THE UNIVERSITY OF TEXAS MD Anderson Cancer Center
Making Cancer History®

Management of Acute Ischemic Stroke in Adult Patients

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PRESENTATION AND INITIAL EVALUATION

Signs and symptoms of acute ischemic stroke[1]

↓

Notify Responding Provider[2] and activate the appropriate emergency response process for your area

↓

- **STAT** orders:
  - Monitoring: 12-lead EKG
  - Laboratory tests:
    - POC finger stick glucose
    - CBC with differential, electrolytes, BUN, serum creatinine (SCr), cardiac panel, PT/INR, and aPTT without delaying brain imaging
  - Imaging: CT angiogram head and neck, and CT head without contrast
    - Call Radiology and notify RN and/or technologist that patient has a possible acute stroke
    - Once imaging is complete, technologist to notify on call Neuroradiologist for imaging review
    - Contact Transportation to arrange rapid transportation to imaging
  - Medications: Tenecteplase (TNK) if the patient is a potential candidate. If TNK is not available in the Pyxis, contact pharmacy to bring to bedside. If TNK is subsequently cancelled, return all medications and tubing to pharmacy.
- Consults
  - Neurology[3]
  - Case Manager and OSA, if appropriate, for possible transfer[4] to stroke center[5]
- Complete neurological exam using NIHSS (see Appendix C)
- Insert and maintain IV access
- Correct hypotension and hypovolemia to maintain perfusion
- Avoid inserting foley catheter, nasogastric tube, or intra-arterial pressure catheter if possible
- Supplemental oxygen to maintain oxygen saturation > 94%
- Obtain urine pregnancy test if appropriate

→ Initiate a Goal Concordant Care (GCC) conversation[6] with the patient, or if clinically indicated, with the Patient Representative, and the Primary Oncologist/ Primary Team/Attending Physician. The Advance Care Planning (ACP) note should be used to document GCC discussion.

→ Evidence of bleeding on CT head or MRI brain?

TREATMENT

Yes → Intraparenchymal hemorrhage or subarachnoid hemorrhage →
- Consult Neurosurgery
- For management, refer to Acute Intracranial Hemorrhage in Adult Cancer Patients algorithm

No → Ischemic stroke per clinical assessment → See Page 2 for continued assessment and management

OSA = Off Shift Administrator
NIHSS = National Institutes of Health Stroke Scale
POC = point of care
EMS = Emergency Medical Services

[1] Signs and symptoms of acute ischemic stroke:
- Numbness and/or paralysis to face, arm or leg (especially on one side)
- 5 Ds of posterior circulation stroke: dizziness, diplopia, dysarthria, dysphagia, dystaxia
- Sudden confusion
- Trouble speaking or understanding
- Sudden painless vision loss in one or both eyes (retinal stroke)
- Sudden severe headache

[2] Appropriate provider may include: Acute Cancer Care Center (ACCC) physician, on-call provider, attending physician, anesthesiologist, radiation oncology team, or diagnostic imaging team/radiologist. For ambulatory and public spaces, Code Blue Team and/or EMS to evaluate and determine disposition as clinically indicated.

[3] Physician may make the determination to transfer patient to a stroke center prior to Neurology consult to prevent any transfer delays. Time permitting, Neurology may assist with determining if a patient is a candidate for endovascular intervention for large vessel occlusion at a stroke center. See Appendix B for Criteria for Transfer to Stroke Center.

