AND RESPONSIBILITIES

EMS PROVIDERS:

FROM THE FIELD:

- Performs 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(es), **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 if needed
- Checks **vital signs** and **FSBS** and treat abnormalities as indicated per Maine EMS guidelines
- Asks patient/caregiver the **3 lytic questions**, document answers and relay responses to EM physician
- Transports 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 and ETA
- Places 1-2 large bore **IVs** in the antecubital fossae, with luer lock if possible
- Removes heavy clothing and jewelry from the patient if possible
- Gives hand-off upon arrival to MMC should include results of the CPSS, FAST-ED, LKW, any “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
- Target BP: <220/110 for non-lytic patients, < 180/100 for post-lytic patients, 130-160 for ICH, < 140/90 for aneurysmal SAH
- For **D2IR** patients, EMS will transport the patient to the Neuro IR suite (**OR 26** unless specifically directed elsewhere by the NI) escorted by **Patient Access**

REMIS:

FROM THE FIELD:

- Sends “**EMS D2CT**” page when notified that patient meets criteria for field activation of the CT scanner

IN THE MMCP ED

- Sends “**MMCP ED Code Stroke**,” “**MMCP Extended Lytic Window**” or “**MMCP 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 and ETA
- Once notified by EMS that ETA is 10-30 minutes out from MMC, sends an updated “**Endo Stroke [OSH] Update, ETA xx min**” page
- When patient arrives at MMCP, overhead announces “**Endo Stroke Patient Direct-to-CT**”

ENDO TRANSFER, D2IR:

- Same as above for Endo stroke alert, plus adds “**Direct-to-IR, OR 26**” to the page

ENDO CODE STROKE, D2MR:

- Same as above for Endo stroke alert, plus adds “**Direct-to-MRI**” to the page

INPATIENT CODE STROKE:

- Sends “**Possible Inpatient Stroke**” page when notified by in-house staff of patient with symptoms concerning for stroke and includes the patient’s name, DOB and location
- 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
- Initiates head CT as quickly as possible: **Goal door/alert to CT initiated (DTCT/ATCT) ≤ 15 min**
- Notifies radiologist of potential acute stroke pt & expected time to scanning (M-F 8am-5pm: 662 4237; All other times: 662-4517)
- **Performs CTP on all Extended Lytic Window and LVO patients**
- See D2MR below

REGISTRATION:

- Registers the patient in the system immediately upon arrival, whether arriving to MMCP directly or via interfacility transfer

TRIAGE RN:

- For pts with acute onset neurological symptoms arriving by POV or by EMS without prenotification, performs **BEFAST** screen
- 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 patient in the ambulance bay or Triage 5 upon arrival and accompany 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 ○ Checks FSBS (if not done by EMS) ○ Draws and sends STAT labs ○ Places/ensures 2 large bore IVs in place • <u>Post CT:</u> ○ 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 ○ For <u>non-transferred</u> pts with LVO who are going to be taken for thrombectomy, place HOB at 0° unless pt vomiting or unable to tolerate position, in which case place HOB at 30° ○ Keeps pt strictly NPO until dysphagia screen is performed AND DOCUMENTED in Epic ○ 12-lead ECG should be obtained after imaging
EMERGENCY MEDICINE ATTENDING/RESIDENT: • <u>D2CT:</u> Meets patient in the ambulance bay or Triage 5 upon arrival and accompanies patient to CT • <u>Non-D2CT:</u> Meets patient in a CC room or nearest available bed • <u>Prior to CT:</u> ○ 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 based on ED Stroke Packet Guidelines (Goal arrival to activation ≤ 10 min) ○ Enters orders into EPIC using the ED Acute Stroke Order Set • <u>Prior to or during CT:</u> ○ 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 <i>TNK Eligibility Criteria</i>) ○ Communicates any identified potential contraindications to lysis with the neurology team • <u>Post-CT:</u> ○ Orders TNK using 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 prior to any intervention (TNK, EVT) if neurology is not in-house ○ If the patient is not a candidate for thrombolysis, discusses further management recommendations with Neurology ○ Contacts the appropriate service for admission • <u>Endo Transfers:</u> ○ 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 <i>prelim</i> read by Radiologist/resident ≤ 5 min) • After 20:00 (8 pm) the radiology resident will provide preliminary read 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 • MMCP 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 no neurology resident is in-house) ○ Obtains history from EM provider ○ Confirms LKW with primary source if possible ○ Reviews scans ○ Reviews <i>TNK Eligibility Criteria</i>, 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 (NI) if patient is a potential EVT candidate
- **MMCP Extended Lytic Window**
 - The NH will review the CTP and determine if pt is a candidate for the late lytic window (4.5-9 hours)
 - If CTP is favorable, the Stroke Team will respond to bedside ASAP and assess for appropriateness of thrombolysis
 - If CTP is unfavorable, the Neurohospitalist (NH) will call the EM Attending and verbally communicate that this pt is not a lytic candidate and clarify if a non-urgent formal Neurology consultation is needed
- **OSH Endo Transfers:**
 - The NH and NI are paged when an OSH reports having a pt with an imaging confirmed LVO
 - The NI determines whether the pt should be sent as an OSH ENDO Code Stroke emergent transfer
 - The NH documents the recommendations provided to the OSH in a Telephone Encounter, including whether pt is a potential endovascular candidate, whether & when lytics were administered 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 meets the pt upon arrival based on ETA pages and assists in acute decision making regarding EVT, though ultimately the decision whether to perform a procedure is up to the NI

