

# 2024 MMC ED Stroke Packet

## ISCHEMIC STROKE

1. Guidelines for Activation of MMC ED CODE STROKES

2. FAST-ED Score with TIPS & TRICKS for difficult to examine patients

New FAST-ED &  
Posterior Stroke tips

3. Posterior Circulation Stroke Recognition

4. MMC ED CODE STROKE PATHWAY

5. ENDOVASCULAR TRANSFER PATHWAY

6. MMC INPATIENT CODE STROKE PATHWAY

7. MMC ED TIA & MINOR STROKE PATHWAY

MINOR STROKE added  
to TIA pathway!

### 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

New ICH Metrics for  
BP and reversal time

11. MMC Intracerebral Hemorrhage (ICH) Pathway

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13. ICH Reversal of Antithrombotics Guidance

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

**See EM CLINICAL GUIDELINES – under Neurology/Neurosurgery**

e1. APPENDIX A: CODE STROKE PAGING MATRIX

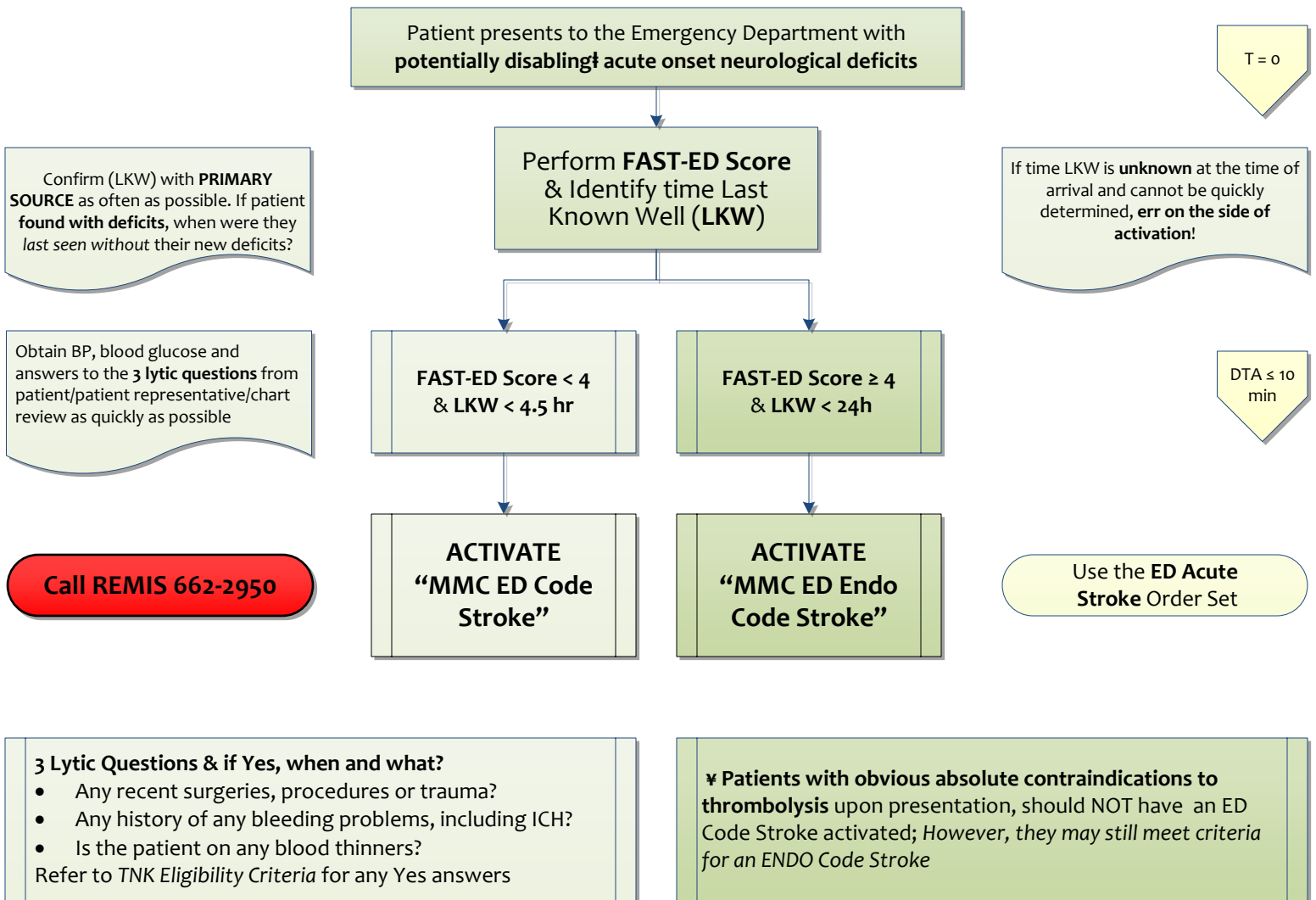
e2-4. APPENDIX B: CODE STROKE ROLES AND RESPONSIBILITIES

e5-7. Imaging Pathways (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.*

# Guidelines for Activation of MMC ED CODE STROKES

For patients thought to be candidates for **thrombolysis\*** or **acute endovascular intervention** for 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:** See “MMC ED Code Stroke Pathway”
- 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 funduscopy.
- 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.

