LERN Acute Stroke Ready Hospital Toolkit

LOUISIANA
EMERGENCY
RESPONSE
NETWORK

Right Place. Right Time. Right Care.

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Acute Stroke Ready Hospitals

Definitions

Acute Stroke Ready Hospitals (ASRH) have been defined by the American Heart Association/American Stroke Association as "hospitals that are not Primary Stroke Centers, yet can provide timely, evidence-based care to most patients with an acute stroke[1]. The Joint Commission provides Acute Stroke Ready Certification, but the Louisiana Emergency Response does not require ASRH in our system to obtain this certification. LERN does require data submission by all ASRHs in order to validate they meet identified metric.

Please note that the LERN Acute Stroke Hospital Ready criteria are based on the Joint Commission's (TJC) Acute Stroke Ready Hospital requirements but do not include all of TJC criteria. The Joint Commission has several additional requirements for certification as an Acute Stroke Ready Hospital which can be found at Acute Stroke Ready Hospital | The Joint Commission

This toolkit is designed to provide hospitals with the necessary information and requirements to become a LERN Acute Stroke Ready Hospital (ASRH).

Background

In 2021, 2,755 Louisianans died from stroke (5.5% of total deaths in Louisiana)*. Nationally, there are 795,000 new stroke cases every year. That equates to one stroke every 40 seconds. Furthermore, stroke is the fifth leading cause of death in the state and is the #1 cause for new nursing home admissions. The Louisiana Emergency Response Network recognizes that all hospitals do not have the capabilities to become Primary Stroke Centers (PSC). However, by becoming an ASRH in Louisiana, a hospital signals to its community that it is committed to the best nationally accepted standards of acute stroke treatment.

Why Become an Acute Stroke Ready Hospital?

The goal of the Louisiana Emergency Response Network Stroke Initiative is to develop a statewide system of stroke care to provide access to care proven to improve outcomes for Louisiana citizens regardless of where they live in the state. To accomplish this, we must identify and support the network of hospital providers that are committed to providing timely, evidence-based care to most patients with an acute stroke. Recent studies have shown that more than 96% of the US population is within 60 minutes of a Stroke Capable Hospital. In Louisiana, there are 22 Primary Stroke Centers, 10 Endovascular Hospitals and 3 Comprehensive Stroke Centers clustered in metropolitan areas. In order to close this gap the system consists of a "hub and spoke" model, where the "hub" hospitals are Primary Stroke Centers (certified by The Joint Commission, Health Care Accreditation Program, or Det Norske Veritas), Thrombectomy Capable Stroke Center (TJC), and Comprehensive Stroke Centers (TJC) and the "spoke" hospitals are Acute Stroke Ready Hospitals. Hub hospitals act as the expert resource centers for the "spoke" hospitals, when needed. To function as a spoke within the system of care requires organization and adoption of protocols, policies, data collection, and performance improvement initiatives.

The ASRH is vital to improving stroke outcomes for the citizens of Louisiana, since the ratio of ASRH hospitals to CSC, TSC, or PSC hospitals is 2:1. Per the American Stroke Association, the vision and intent of the ASRH is to provide initial diagnostic services, stabilization, emergent care, and therapies to patients with an acute stroke who are seen in their Emergency Department (ED).

*https://www.cdc.gov/nchs/pressroom/sosmap/stroke_mortality/stroke.htm

What Does an Acute Stroke Ready Hospital Do?

An Acute Stroke Ready Hospital ("spoke" hospital) will provide immediate and time-critical care to the stroke patient, including initial emergency evaluation and screening, stroke scale assessment, and, if indicated, thrombolytic treatment. Using standardized and evidence-based protocols, these Stroke Receiving Facilities will be able to provide the optimum level of care to the acute stroke patient without an emergent large vessel occlusion (LVO). To assist in this evaluation and decision-making, "spoke" hospitals will have 24-hour access to the expert neurologic resources internally or via hub hospitals (Primary, Thrombectomy Capable, or Comprehensive Stroke Centers) for consultation. Local EMS agencies will be notified that an Acute Stroke Ready Hospital has been identified by LERN and is "stroke ready" to receive acute stroke patients as identified by EMS personnel in the field. The intent of this approach is to get the patient to a facility that can provide appropriate acute stroke care as quickly as possible, with efficient and safe administration of thrombolytic treatment at the foundation of care. The facility also needs to be ready to quickly screen patients for the large vessel occlusions, utilizing VAN or other screens, to quickly and efficiently initiate transfer to the Thrombectomy Capable or Comprehensive Centers.