[4] See Appendix A for Emergency Transfer Administrative Process

[5] See Appendix B for Criteria for Transfer to Stroke Center

[6] Refer to GCC home page (for internal use only)

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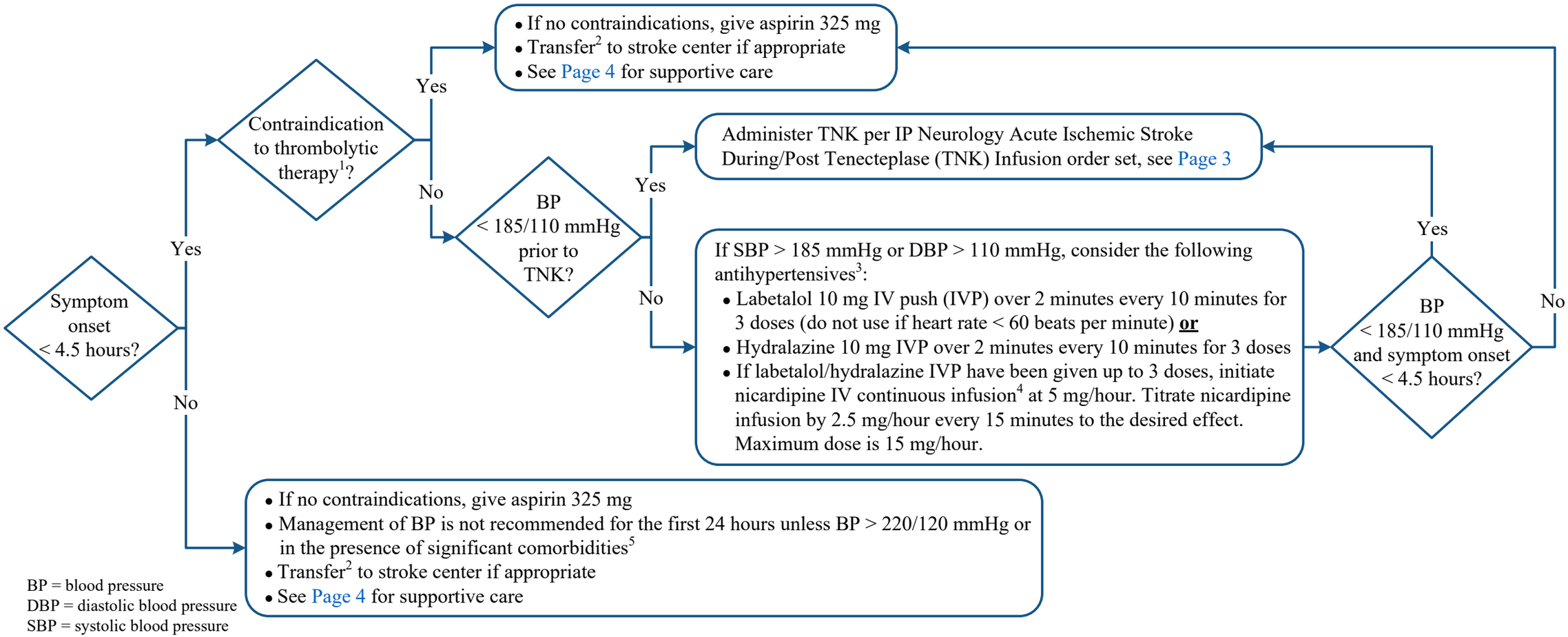
CONTINUED ASSESSMENT & MANAGEMENT



BP = blood pressure
DBP = diastolic blood pressure
SBP = systolic blood pressure

[1] See Appendix D for Contraindications to Thrombolytic Therapy
[2] See Appendix A for Emergency Transfer Administrative Process
[3] Blood pressure should not be reduced by > 15%
[4] For specific cardiac monitoring for continuous infusion administration, refer to Adult Cardiac Medication Monitoring Policy (#CLN0500)
[5] Examples of significant comorbidities: severe cardiac failure, aortic dissection, or hypertensive encephalopathy

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INPATIENT/ACCC MANAGEMENT

Administer TNK[1] per Acute Ischemic Stroke During/Post Tenecteplase (TNK) Infusion Order Set

Patient develops severe headache, acute hypertension, severe nausea and vomiting?