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

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
<b>F</b>	<b>Facial palsy</b>	Normal or mild facial asymmetry	Obvious droop on one side of the mouth	N/A	
<b>A</b>	<b>Arm weakness</b> Extend the <b>weak arm</b> with palm facing down to 90° (if sitting) or 45° (if supine) and ask them to hold it there for 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	
<b>S</b>	<b>Speech changes</b> Note spontaneous speech; ask the patient to name 3 common items; ask the patient to show you 2 fingers without demonstrating this visually to the patient	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	
<b>T</b>	<b>Time LKW*</b>	N/A	N/A	N/A	
<b>E</b>	<b>Eye deviation</b> Ask the patient to track your hand all the way to the left and then all the way to the right	Normal horizontal eye movements	Eyes tend to only move to one side	Eyes both forced over to one side	
<b>D</b>	<b>Denial/Neglect</b> 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	
	<b>TOTAL SCORE</b>				

\*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
<b>F</b>	<b>Default score: 1</b>	Use noxious stimulation to elicit grimace. <b>Score:</b> 0 = symmetric grimace 1 = asymmetric grimace
<b>A</b>	<b>Default score: 2</b>	Observe spontaneous arm movements, hold up arms and note any effort against gravity or asymmetry of drop, note asymmetry of withdrawal to noxious stimuli. <b>Score:</b> 0 = symmetric movements 1 = some movement against gravity 2 = no movement against gravity
<b>S</b>	<b>Default score: 2</b>	Choose score based on ability for the examiner to understand any attempts at communication and whether patient is following any commands or not. <b>Score:</b> 1 = impaired but comprehensible speech, and/or unable to follow commands 2 = incomprehensible speech and/or complete lack of understanding or mute
<b>E</b>	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. <b>Score</b> 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. <b>Score</b> 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
<b>D</b>	<b>Default score: 0</b>	<b>Score</b> 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

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 Stroke Recognition

For patients who present to the Emergency Department with one of the “5D’s” of posterior circulation symptoms

## The 5D’s

- **Dizziness** (Vertigo)
- **Diplopia** (or loss of vision)
- **Dysarthria**
- **Dysphagia**
- **Dystaxia** (limbs > gait)

If pt present with ANY 1 of the 5 D’s, ASK about the other 4.  
If you confirm that the pt has ≥ 1 of the 5 D symptoms, then confirm that these were:

- **SUDDEN** in onset
- **UNPROVOKED** and
- **UNEXPLAINED** by another process

Yes

Establish LKW  
Perform a FAST-ED

Potential acute stroke  
therapy candidate?

Initiate appropriate  
ED Code Stroke Process

No

Perform complete neurological exam, focusing on the following posterior  
circulation findings to identify possible central causes of symptoms

## Posterior circulation exam findings

**Dizziness/vertigo:** If dizziness is still present, document whether nystagmus is present (record a short video for pt chart if possible) & perform a **HINTS-plus** exam (plus = check hearing to finger-rub bilaterally)

**Diplopia:** Check **extraocular movement** and look for ocular palsies while asking about subjective diplopia

- **Vision:** Formally test **Visual Fields** with EACH EYE tested separately

**Dysarthria:** Listen to the quality of the pts speech, note **palate** elevation, check for **tongue** deviation

**Dysphagia:** Ask about difficulty swallowing or drooling – if present, ask RN to do a bedside swallow screen

**Dystaxia:** Check **finger-to-nose**, **heel-to-shin** and **gait**

If there is concern for central cause of vertigo

Consult Neurology

# MMC ED CODE STROKE PATHWAY

For patients who present to the MMC ED with suspected acute stroke

LKW/Onset of symptoms

Patient in the community experiences symptoms concerning for acute stroke is brought to MMC

Arrives **with** pre-notification

Arrives **without** pre-notification

T = 0

Direct-to-CT Pathway

NonDirect to CT Pathway

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

Appropriate Code Stroke Process is Activated

DTA ≤ 10 min

Head CT followed immediately by CTA head and neck

DTCT ≤ 15 min

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

TKN candidate?

See *TKN Eligibility Criteria*

**TKN 0.25 mg/kg, Max 25 mg IV push**

DTN ≤ 30 min

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

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

Yes or No

**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°

LVO detected on CTA?

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

Proceed with CT Perfusion (CTP)

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

EVT candidate?

Yes

Patient transported STAT to IR suite

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

Floor admission:  
**Gen Med Ischemic Stroke Admission Order Set**

ICU admission no TKN:  
**Ischemic Stroke NON-Thrombolysis ICU Order Set**

ICU admission after TKN:  
**Ischemic Stroke POST-thrombolysis ICU Order Set**

Post-EVT:  
**Cerebral Thrombectomy Post-Procedure Order Set**

See *Code Stroke Paging Matrix; Code Stroke Roles and Responsibilities and D2CT and non-D2CT Pathways*

# ENDOVASCULAR STROKE TRANSFER PATHWAY

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

REMIS pages the MMC **Neurologist** (or TeleStroke Neurologist if a TeleStroke Consult is requested) **AND** the **Neurointerventionalist (NI)** for an **“Urgent Stroke”** question

LKW/Onset of symptoms

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

Yes

The NI accepts patient for endovascular therapy (EVT) evaluation

If basilar artery thrombosis NI and NH may request *D2MR* pathway

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

REMIS **“Endo Stroke Alert, [name of OSH]”** with Patient information & ETA

\*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

ED-to-ED transfer to MMC STAT via EMS

An ED Acute Stroke Alert is **NOT** activated for OSH Endo Stroke Alerts

Patient arrives at MMC ED via inter-facility transfer

T = 0

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

Pt taken D2CT

See *D2MR* if applicable

CT/CTA/CTP performed as directed by the NI

DTCT ≤ 15 min

Patient admitted to the appropriate level of care

EVT candidate?

