Emergency Neurological Life Support®
Acute Ischemic Stroke Protocol
Version 6.0

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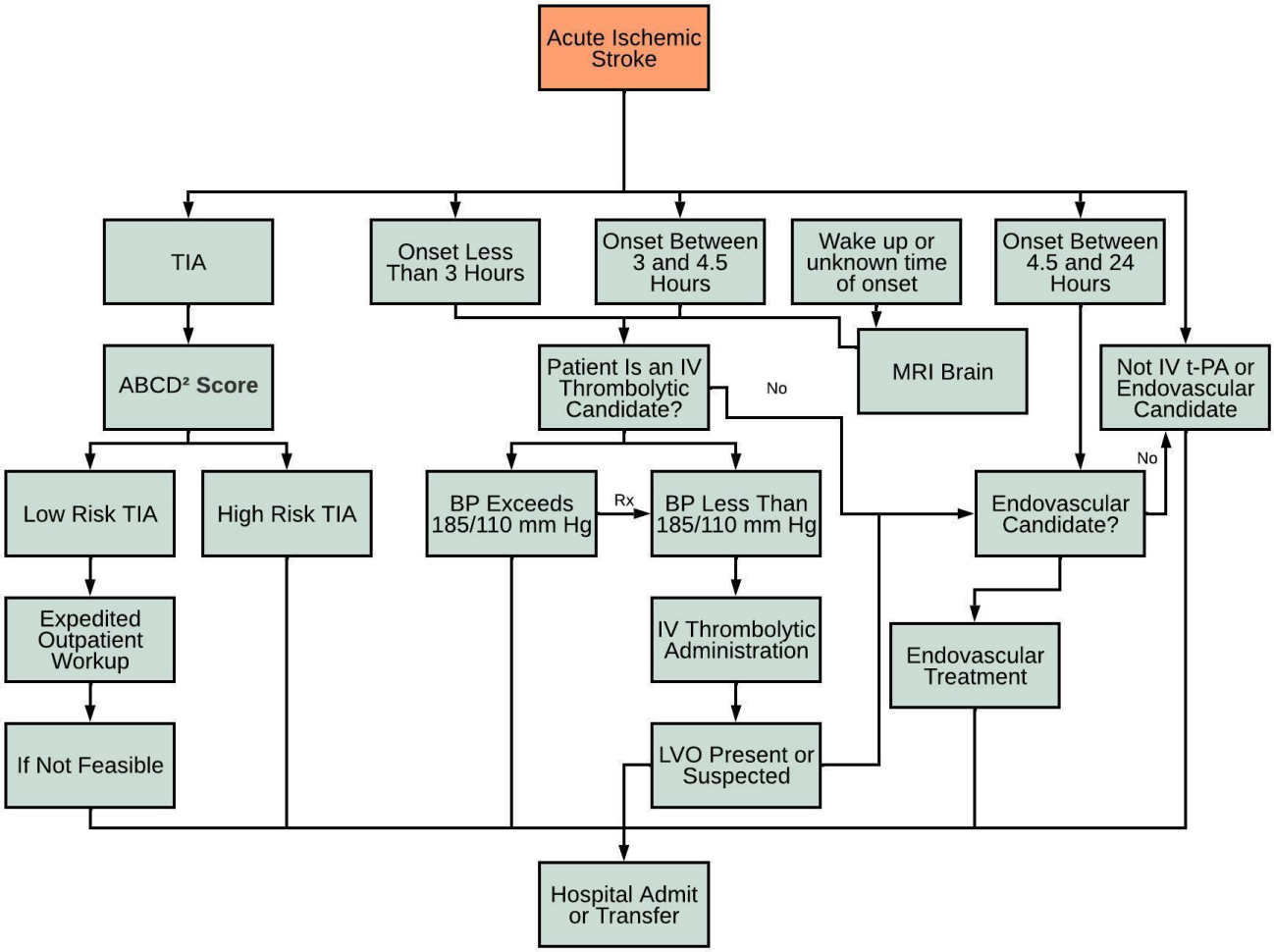
ACUTE ISCHEMIC STROKE ALGORITHM