- Yes:
  - **Stop TNK and obtain STAT CT head without contrast**
  - Consult Benign Hematology and Neurosurgery
  - STAT labs: CBC, PT/INR, aPTT, fibrinogen, and type & cross-match
  - Consider treatment with:
    - Cryoprecipitate 10 units infused over 10-30 minutes with additional doses for fibrinogen level < 150 mg/dL
    - Tranexamic acid 1,000 mg IV infusion over 10 minutes **or** aminocaproic acid 4-5 grams IVPB bolus over 1 hour followed by 1 gram IV infusion until bleeding is controlled (see Acute Intracranial Hemorrhage in Adult Cancer Patients algorithm)
- No

Patient develops angioedema?

- Yes:
  - **Stop TNK and treat allergic reaction (see Adult Hypersensitivity(HSR)/Allergic Reaction Management algorithm)**
  - Endotracheal intubation:
    - May not be necessary if edema is limited to tongue and lips
    - May be required for edema with rapid progression (within 30 minutes) involving larynx, palate, floor of mouth, or oropharynx
  - Hold all ACE inhibitors and ARBs
- No

Patient's BP increases to > 180/105 mmHg?

- Yes:
  - If SBP > 180-230 mmHg or DBP > 105-120 mmHg, consider the following antihypertensives:
  - Labetalol 10 mg IVP (do not use if heart rate < 60 beats per minute) **or**
  - Hydralazine 10 mg IVP over 2 minutes every 10 minutes for 3 doses
  - If labetalol/hydralazine IVP have been given up to 3 doses, initiate nicardipine IV continuous infusion[4] at 5 mg/hour. Titrate by 2.5 mg/hour every 15 minutes to desired effect. Maximum dose is 15 mg/hour.
- No

- Admit to ICU or transfer[2] to stroke center[3] as appropriate
- See Page 4 for supportive care

ACE = angiotensin-converting enzyme
ARB = angiotensin II receptor blocker

[1] Maintain strict BP control in the first 24 hours after TNK administration
[2] See Appendix A for Emergency Transfer Administrative Process
[3] See Appendix B for Criteria for Transfer to Stroke Center
[4] For specific cardiac monitoring for continuous infusion administration, refer to Adult Cardiac Medication Monitoring Policy (#CLN0500)

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SUPPORTIVE CARE

- Continue to correct hypotension and hypovolemia to maintain perfusion
- Supplemental oxygen to maintain oxygen saturation > 94%
- Consider additional imaging as clinically indicated including CT head with and without contrast or MRI brain with and without contrast if suspected brain metastasis
- Treat hyperglycemia to maintain glucose in a range of 140-180 mg/dL **and**
- Avoid hypoglycemia (glucose < 60 mg/dL)
- Stress ulcer prophylaxis
- Deep vein thrombosis (DVT) prophylaxis[1]
- Aspiration precautions and bedside swallow evaluation; Speech Pathology consult as clinically indicated
- Physical Therapy consult
- Occupational Therapy consult
- Physical Medicine and Rehabilitation consult
- Nutrition Services consult
- Case Management consult for discharge planning
- Social Work consult as indicated

[1] Initiate mechanical prophylaxis immediately if no contraindications, consider pharmacological prophylaxis 24 hours after TNK administration, and begin aspirin therapy at least 24-48 hours after TNK administration