Yes

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

DTP ≤ 60 min

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

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

DTR ≤ 90 min

See *Code Stroke Paging Matrix; Code Stroke Roles and Responsibilities* and *D2CT and D2MR Pathways*



# MMC INPATIENT CODE STROKE PATHWAY

For patients **admitted to MMC** 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?

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

**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  $\geq 6$  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  
 $\leq 15$  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?

ED Nurse Coordinator will direct patient location in CC

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

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

ATN  
 $\leq 30$  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  
 $\leq 60$  min

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

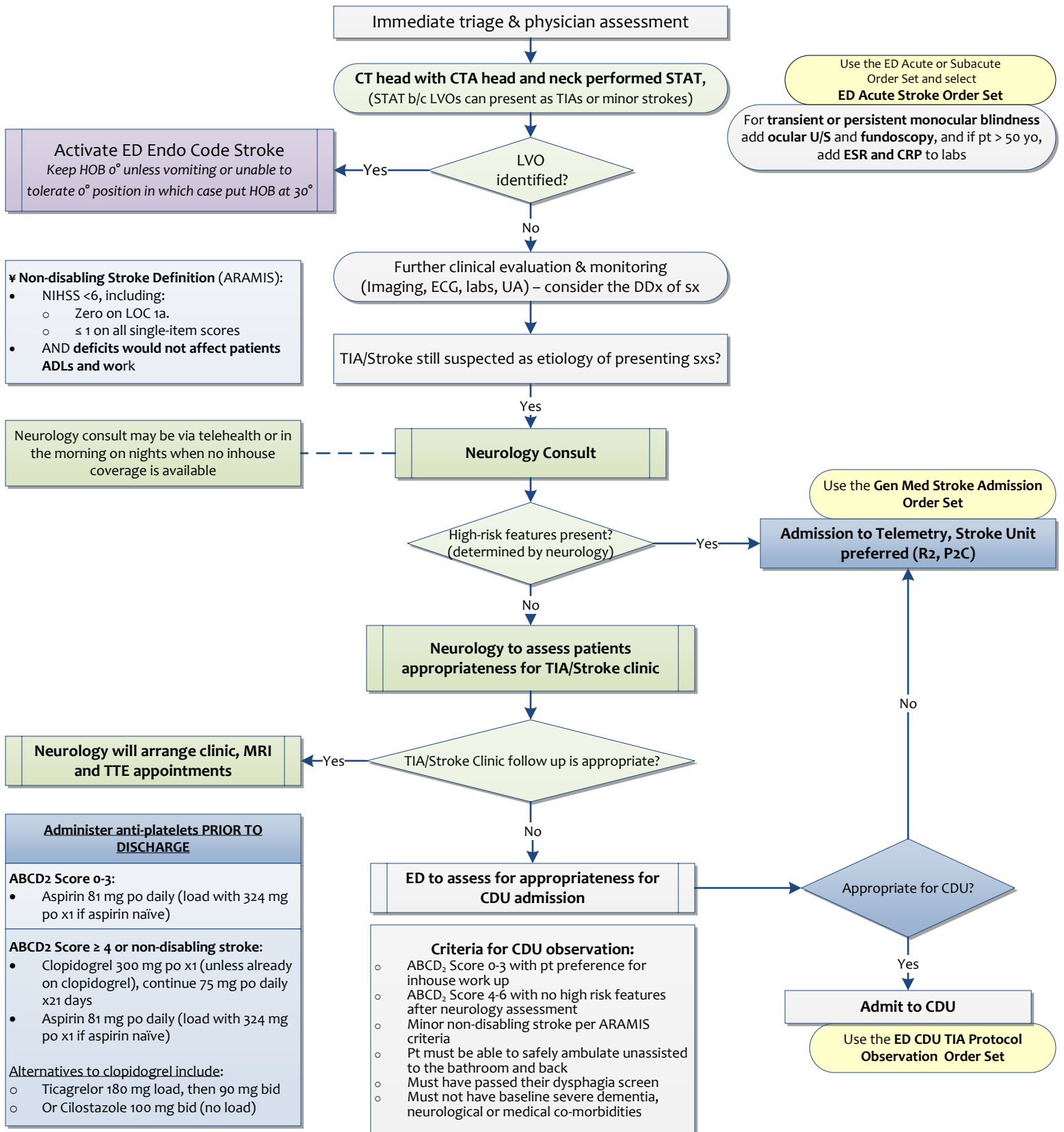
Use the **Ischemic Stroke ICU Order Sets** for ICU admissions

**Post-lytic or EVT the patient will need to be bedded in an ICU, Neurocritical Care Unit preferred**  
If the 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.