CHECKLIST

- ☐ Activate stroke code system (if available)
- ☐ Check vital signs
- ☐ Administer supplemental oxygen to maintain saturation ≥ 94%
- ☐ Determine time of onset/last seen normal (LSN)
- ☐ Determine NIHSS
- ☐ Perform CT, CTA
- ☐ Review medication list*
- ☐ Establish IV access — 18g peripheral IV
- ☐ Run labs: Fingerstick glucose; CBC with platelets; PT/ INR, PTT; and beta-HCG for women of childbearing age
- ☐ Perform EKG

*When asking about medications, be sure to ask specifically about anticoagulants and when medication was last taken/administered.

COMMUNICATION CHECKLIST

- ☐ Age
- ☐ Airway status
- ☐ Last seen normal (LSN)
- ☐ NIHSS
- ☐ Coagulation parameters – PT, PTT, INR
- ☐ CT – Dense MCA sign, MCA dot sign, dense basilar sign, ASPECTS score, early ischemic changes
- ☐ CTA/MRA – Large vessel occlusion (ICA, M1, M2, basilar, PCS, ACA)
- ☐ CTP – Volume of core and penumbra, matched or mismatched perfusion
- ☐ Thrombolytic administration – ves (initiation completion time) no (reason)
- ☐ Endovascular intervention (time to groin puncture, recanalization, TICI score)
- ☐ Target BP

ACUTE ISCHEMIC STROKE

Acute ischemic stroke (AIS) is a neurological emergency that can be treated with time-sensitive interventions, including administration of intravenous thrombolytic medications and endovascular thrombus removal. Numerous studies have demonstrated that rapid, protocolized assessment and treatment is essential to improving neurological outcomes. These interventions are often completed simultaneously to achieve a safe and fast medical and/or surgical intervention. This protocol focuses on the early identification and initial management within the first hour(s) following acute onset of a neurological deficit.

IV THROMBOLYTIC ADMINISTRATION

Once a patient is deemed a candidate for IV thrombolytics

After placing two peripheral IV lines:

- Weigh the patient; do not estimate body weight. If the patient cannot be weighed, then two people should estimate weight.
- Mix by swirling (do not shake) 0.9 mg/kg intravenous alteplase, total dose not to exceed 90 mg.
- Give 10% of the total dose of intravenous alteplase by bolus over 1 minute, then infuse the remaining dose over 1 hour.
- The remaining intravenous alteplase in the IV tubing at the end of the infusion should be administered by running an additional 100 ml of saline at the same rate of the intravenous alteplase infusion until the line is cleared.
- Tenecteplase is a reasonable alternative to alteplase and should be given as a one-time bolus dose of 0.25 mg/kg (maximum dose of 25mg).

Alternative dosing strategies utilizing lower doses have been evaluated in the literature; however, they are not endorsed by the AHA/ASA guidelines and should not be routinely implemented.

As intravenous alteplase is dispensed in 50- and 100-mg bottles, it is suggested to withdraw and discard any excess intravenous alteplase from the vial to avoid accidental infusion of excess medication.

ENDOVASCULAR TREATMENT

Consider mechanical thrombectomy

Mechanical thrombectomy should be considered if the patient has a large vessel occlusion (proximal (M1) MCA, intracranial ICA, or basilar artery) and is within a 24-hour window of last seen normal (LSN) time. Additional imaging such as MR- or CT perfusion should be obtained if the patient presents beyond 6 hours from LSN. If the patient is a candidate for IV thrombolytic, it should be administered expeditiously, regardless of endovascular procedure candidacy.

Large vessel occlusions can be suspected by seeing a hyperdense sign (clot within the vessel) on noncontrast CT imaging, but this sign is insensitive. The probability of a large vessel occlusion increases with NIHSS score. An NIHSS > 6 should raise suspicion for a large vessel occlusion. CTA or MRA is diagnostic, as is conventional angiography.