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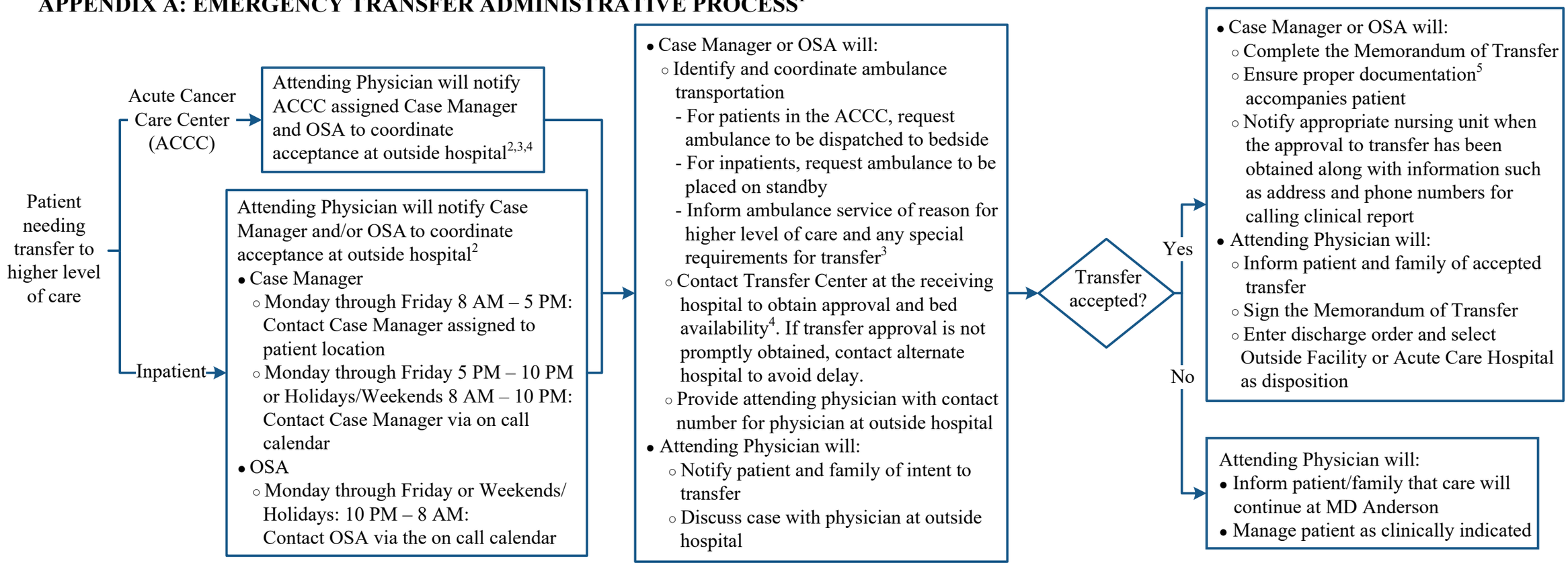
APPENDIX A: EMERGENCY TRANSFER ADMINISTRATIVE PROCESS[1]



[1] If patient is not stabilized prior to transferring to another facility, continue to pursue a transfer if the individual requests the transfer **or** the expected benefits outweigh the increased risks of the transfer. Refer to Emergency Medical Screening Examination, Stabilization, and Appropriate Transfers Policy (#CLN3280).

[2] Refer to Transfer of Patients to, from and Within MD Anderson Cancer Center Policy (#CLN0614)

[3] Discuss with Attending Physician regarding required level of ambulance team (*e.g.*, basic life support, advanced life support, critical care), equipment and special medications (*e.g.*, infusion pumps, oxygen, ventilator), and special patient-specific factors (*e.g.*, large body habitus, isolation status)

[4] UT Memorial Hermann is the preferred stroke center for transfer. Discuss with Attending Physician regarding preference for receiving hospital based on clinical scenario. See Appendix E for Texas Medical Center (TMC) Hospital Contact Information

[5] Documentation: • "Face sheet" • Diagnostic imaging films or CDs as indicated • Other documentation as appropriate
• Medical records to include a current reconciled medication list and transfer orders per primary care team

APPENDIX B: Criteria for Transfer to Stroke Center

Thrombectomy in acute ischemic stroke with emergent large vessel occlusion (ELVO)	
Time from symptom onset	• Up to 24 hours • If > 24 hours, discuss with stroke center
Location of large vessel occlusion	Intracranial and extracranial occlusion of the internal carotid artery (ICA) including tandem or isolated occlusion of the middle cerebral artery (MCA), basilar artery occlusion, and carotid and vertebral dissections
Stroke severity by NIHSS score (see Appendix C)	• NIHSS score of ≥ 6 per several published trials • NIHSS score of < 6 with anterior circulation ELVO but with disabling symptoms such as isolated aphasia should be considered for thrombectomy • No improvement in NIHSS score post TNK administration
Age and baseline level of functioning	Assessment of thrombectomy risk benefits with primary oncologist in patients with significant disability, refractory cancer, wild metastatic disease, poor performance status, and contraindications to TNK administration

Note: Patients who received TNK could be considered candidates for thrombectomy. Such cases should be further discussed with the stroke center/specialist.