ATR  
 $\leq 90$  min

# MMC ED TIA and MINOR STROKE PATHWAY

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





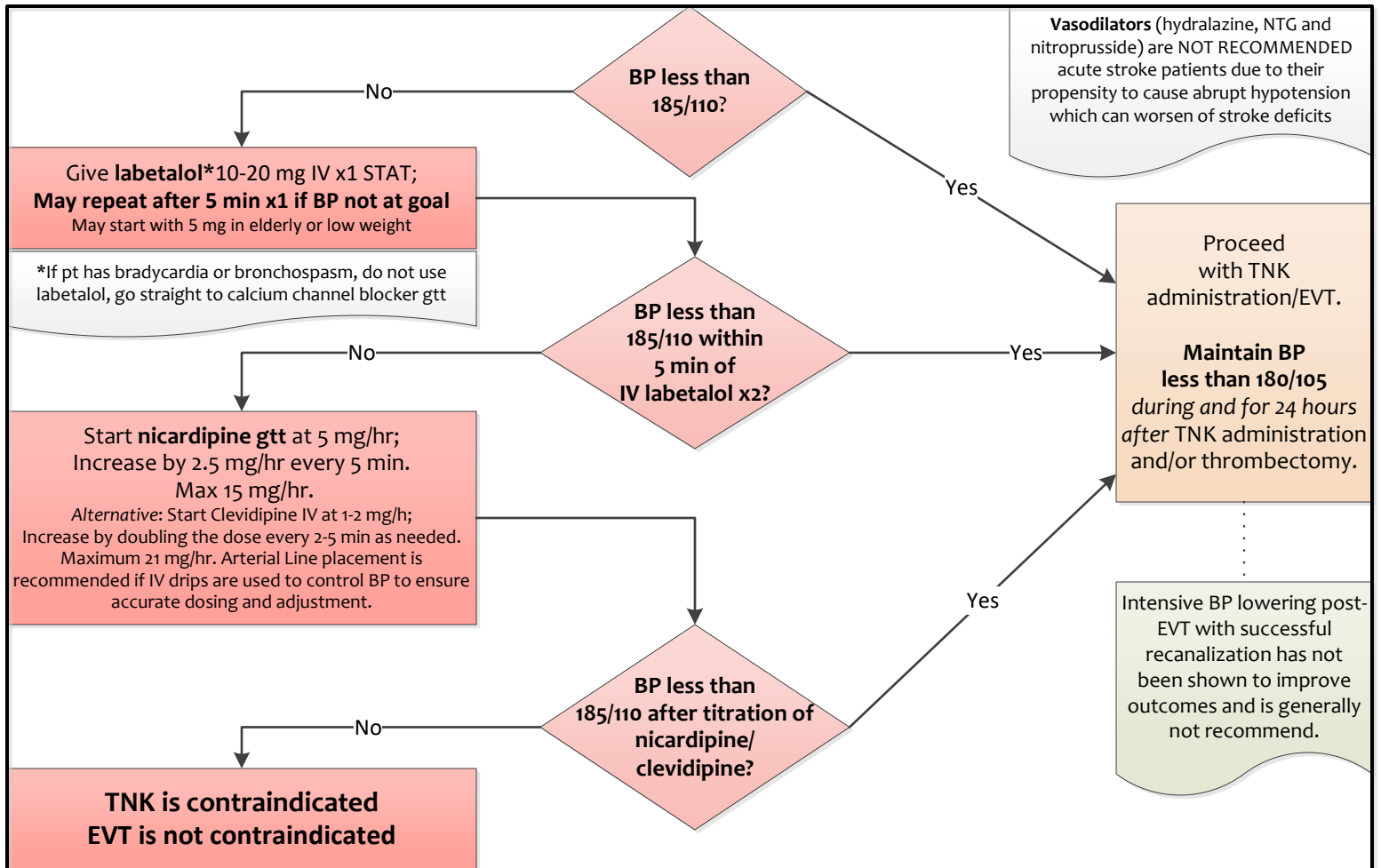
# TNK Eligibility Criteria

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

Risk of bleeding	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*
Higher risk	<p><b>TNK is contraindicated</b></p> <ul style="list-style-type: none"> <li>LKW &gt; 4.5h</li> <li>Sx of SAH</li> </ul>	<ul style="list-style-type: none"> <li>Severe head trauma w/in 3 mo</li> </ul>			<ul style="list-style-type: none"> <li>Acute intracranial hemorrhage</li> <li>Completed infarct</li> </ul>	
	<p><b>Lytic is not recommended/potentially harmful</b></p> <ul style="list-style-type: none"> <li>BP cannot be lowered &lt; 185/110</li> <li>Sx concerning for endocarditis</li> <li>Known or suspected aortic dissection</li> <li><b>On anti-amyloid immunotherapy†</b></li> </ul>	<ul style="list-style-type: none"> <li>Intracranial or intra-spinal surgery w/in 3 mo</li> <li>Major non-cranial surgery† or trauma w/in 14 days with uncontrollable bleeding site (e.g. internal organs)</li> </ul>	<ul style="list-style-type: none"> <li>H/o intracranial hemorrhage§ (consider the etiology and timing of hemorrhage)</li> <li>Structural GI malignancy or GIB w/in 21 days</li> </ul>	<ul style="list-style-type: none"> <li>Warfarin w/ INR &gt; 1.7</li> <li>UFH w/ ↑ aPPT</li> <li>Therapeutic dose LMWH w/in 24 hrs</li> <li>DOAC w/in 48 hrs</li> </ul>	<ul style="list-style-type: none"> <li>Intra-axial intracranial neoplasm (not extra-axial, i.e. not meningioma)</li> </ul>	<ul style="list-style-type: none"> <li>INR &gt; 1.7</li> <li>PT &gt; 15 sec</li> <li>aPTT &gt; 40 sec</li> <li>Plt &lt; 100K</li> </ul>
	<p><b>Safety and efficacy of lytic is not well established</b></p> <ul style="list-style-type: none"> <li>Age &lt; 18yo</li> <li>Ischemic stroke w/ in 3 mo</li> <li>NIHSS &gt; 25 in the 3-4.5 hr window</li> <li>Cerebral aneurysm &gt; 1 cm in size</li> </ul>	<ul style="list-style-type: none"> <li>Arterial puncture at a non-compressible site w/in 7 days</li> <li>Parturition w/in 14 days*</li> </ul>	<ul style="list-style-type: none"> <li>Known bleeding diathesis</li> </ul>	<p><b>DOACs:</b></p> <ul style="list-style-type: none"> <li>Dabigatran (Pradaxa)</li> <li>Rivaroxaban (Xarelto)</li> <li>Apixaban (Eliquis)</li> <li>Edoxaban (Savaysa)</li> </ul>	<ul style="list-style-type: none"> <li>Intra-cranial arterial dissection</li> <li>Unruptured or untreated intracranial vascular malformation</li> </ul>	<p>*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</p>