- Contact the neurointerventional physician on call; if the treating hospital does not have this capability, consider transfer to a comprehensive stroke center.
- Based on the results of the DAWN and DEFUSE 3 trials, mechanical thrombectomy should be considered based on CTP, DWI–MRI, and MR perfusion results. These studies are recommended to aid in the selection of patients for mechanical thrombectomy who meet eligibility criteria.

HOSPITAL ADMIT OR TRANSFER

While waiting for ICU bed

After IV thrombolytic administration, endovascular intervention, or no specific treatment, consider the following initial admission orders:

- Neuro checks every 15 minutes for 2 hours, then every 30 minutes for 6 hours, then hourly
- Supplemental oxygenation if needed to keep O_2 sat > 94%
- Blood pressure (BP) checks every 15 minutes for 2 hours, then every 30 minutes for 6 hours, then every hour for 16 hours
- After IV thrombolytic administration, maintain BP < 180/105 mmHg (note: this is lower than pretreatment values); if no thrombolytic is given, keep BP < 220/120 mmHg
- Bedside swallow test is quickly performed by giving 30 ml water by mouth. Dysphagia screening should be performed before administering anything else by mouth. Certain stroke patients are at high risk of aspiration. If the patient coughs or chokes during the bedside swallow test, then they should remain NPO until additional formal testing can be performed
- Keep glucose at 140-180 mg/dl and consider insulin drip if blood glucose is persistently > 200 mg/dl
- IVF (normal saline) at 1.5 ml/kg/hour to maintain euvolemia
- Monitor for atrial fibrillation for at least 72 hours after admission
- Monitor for and prevent fever. Fever is detrimental to an already-injured brain. Treat fever sources with antibiotics when indicated and prevent fever with antipyretics. Rectal or IV acetaminophen will help control fever. Therapeutic hypothermia has not been proven effective to improve clinical outcomes after acute stroke
- Avoid indwelling urinary catheter to avoid nosocomial infection
- For large cerebral infarctions, it may be prudent to keep the head of bed elevated at 30 degrees to help reduce edema. Decompressive surgery (including prophylactically) is recommended in some patients with malignant edema who develop sudden clinical deterioration due to herniation from massive swelling

If thrombolytics are administered:

- Avoid inserting urinary catheter, nasogastric tubes (NGT), and intra-arterial (IA) catheters. When possible, avoid insertion of urinary catheters during thrombolytic infusion and for at least 4 hours afterward. NGT and IV catheters should be avoided for 24 hours. Do not give anticoagulant/antiplatelet therapy for 24 hours; repeat head CT or MRI at 24 hours before starting anticoagulant/antiplatelet medication

Watch for complications of IV thrombolytics, including

- Angioedema – with potential for airway obstruction. Most will treat as an allergic reaction with:
  - H-1 blockers, e.g., diphenhydramine 50 mg IV
  - H-2 blockers, e.g., famotidine 20 mg IV or ranitidine 50 mg IV, and
  - Steroids, e.g., methylprednisolone 125 mg IV
  - If angioedema fails to improve, epinephrine at 0.3 or 0.5 mg intramuscularly (0.5 mg is preferred in patients weighing > 50 kg, unless rapidly deteriorating; may use 0.3 mg via autoinjector if it is the only option available)
  - Icatibant (bradykinin antagonist) 30 mg subcutaneous injection into abdominal wall, repeat in 6 hours, with maximum of 90 mg in 24 hours
  - FFP (contains C1 esterase inhibitor) may be required as targeted therapy for hereditary angioedema and ACEI-related angioedema
  - Consider early/rapid intubation if there are early signs of airway compromise. It is typically not necessary if there is only isolated lip or tip-of-tongue swelling
- Hemorrhage – stop IV thrombolytic (if IV alteplase is given)
- Sudden deterioration in mental status – see below
- Severe hypertension or hypotension – may be signs of ICH or systemic hemorrhage