INPATIENT STROKE IN THE ED

- **Patients who are physically in the emergency department when they develop New or Worsening stroke deficits:**
 - This is considered an **Inpatient Code Stroke**
 - If the pt has been admitted to the hospital but is still boarding in the ED, the IP Code Stroke process should be followed, starting with *Code White – Possible Stroke* page (see Inpatient Code Stroke Pathway)
 - If the pt who is in the ED but not yet admitted to the hospital develops new or worsening neurological deficits concerning for stroke, determine the correct activation based on FAST-ED – *repeated to reflect the severity of the clinical change – and time LKW*) and activate the correct code stroke process even if the pt had an earlier Code Stroke activation (new/worsening deficits = new code stroke!)
 - Routine ED pages, Epic chatting and Texting the Neurologist, Resident or Neurointerventionalist are **not** appropriate

ONECALL:

- **For Endo Transfers**, registers pt in Epic and places 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
- 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 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

NEURO IR NURSE/STAFF:

- 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)
- Documents HOB position on arrival, all time stamps and TICI score in Epic

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

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

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**
- Provides 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 COORDINATOR/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:

- Monitors and cares for pt 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

See above for INPATIENT STROKE IN THE ED.

D2CT PATHWAY

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

Patient in the community experiences symptoms concerning for stroke

LKW/Onset of symptoms

Patient transported directly to the ED from the field via **EMS with pre-notification for suspected stroke**

Inter-facility transfer via **EMS for suspected LVO** (see Endo Stroke Transfer Pathway)

Patient met by registration, ED CC RN and EM Physician immediately upon arrival and receives sign-out from EMS

T = 0

Patient medically stable?

Pt taken to CC bay for stabilization and once stable proceed with further work up

For patient **BIBEMS**

For **Endo Stroke Transfers**

Further work up and management as indicated

Presentation consistent with stroke?

Alerts sent by REMIS per ETA pages and **DO NOT** require any additional activation upon arrival