Lower risk	<p><b>Lytic may be considered/may be reasonable, especially if moderate to severe stroke</b></p> <ul style="list-style-type: none"> <li>Pregnancy‡</li> <li>Myocardial infarction w/in 3 mo</li> <li>Acute pericarditis or LV/LA thrombus</li> </ul>	<ul style="list-style-type: none"> <li>Lumbar puncture w/ in 7 days</li> <li>Major non-cranial surgery† or trauma within 14days with controllable bleeding site (e.g. limb)</li> </ul>	<ul style="list-style-type: none"> <li>GI or GU bleeding &gt; 21 days ago</li> <li>Hemorrhagic ophthalmologic condition</li> <li>Menorrhagia‡</li> </ul>	<p>† Recent surgeries and procedures: Consider the risk of <b>bleeding at the site</b> of the surgery/procedure AND Consider the risk of the surgery/procedure of having caused a <b>silent stroke (ex: TAVR, CEA, CABG)</b> that could serve as a potential nidus for thrombolysis-associated hemorrhage</p>		<p>BG &lt; 50 or &gt; 400</p>
	<p>‡ <b>Pregnancy and vaginal bleeding:</b> 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</p>	<p>§ <b>Patients w/ h/o cerebral microbleeds:</b></p> <ul style="list-style-type: none"> <li>1-10 CMB: administration of lytic is reasonable</li> <li>&gt; 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</li> </ul>	<p><b>Factors which are not contraindications to lytic, but are known to be associated with an increased risk of post-lytic hemorrhage:</b></p> <ul style="list-style-type: none"> <li>Older age (&gt; 80 yo)</li> <li>Later in the time window (&gt; 3 hr from time LKW)</li> <li>Severe stroke (NIHSS &gt; 25)</li> <li>Hyperglycemia (BG &gt; 140)</li> <li>Hypertension (BP &gt; 180/100)</li> <li>Severe white matter disease on head CT (Fazekas grade 3)</li> </ul> <p>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.</p>			
	<p>• † <b>Anti-amyloid immunotherapy</b> (IV infusions): aducanumab (Aduhelm), lecanemab (Leqembi), donanemab (enrolled in the TRAILBLAZER Trial)</p>					
	<p>In every case, the <b>risk of bleeding</b> complications from lytic should be weighed against the <b>potential benefit</b> from lytic given the severity of deficits</p>					

# 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:

- 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 euolemia** 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

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
- **0.3 mL (0.3 mg) of 1 mg/mL epinephrine IM** or 0.5 mL of 2.25% racinephrine nebulized