A sudden decline in neurological exam during or following thrombolysis administration may be due to an intracranial hemorrhage. This is often accompanied by a marked rise in blood pressure; however, a marked rise or fall in blood pressure alone may signal an ICH. Do the following immediately:

- STOP thrombolytic infusion (if alteplase is given).
- Monitor airway closely.
- Obtain vital signs every 15 minutes (assessment for signs of increased ICP). Assess GCS/pupil response. Treat blood pressure and use noninvasive interventions to lower ICP (raise HOB, maintain neck midline).
- Obtain Stat head CT scan.
- Notify your neurosurgeon on call; if not available, begin the process of transferring the patient to a facility with neurosurgical capabilities if the CT scan shows hemorrhage.
- Order Stat labs: PT, PTT, platelets, fibrinogen, type and cross 2-4 unit PRBCs.
- Give the following:
    - 10 units of cryoprecipitate IV over 10-30 minutes. Give additional doses until the fibrinogen level exceeds 150 mg/dL
    - And
        - Tranexamic acid 1,000 mg IV over 10 minutes or
        - Aminocaproic acid IV 4-5 g over 1 hour followed by 1 g until bleeding stops (usually within 3 hours)

Consider patient transfer if:

- The treating hospital cannot provide the level of care for the patient (no ICU, for example). Patient outcomes have been shown to improve if the patient is treated in a stroke center.
- There is suspicion of large vessel occlusion (CTA/MRA, hyperdense vessel sign on imaging; or clinical findings consistent with an MCA stroke) and the patient can arrive and be treated at the receiving hospital within 24 hours of symptom onset.

LOW-RISK TIA

ABCD^2 Score 0-3

Patients at low risk of stroke can be treated as outpatients. This can begin in the ED or clinic starting with medications and expediting ECG and imaging of the carotids in 1-2 days following the ABCD^2 score calculation. Do the following:

- Start an antithrombotic agent (ASA 81 mg/day, clopidogrel 75 mg/day, or ASA/ extended release dipyridamole 200 mg twice daily).
- Initiate high-intensity statin if not taking one already (moderate-intensity statin in patients > 75 years old).
- Obtain a 12-lead ECG or review the rhythm strip if available. If atrial fibrillation is detected, consider starting anticoagulation (oral anticoagulant or low-molecular-weight heparin) or ASA 81 mg if anticoagulation is contraindicated; calculate CHADS2 or CHADS2Vasc and HAS-BLED score to help guide long-term therapy.
- Consider initiating longer-term outpatient cardiac monitoring (30 days) if there is high suspicion for an embolic cause and atrial fibrillation is not identified already, or if there is no other cause for TIA.
- Arrange carotid imaging: ultrasound, CTA, or MRA.
- Consider transthoracic echocardiography.
- Initiate smoking cessation counseling.
- Counsel about the importance of compliance with medication regimen.

NO THROMBOLYTIC UNLESS BP IS REDUCED

If the patient is a potential thrombolytic candidate, interventions to control BP should be initiated immediately. Short-acting intravenous and/or titratable IV antihypertensive agents can be used for the treatment of hypertension in the acute setting.

Blood pressure (BP) exceeds 185/110 mmHg

- This is too high for IV thrombolytic administration and *requires* gentle reduction prior to initiating thrombolytic agents.
- Labetalol 10-20 mg IV every 10 minutes (consider doubling dose (i.e., 20 mg, 40 mg, 80 mg) to maximum total dose of 300 mg. Start maintenance infusion.*
- Nicardipine IV – start 5 mg/hour, titrate up by 2.5 mg/hour at 5- to 15-minute intervals, maximum dose 15 mg/hour; when desired blood pressure is attained, lower the dose.
- Clevidipine IV– begin with 1-2 mg/hour IV infusion; double medication dose every 90 seconds until the BP goal is neared, then increase in smaller increments until the desired BP goal is reached. Maximum dose is 32 mg/hour.
- Other medications. **

If BP falls below 185/110 mmHg, proceed with IV thrombolytic administration.