APPENDIX C: National Institutes of Health Stroke Scale (NIHSS)

	Title	Responses	Score
1A	Level of consciousness	0 – Alert 1 – Drowsy 2 – Obtunded 3 – Coma/unresponsive	
1B	Orientation questions (2)	0 – Answers both correctly 1 – Answers 1 correctly 2 – Answers neither correctly	
1C	Response to commands (2)	0 – Performs both task correctly 1 – Performs 1 task correctly 2 – Performs neither	
2	Gaze	0 – Normal horizontal movements 1 – Partial gaze palsy 2 – Complete gaze palsy	
3	Visual field	0 – No visual defect 1 – Partial hemianopia 2 – Complete hemianopia 3 – Bilateral hemianopia	
4	Facial movement	0 – Normal 1 – Minor facial weakness 2 – Partial facial weakness 3 – Complete unilateral palsy	
5	Motor function (arm): ◦ Left ◦ Right	0 – No drift 1 – Drift before 10 seconds 2 – Falls before 10 seconds 3 – No effort against gravity 4 – No movement	Left: Right:
6	Motor function (leg): ◦ Left ◦ Right	0 – No drift 1 – Drift before 5 seconds 2 – Falls before 5 seconds 3 – No effort against gravity 4 – No movement	Left: Right:
7	Limb ataxia	0 – No ataxia 1 – Ataxia in 1 limb 2 – Ataxia in 2 limbs	
8	Sensory	0 – No sensory loss 1 – Mild sensory loss 2 – Severe loss	
9	Language	0 – Normal 1 – Mild aphasia 2 – Severe aphasia 3 – Mute or global aphasia	
10	Articulation	0 – Normal 1 – Mild dysarthia 2 – Severe dysarthia	
11	Extinction or inattention	0 – Absent 1 – Mild loss (1 sensory modality lost) 2 – Severe loss (2 modalities lost)	

Score ≥ 25	Very severe neurological impairment
Score 5-24	Mild to severe neurological impairment
Score < 5	Mild impairment

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APPENDIX D: Contraindications to Thrombolytic Therapy

ABSOLUTE CONTRAINDICATIONS

Patient history:

- Ischemic stroke or severe head trauma in the previous 3 months
- Previous intracranial hemorrhage
- Intra-axial intracranial neoplasm
- Gastrointestinal malignancy
- Gastrointestinal hemorrhage in the previous 21 days
- Intracranial or intraspinal surgery within the prior 3 months

Clinical:

- Symptoms suggestive of subarachnoid hemorrhage
- Persistent blood pressure elevation (SBP ≥ 185 mmHg or DBP ≥ 110 mmHg)
- Active internal bleeding
- Presentation consistent with infective endocarditis
- Stroke known or suspected to be associated with aortic arch dissection
- Acute bleeding diathesis, including but not limited to conditions defined under hematologic

Hematologic:

- Platelet count < 100 K/microliter[1]
- Current anticoagulant use[2] with an INR > 1.7 or PT > 15 seconds[1] or aPTT > 40 seconds[1]
- Current use of treatment dose LMWH[2] in the past 24 hours (*e.g.,* to treat VTE and ACS); this exclusion does not apply to prophylactic doses (*e.g.,* to prevent VTE)
- Current use of direct thrombin inhibitors[2] (dabigatran) or direct factor Xa inhibitors[2] (rivaroxaban, apixaban, and edoxaban) within 48 hours assuming normal renal function

CT head/MRI brain findings:

- Evidence of hemorrhage
- Extensive regions of obvious hypodensity consistent with irreversible injury