- 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

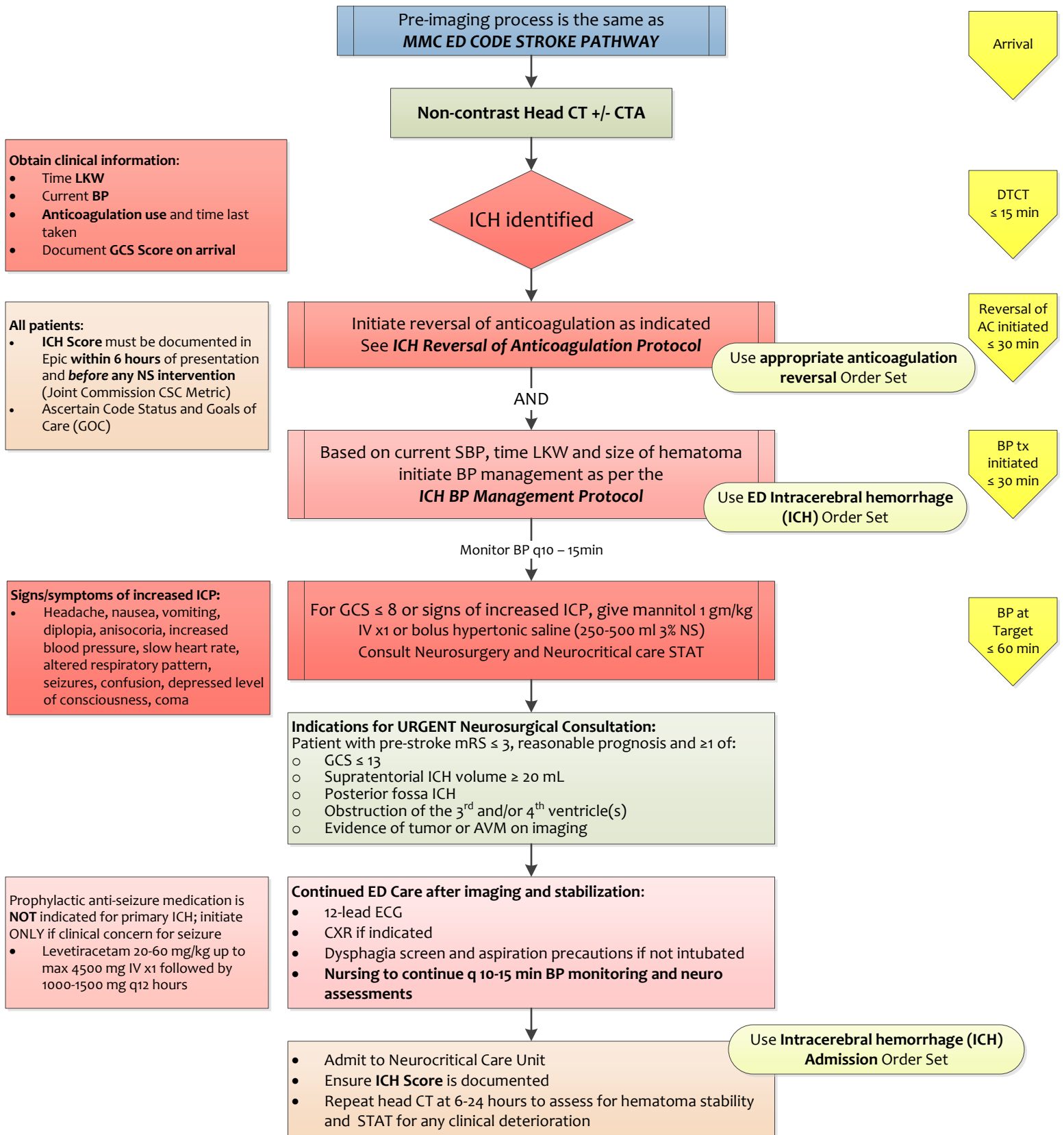
Risks of Reversal Agents	
Cryoprecipitate	Transfusion reaction, TRALI
Platelets	Transfusion reaction, TRALI, volume overload
FFP	Transfusion reaction, TRALI, volume overload
PCC	Thrombosis
TXA	Thrombosis
Aminocaproic acid	Thrombosis
Vitamin K	Anaphylaxis

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.