If BP proves refractory to the above, the risk for intracerebral hemorrhage is considered too high and the patient should not be treated with thrombolytics. Continue to treat BP with a goal of less than 220/120 mmHg, however. ***

Footnotes:

*Be sure to initiate a continuous infusion of the antihypertensive agent as boluses will wear off and BP will likely return to its previously high levels.

Labetalol, nicardipine, and clevidipine are recommended by the American Stroke Association. See ENLS: *Pharmacotherapy*.

***Permissive hypertension is allowed for TIA, as it is for patients who do not receive thrombolytics or undergo endovascular therapy, up to 220/120 mmHg. This may be gradually lowered over the next 24-48 hours.

HIGH-RISK TIA

TIA risk moderate or high, or unable to arrange timely outpatient work-up and follow-up

Admit for observation:

- Patients with $ABCD^2$ scores > 3
- Permissive hypertension (not to exceed 220/120 mmHg), and BP should be gradually lowered over 24-48 hours
- Keeping head of bed flat for 24 hours has been recommended in the past but is not evidence-based
- Telemetry
- In a high-risk TIA ($ABCD^2$ score ≥ 4) the CHANCE trial demonstrated that dual antiplatelet therapy using a combination of clopidogrel (initial dose of 300 mg followed by 75 mg/day) and aspirin (75 mg/day) for 21 days followed by clopidogrel (75 mg/day) for 90 days was superior to aspirin alone in reducing the risk of stroke
- Similarly, the POINT trial from the United States showed that combined use of clopidogrel at a loading dose of 600 mg once followed by 75 mg/day for 90 days plus aspirin 50-325 mg/day for the first 21 days was superior to aspirin 50-325 mg/day alone for 90 days.
- Ticagrelor may be a reasonable alternative to clopidogrel for DAPT after high-risk TIA or minor stroke. The THALES trial showed that the combination of aspirin (initial dose of 300- 325 mg followed by 75-100 mg/day) and ticagrelor (initial dose of 180 mg followed by 90 mg/day) for 30 days was superior to aspirin alone in reducing the risk of recurrent ischemic stroke within 30 days.
- Initiate high-intensity statins (ex: atorvastatin 80 mg daily or rosuvastatin 20 mg daily) if not taking one already (moderate-intensity statin in patients > 75 years old).
- Obtain a 12-lead ECG or review the rhythm strip if available. If these show atrial fibrillation, consider starting anticoagulation (oral anticoagulant or low-molecular-weight heparin) or aspirin 81 mg if anticoagulation is contraindicated; calculate CHADS2 or CHADS2Vasc and HAS-BLED score to help guide long-term therapy.
- Consider initiating longer-term outpatient cardiac monitoring (30 days) if there is high suspicion for an embolic cause and atrial fibrillation is not identified already, or if there is no other cause for TIA.
- Arrange carotid imaging: ultrasound, CTA, or MRA.

- Consider transthoracic echocardiography.
- Initiate smoking cessation counseling.
- Counsel about the importance of compliance with medication regimen.

ONSET LESS THAN 3 HOURS

One of the chief criteria used to select patients for acute stroke interventions is the patient's time of stroke onset – defined as LSN time or, alternatively, the time of symptom onset (if witnessed). Acute stroke treatment therapies such as thrombolytic agent administration are time sensitive, and delays can lead to a lower likelihood of a good outcome and an increased risk of intracranial hemorrhage. If you cannot establish the time with certainty, most providers will not treat with IV thrombolytics.

Time from stroke symptom onset is less than 3 hours

Time of onset is when the patient was last seen normal.

- If the patient or observer can verify when the first symptoms began, use that time.
- If a patient awakens with a stroke, the time of onset is when they last went to bed.