RELATIVE CONTRAINDICATIONS

- Only minor and isolated neurologic signs or rapidly improving symptoms
- Serum glucose[3] < 50 mg/dL (< 2.8 mmol/L) or > 400 mg/dL (> 22.2 mmol/L)
- Serious trauma in the previous 14 days
- Major surgery in the previous 14 days
- History of gastrointestinal bleeding (remote) or genitourinary bleeding
- Seizure at the onset of stroke with postictal neurologic impairments[4]
- Pregnancy
- Arterial puncture at a noncompressible site in the previous seven days[5]
- Large (≥ 10 mm), untreated, unruptured intracranial aneurysm[5]
- Untreated intracranial vascular malformation[5]

ADDITIONAL CONTRAINDICATION IF SYMPTOM ONSET 3-4.5 HOURS

- Age > 80 years[6]
- Oral anticoagulant use regardless of INR[6]
- Severe stroke (NIHSS score > 25, see Appendix C)
- Combination of both previous ischemic stroke and diabetes mellitus[6]

ACS = acute coronary syndrome
LMWH = low molecular weight heparin
VTE = venous thromboembolism

[1] Although it is desirable to know the results of these tests, thrombolytic therapy should not be delayed while results are pending unless there is clinical suspicion of a bleeding abnormality or thrombocytopenia, the patient is currently on or has recently received anticoagulants (*e.g.,* heparin, warfarin, a direct thrombin inhibitor, or a direct factor Xa inhibitor), or use of anticoagulants is not known. Otherwise, treatment with intravenous TNK can be started before availability of coagulation test results but should be discontinued if the INR, PT, or aPTT exceed the limits stated in the table, or if platelet count is < 100 K/microliter.

[2] Consult Benign Hematology

[3] Patients may be treated with intravenous TNK if glucose level is subsequently normalized

[4] TNK is reasonable in patients with a seizure at stroke onset if evidence suggests that residual impairments are secondary to acute ischemic stroke and not to a postictal phenomenon

[5] The safety and efficacy of administering TNK is uncertain for these relative exclusions

[6] Although these were exclusions in the trial showing benefit in the 3-4.5 hour window for alteplase, intravenous alteplase as well as TNK appears to be safe and may be beneficial for patients with these criteria, including patients taking warfarin with an INR < 1.7

APPENDIX E: Texas Medical Center (TMC) Hospital Contact Information

	Memorial Hermann TMC	CHI St. Luke's TMC	Methodist TMC
For Transfers:	Transfer Center (713) 704-2500	Transfer Center (832) 355-2233	Transfer Center (713) 441-6804

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MD Anderson Institutional Policy #CLN1202 - Advance Care Planning Policy
Advance Care Planning (ACP) Conversation Workflow (ATT1925)

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SUGGESTED READINGS - continued

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DEVELOPMENT CREDITS

This practice consensus statement is based on majority opinion of the Ischemic Stroke workgroup experts at the University of Texas MD Anderson Cancer Center for the patient population. These experts included:

Core Development Team Leads

Monica Loghin, MD (Neuro-Oncology)
Katy Toale, PharmD (Pharmacy Quality-Regulatory)
Sudhakar Tummala, MD (Neuro-Oncology)

Workgroup Members

Ashley Aaroe, MD (Neuro-Oncology)
Melissa Chen, MD (Neuroradiology)
Maria Susan Gaeta, MD (Emergency Medicine)
Wendy Garcia, BS♦
Petra Grami, DNP, RN (Nursing Administration)
Anne Kleiman, DO (Neuro-Oncology)
Arine Musaelyan, MD (Hospital Medicine)
Karen Plexman, MSN, RN (Code Blue Operations)
Julia Roh, PharmD (Pharmacy Clinical Programs)
Danna Stone, BSN, RN, MBA (Diagnostic Imaging Administration)
Mary Lou Warren, DNP, APRN, CNS-CC♦
Christopher L. Williams, BS, RT(R)(CT) (Diagnostic Imaging)
Suzanne Wilson, BSN, DBA, RN (Case Management)

♦Clinical Effectiveness Development Team