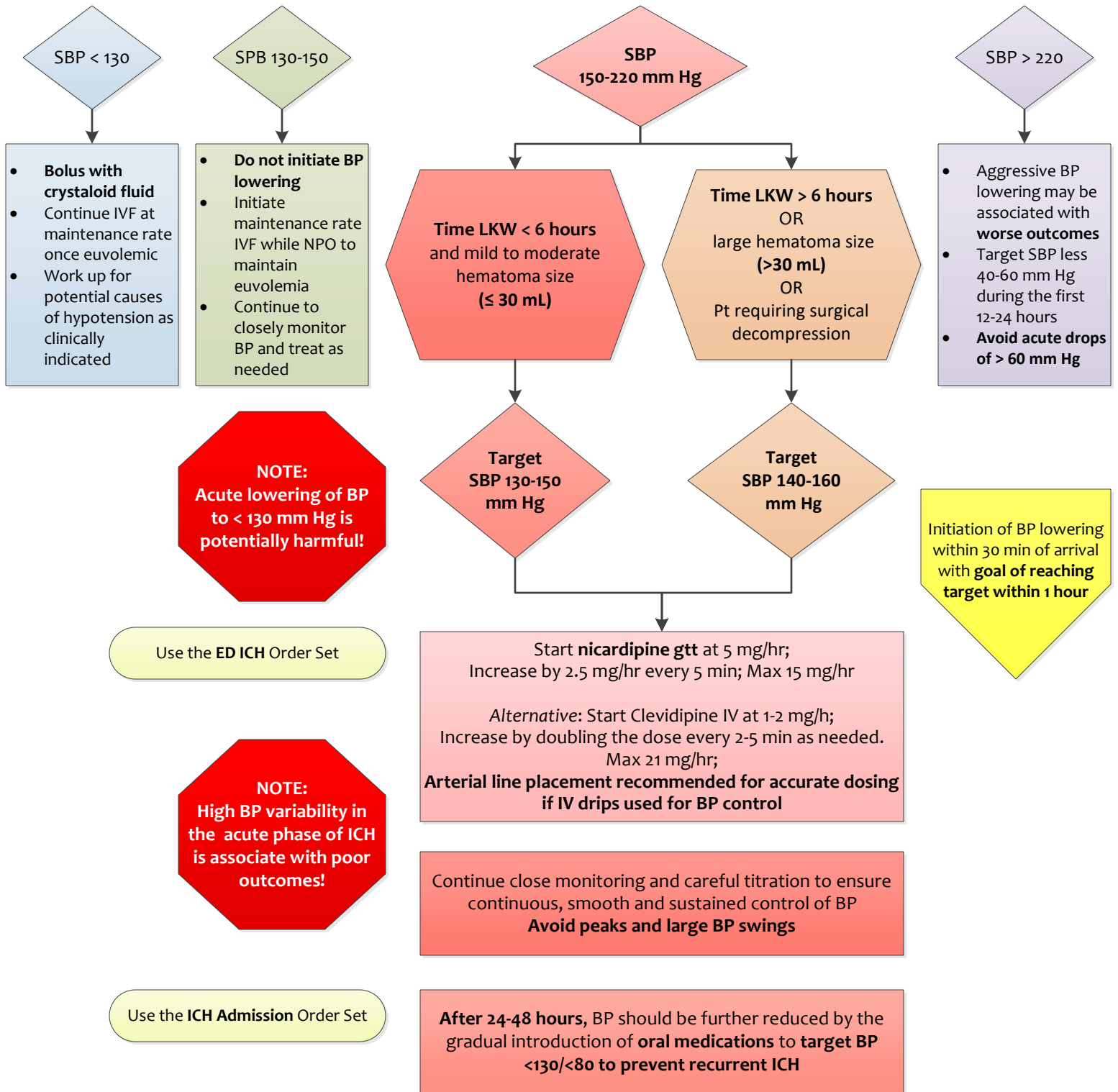
# MMC INTRACEREBRAL HEMORRHAGE (ICH) PATHWAY

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



# 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 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

### 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  $\leq$  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



# 2024 MMC ED STROKE PACKET

## Electronic supplement

### eAPPENDIX A. 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
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

## eAPPENDIX B: 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

### REMIS:

#### FROM THE FIELD:

- Sends “**EMS Code Stroke**” when notified by EMS that patient meets criteria for field activation of the CT scanner
- 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:

- Sends ETA page once a patient accepted in transfer by the NI, “**Endo stroke alert, [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 patient, ETA xx min**” page
- When patient arrives at MMC, overhead announces “**Endo Stroke Patient Direct-to-CT**”

#### ENDO CODE STROKE, D2MR:

- Same as above for Endo stroke alert, however adds “**Direct-to-MR 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

### TRIAGE RN:

- For walk-ins, **BEFAST** screen performed for patients with any neurological symptoms
- If BEFAST positive, overhead page “**Trigger patient to critical care**” and have patient brought to a CC room

### 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 degrees unless pt vomiting or unable to tolerate position; otherwise place HOB at 30 degrees
- 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**)
  - **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

**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** (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

**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 pathway 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 or not 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 or not 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, TIC1 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:**

- 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

**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 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:**

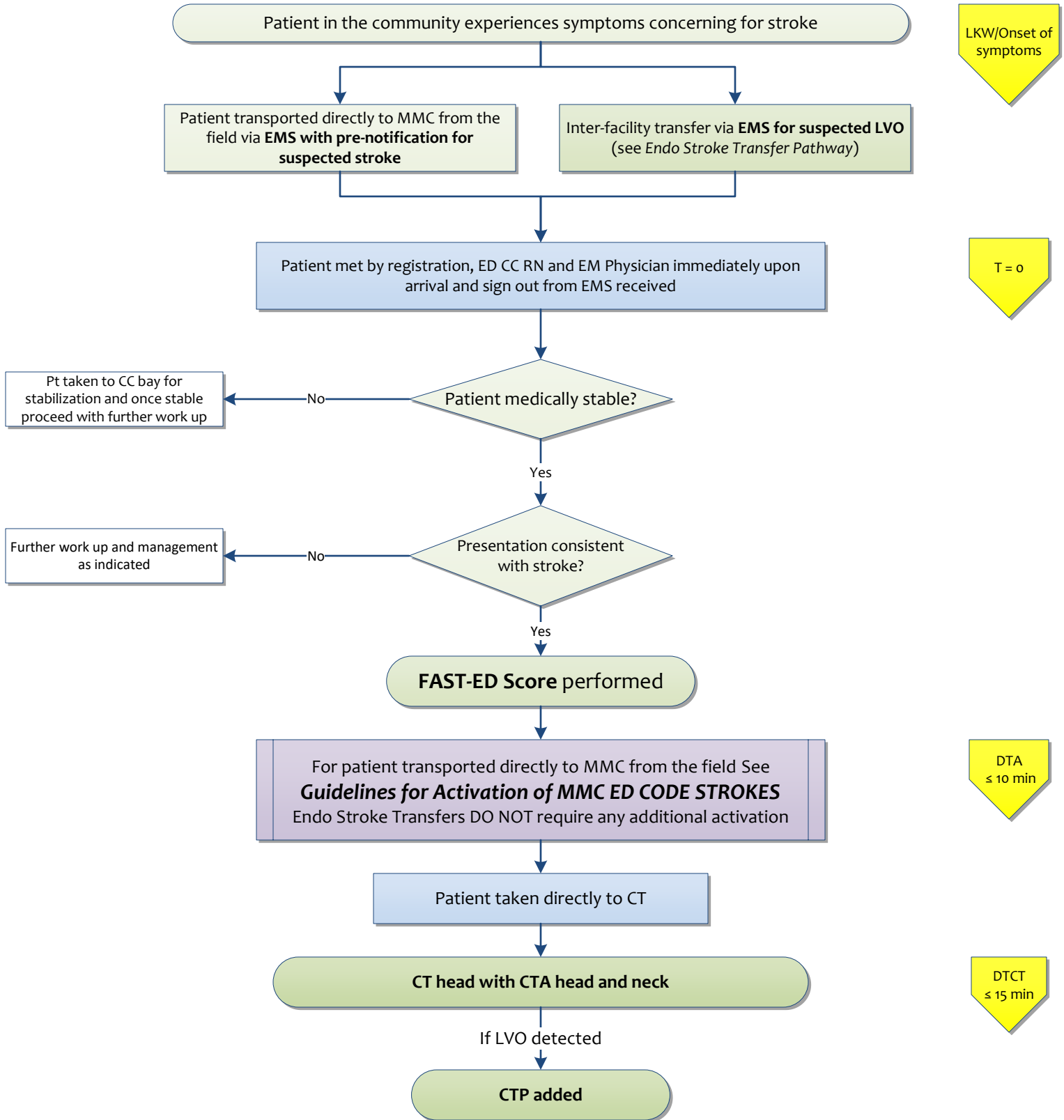
- Patient is managed and monitored there by an until an ICU bed is available or patient is taken to NIR Suite for EVT