Patients with a shorter time to thrombolysis administration have a higher likelihood of a good outcome. Therefore, expediting care may greatly impact your patient.

Check eligibility for on-label use of IV thrombolytics (United States and elsewhere):

- Diagnosis of ischemic stroke causing measurable neurological deficit. Tip: ask the patient if the deficit is disabling to them – can they carry out all of their normal and enjoyable activities as they could before this event?
- Onset less than 3 hours before initiating thrombolytic agents
- Patient is at least 18 years of age (see ENLS module on *Pediatric Stroke*)

Alteplase is the only FDA-approved IV thrombolytic for use in acute ischemic stroke in the United States. However, tenecteplase 0.25 mg/kg (maximum dose 25 mg) given as a single IV bolus may be used as an alternative IV thrombolytic agent.

Absolute exclusion criteria if positive:

- The symptoms of stroke should not be suggestive of subarachnoid hemorrhage. (2015 FDA label, changed to subarachnoid hemorrhage)
- No major head trauma in previous 3 months
- No prior stroke within previous 3 months (removed in 2015 FDA label)
- No intracranial or intraspinal surgery in the previous 3 months
- No arterial puncture at a non-compressible site or lumbar puncture in the previous 7 days
- No history of previous intracranial hemorrhage (contraindication removed in 2015 FDA label, warning added for recent ICH)
- No history of intracranial neoplasm, aneurysm, or arteriovenous malformation. Note that it is probably prudent to give IV thrombolytic to a patient with a disabling ischemic stroke and a small asymptomatic, unsecured intracranial aneurysm.
- Blood pressure not elevated above specific thresholds (systolic < 185 mmHg and diastolic < 110 mmHg) (in 2015 FDA label, specific BP values removed from contraindication, warning for BP > 185/110 mmHg remains)
- No evidence of active bleeding or acute trauma (fracture) on examination
- Not taking an oral anticoagulant or, if anticoagulant is being taken, INR < 1.7 or PT > 15 seconds
- No current use of direct thrombin inhibitors or direct factor Xa inhibitors or elevated sensitive laboratory tests (such as aPTT, INR, platelet count, and ECT [ecarin clotting time]); TT (thrombin time); or appropriate factor Xa assays *
- If receiving heparin in previous 48 hours, aPTT must be in normal range.
- Platelet count <100 000 mm^3

- Blood glucose concentration < 50 mg/dl (2.7 mmol/l) **(FDA 2015 label, removed entirely). In spite of the FDA removal of limitation, a blood glucose test (serum or capillary) is the only test result one should have back before administering thrombolytic agents.
- CT does not show a multilobar infarction (hypodensity >1/3 cerebral hemisphere) (removed from FDA 2015 label).

Relative exclusion criteria if positive:

Use caution in recommending thrombolytics if one or more are positive:

- The neurological signs are rapidly improving ***(removed from 2015 FDA label)
- The neurological signs are minor and isolated ****(removed from 2015 FDA label)
- Pregnancy
- Seizure with postictal residual neurological impairments
- Major surgery or major trauma in the previous 14 days
- Gastrointestinal or urinary tract hemorrhage in previous 21 days
- Myocardial infarction in the previous 3 months

Some additional considerations:

- Caution should be exercised in treating a patient with major deficits (NIHSS > 25).
- Caution using thrombolysis in patients treated with low-molecular-weight (LMW) heparin in the past 24 hours. Note that prophylactic dose of LMW heparin is NOT a contraindication, only the full treatment dose.
- The patient or family members understand the potential risks and benefits from treatment. No written consent is required, but the conversation should be documented in the clinical notes. Do not delay therapy if surrogate is not available.

* Direct thrombin inhibitors or direct factor Xa inhibitors pose a conundrum in determining thrombolytic eligibility. Without available blood tests and based on drug half-lives, most practitioners are using a cut-off of 48 hours (or 5 half-lives) since last use of any of these medications before recommending thrombolytics.