See Guidelines for Activation of **ED CODE STROKES**

See **ENDOVASCULAR STROKE TRANSFER PATHWAY**

DTA ≤ 10 min

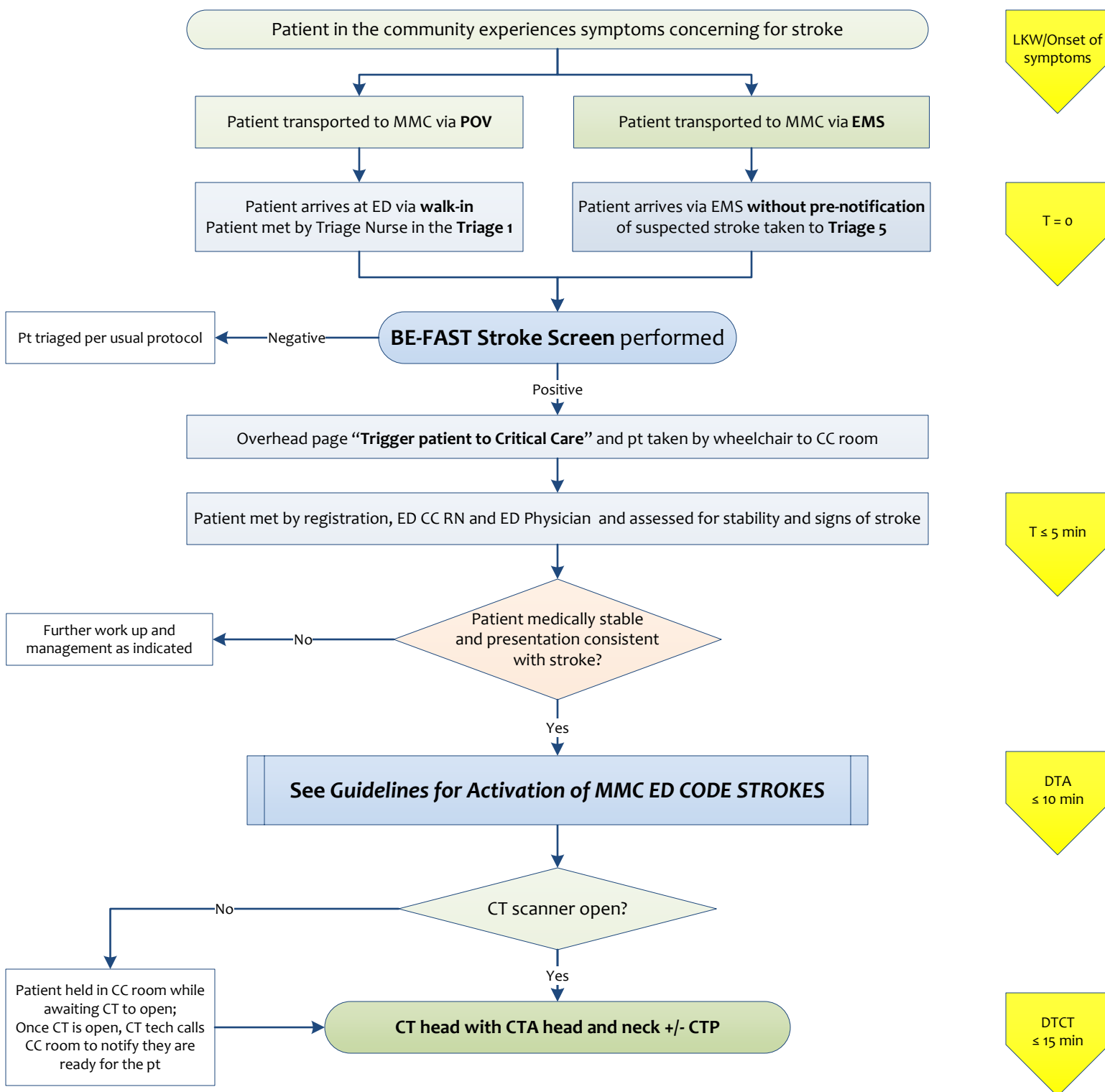
Patient taken directly to CT without stopping in a CC bay

CT head with CTA head and neck +/- CTP

DTCT ≤ 15 min

NON-D2CT PATHWAY

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



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

DIDO
≤ 90 min

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?

Patient taken to CC bay for
stabilization & **MR technician**
notified of delay 662-4028

No

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**

Yes

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

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

Patient taken back to CC bay for
further management & to
determine disposition

Vent management:
Respiratory therapist

Yes

Vent management:
Anesthesiologist

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**)