**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*

# D2CT Pathway

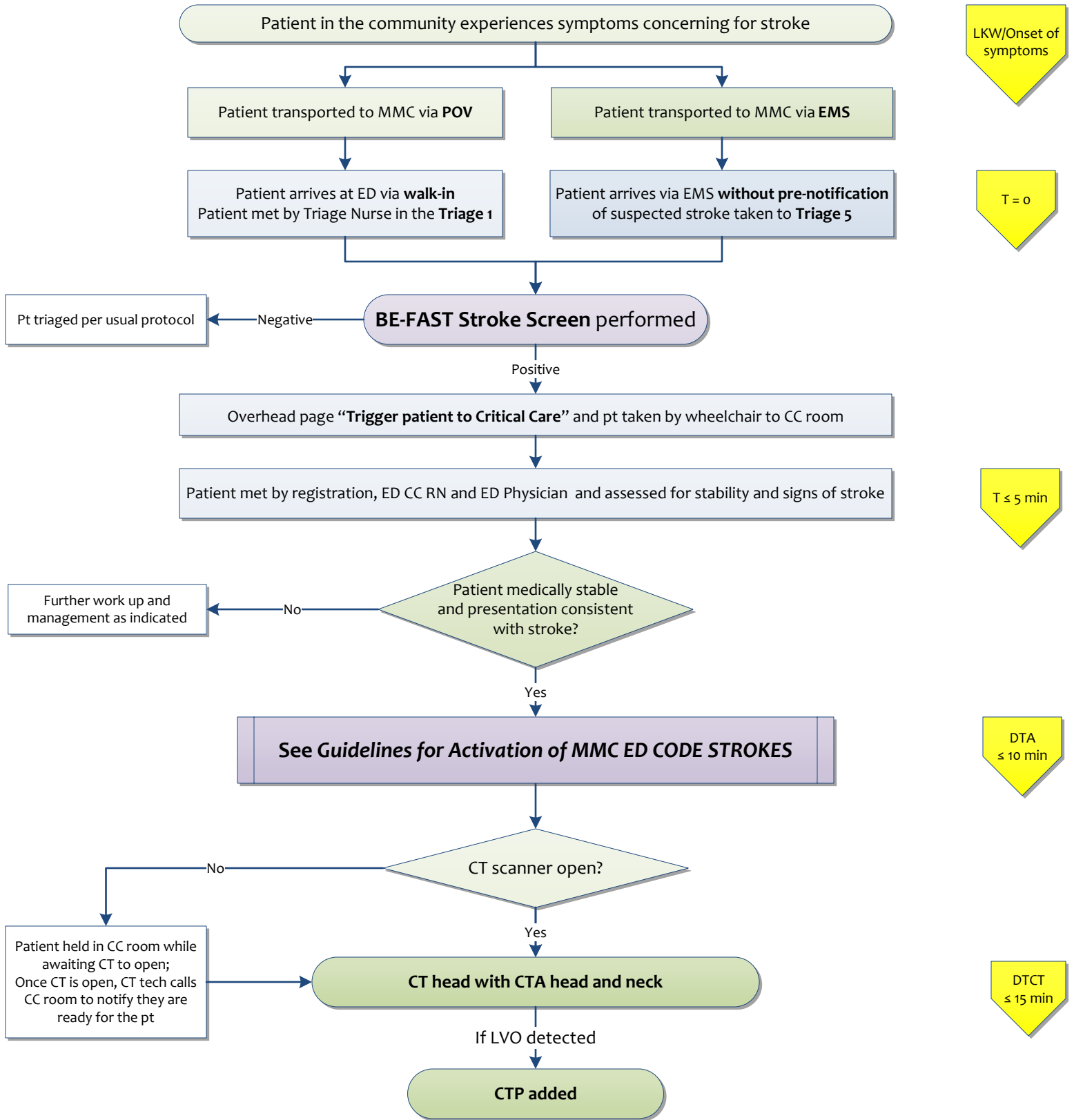
For patients with suspected stroke who arrive at the MMC ED with pre-notification



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**





# Direct-to-MRI (D2MR) Pathway

For patients being transferred from an outside hospital (OSH) with **BASILAR ARTERY THROMBOSIS (BAT)** in whom the Neurointerventionalist (NI) and Neurologist agree MRI is necessary prior to decision to proceed with thrombectomy

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

At the request of the NI, REMIS sends an **"Endo Stroke Alert, [OSH] Direct-to-MR Protocol"** page and enters **Next-of-Kin** into 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**

Yes

Patient cleared for MR?

Once patient is stabilized

Vent management:  
Respiratory therapist

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

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:  
Anesthesia

DTP  
≤ 60 min

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

DTR  
≤ 90 min