** The original thrombolytic guidelines for acute ischemic stroke included an exclusion for patients with serum or capillary glucose level > 400 gm/dl. While this parameter has been removed for many years, a level this high should prompt the consideration of an alternate diagnosis. Similarly, a low blood glucose level may be symptomatic and should be corrected and the patient's neurologic status reassessed.

*** Some stroke patients will have stuttering symptoms or they may have mild improvement, e.g., from a NIHSS of 12 to 8 points, but then hold at 8 with no further improvement. The recommendation is to still treat these patients with thrombolytics.

**** In the past, many physicians used an NIHSS score of 4 or 5 points as a lower-end cut-off for recommending thrombolytics. It must be noted that patients may have significant residual stroke symptoms despite low NIHSS scores (e.g., isolated hemianopsia, aphasia, or cranial nerve dysfunction). Thrombolytic administration should strongly be considered in these patients. Asking the patient about how disabling their symptoms are will help guide decision-making for thrombolytic administration.

ONSET BETWEEN 3 AND 4.5 HOURS

Time from stroke onset is between 3 and 4.5 hours

Time of onset is when the patient was last seen normal.

- If the patient or an observer can corroborate when the first symptoms began, use that time.
- If a patient awakens with a stroke, the time of onset is when they last went to bed.

The time of onset is critical for using thrombolysis, as the risk of intracerebral bleeding increases with increased time from stroke onset. If you cannot establish the time with certainty, most physicians will not treat with IV thrombolytics.

In the United States, thrombolytics are not FDA approved for the 3- 4.5-hour time window, although the approach is approved in Europe and Canada. Nonetheless, the 3- 4.5-hour window is endorsed by the American Heart Association and American Stroke Association. The inclusion criteria are similar to those of < 3 hours, but are modified as follows:

- Meet all criteria of < 3 hours since stroke onset
- Age < 80 years
- No anticoagulant use, regardless of INR
- NIHSS score < /= 25
- No combined history of prior stroke and diabetes

This selective inclusion criteria has come under intense scrutiny, however, as patients taking warfarin with an INR ≤ 1.7, patients > 80 years, and patients with both a prior stroke and diabetes presenting within the 3- to 4.5-hour window may benefit from IV thrombolytic administration in a similar fashion to those patients who present within the 0- to 3-hour time window. Analysis of data summarized in an AHA/ASA scientific statement indicates that the above exclusion criteria may not be justified in practice. It should be noted, however, that the benefit of IV thrombolytics in this time window is less clear in patients presenting with severe symptoms (NIHSS score > 25).

YES: PATIENT IS AN IV THROMBOLYSIS CANDIDATE

Is blood pressure (BP) less than 185/110 mmHg?

After reviewing the inclusion/exclusion criteria for IV thrombolytic use, the patient is eligible to receive the drug. Current blood pressure is the last inclusion criteria.

Blood pressure (BP) measurements are vital and must be obtained frequently, especially in the early management of AIS. If the patient is a potential thrombolytic candidate, interventions to control BP should be initiated immediately. The target BP goal for patients eligible to receive IV thrombolytics is < 185/110 mmHg; and once the IV thrombolytic is initiated, BP must be maintained < 180/105 mmHg for 24 hours after administration to lower the risk of intracranial hemorrhage. A strategy for careful BP lowering should be employed while ensuring large fluctuations in BP once at goal are limited.

Steps can be taken to lower blood pressure so as to make the patient eligible to receive thrombolytics. See the ENLS: *Pharmacotherapy* protocol for dosing. Note that while the FDA has lifted absolute target BP numbers, the AHA/ASA guidelines still recommend maintaining BP below 185/110 mmHg to start thrombolytics and even lower, at less than 180/105 mmHg, while the thrombolytic is infusing (if alteplase is given).

NO: PATIENT IS NOT AN IV THROMBOLYTIC OR ENDOVASCULAR CANDIDATE

Neither IV thrombolysis nor endovascular intervention is appropriate

Common exclusions for IV thrombolysis are time (duration > 4.5 hours) or specific contraindications to thrombolytic medications.

Endovascular intervention exclusions include lack of large vessel occlusion on CTA or MRA, large area of infarction already present on the brain imaging study (ASPECTS score < 6), poor baseline modified Rankin Score (mRS) (≥ 3). CTA/CTP or MRI/MRA may show large infarct cores and small penumbra indicating that endovascular intervention might not be successful and may even, in fact, be dangerous.

LSN > 4.5 HOURS AND PATIENT IS NOT AN ENDOVASCULAR CANDIDATE

Outside IV thrombolytic window

In patients who wake up with stroke symptoms or present with unclear LSN time > 4.5 hours but < 24 hours and who are ineligible for thrombectomy, MRI may be utilized to determine thrombolytic candidacy. MRIs showing diffusion-positive and FLAIR-negative lesions can be used to select those patients who may benefit from thrombolytics.[20] A subset of patients who present between 4.5 hours and 9 hours from LSN may benefit from IV thrombolytic based on CT perfusion mismatch, per the EXTEND trial[32].

LSN BETWEEN 0-6 HOURS: ENDOVASCULAR TREATMENT

In AIS patients presenting within 6 hours of LSN with a CT scan showing AN ASPECTS score of ≥ 6 with an LVO – e.g., proximal (M1) middle cerebral artery (MCA), intracranial internal carotid artery (ICA), basilar or vertebral artery, mechanical thrombectomy treatment should be considered. Several randomized trials of thrombectomy in AIS with LVO stroke have shown marked clinical efficacy and reduction in mortality.[41-44] Patients with distal occlusions e.g., M2, M3, or occlusions of the anterior cerebral arteries, posterior cerebral arteries, vertebral or basilar arteries have uncertain benefits. Patients presenting within the 0- to 4.5-hour window should be offered IV thrombolytic therapy if criteria are met.

LSN BETWEEN 6-24 HOURS: ENDOVASCULAR TREATMENT

Based on the results of the DAWN and DEFUSE 3 trials, it is recommended that for AIS patients presenting within 6-24 hours of LSN time who have an LVO in the anterior circulation, obtaining a CTP, DWI–MRI with MR perfusion is recommended to aid in selection of patients for mechanical thrombectomy who meet eligibility criteria.[21, 22] Both of these trials incorporated CT perfusion or MRI diffusion and perfusion scans that used the RAPID software (iSchemaView), an automated image processing system, to calculate the volume of ischemic core (or infarct volume) and penumbral tissue.

THE ABCD^2 SCORE

What is the predicted risk for stroke?

The ABCD^2 score is an ordinal scale that provides risk prediction of stroke following the TIA. It is scored as follows:

ABCD^2 Element	Points
Age > 60 years	1
Blood pressure ≥ 140/90 mmHg on initial evaluation	1
Clinical features	
Speech disturbance without weakness	1
Unilateral weakness	2
Duration of symptoms	
10-59 minutes	1
≥ 60 minutes	2
Diabetes mellitus in patient's history	1
Total score	0-7

The following is the estimated risk (%) of a stroke occurring within various time ranges:

Total risk	ABCD^2 Score	2-day	7-day	90-day
Low	0-3	1.0	1.2	3.1
Moderate	4-5	4.1	5.9	9.8
High	6-7	8.1	12	18

Based on this risk stratification, some physicians choose to admit high-risk patients and discharge those with low risk, and controversy exists about moderate-risk patients.

TIA

Symptoms have completely resolved

Diagnosis of TIA (transient ischemic attack) is based on new onset of focal neurological symptoms that are explainable by a vascular cause (i.e., arterial occlusion of a single or group of arteries adequately explain the patient's signs and symptoms), and these signs and symptoms resolve within 24 hours (most TIAs resolve in a much shorter period of time). If the patient’s symptoms clear by 24 hours but an acute infarct is observed on brain imaging, this is defined as a stroke and no longer TIA.