The Chief Executive Officer of any hospital of any size and location, that meets the LERN ASRH criteria (page 5), may sign an attestation that states they meet the LERN requirements. The LERN Tri-Regional Registered Nurse Coordinator will schedule a meeting with hospital administration to discuss and verify key requirements. After two consecutive quarters of data submissions that meet the goal requirements for ASRH, the hospital will then go before the board for designation. If criteria are met, EMS agencies in the area will then be notified that suspected stroke patients might be transported to this facility.

The use of the standardized pre-hospital LERN Stroke Care Guideline and the Stroke Destination Protocol will reduce the time of treatment for patients with acute ischemic strokes who may benefit from thrombolysis by facilitating early identification, communication and delivery of the stroke patient to the closest Acute Stroke Ready Hospital. It will also reduce delays and improve the overall care of other stroke patients who may not qualify for intravenous thrombolysis such as:

- Stroke symptoms with duration more than the institutional window for thrombolytic treatment
- Hemorrhagic strokes
- Patients with completely resolved symptoms suggestive of TIA

What Does this Toolkit Do?

This toolkit will provide medical professionals and hospital administrators the necessary information to improve their hospital's acute stroke care and become an Acute Stroke Ready Hospital in Louisiana. Each hospital is invited to review the information contained in this toolkit and plan its Acute Stroke Ready Hospital implementation.

LERN Acute Stroke Ready Hospital Requirements

Facilities in this category will provide timely access to stroke care but may not be able to meet all the criteria specified in CSC, TSC, PSC and PSC-E guidelines. These centers will provide acute stroke care in urban and rural areas where transportation and access to time-sensitive treatment are limited and are intended to recognize those models of care delivery that have shown utility including "drip-and-ship" and telemedicine. Because the effectiveness of treatment is time-dependent, ASRH centers should not be bypassed to go to a more distant LERN CSC, TSC, PSC-E or PSC Hospital unless 1) the patient is >4.5hr from last seen normal and and <4.5 hours from the times symptoms were noted and the hospital does not have imaging capabilities for determination of lytic, or 2) a screen for large vessel occlusion is positive and it would take <15 additional minutes of transportation time to reach a hospital with endovascular therapy.

Program Concept	Acute Stroke Ready Hospital
Eligibility	General eligibility requirements; use of a standardized method of delivering care centered on evidence-based guidelines for stroke care.
Emergency Department	Physician staffed 24/7: Perform initial ER physician evaluation within 10 minutes of patient arrival
CT Scan	Ability to perform CT on site ≤ 20 minutes of patient arrival and interpret within ≤45 minutes of arrival, 24/7
Labs	Ability to draw and report results of appropriate lab work ≤ 45 minutes of patient arrival 24/7
Neurological Expertise	Access to neurological expertise by phone or telemedicine ≤ 15 minutes of arrival.
Proficiency in delivery of thrombolytic therapy	a. Ensure that the thrombolytic can be delivered within ≤60 minutes from arrival. Documentation of ongoing efforts to reduce the median time from arrival to lytic, in recognition of the new target door-to-needle time of 45min (AHA Target Stroke). b. Timely transfer of appropriate patients for unavailable services, such as endovascular and neurosurgical procedures to an appropriate higher level of care.
Personnel	Emergency Physician
Infrastructure	Emergency Room, If the hospital does not have an ICU then patient transfer should be considered after thrombolytic administration.
Written care protocols and order sets for stroke, including guidelines, algorithms for management of post thrombolytic-related and other hemorrhagic strokes and angioedema, critical care pathways, NIH Stroke Scale training.	
Written documentation of a plan for secondary transfer to CSC, TSC, PSC-E, PSC , or other appropriate facility, if resources deemed necessary are not available at the primary destination site.	
Quality of stroke care demonstrated by submission of required data elements to LERN on a quarterly basis.	
Please note the LERN ASRH requirements are based on the Joint Commission ASRH requirements, but do not include all TJC criteria. TJC has several additional requirements for certification as an Acute Stroke Ready Hospital found at Acute Stroke Ready Hospital | The Joint Commission	

Note:
Post-thrombolytic patients must be transferred to a higher level of care if an Intensive Care Unit, or appropriate monitoring unit, is not available. Transfer agreements with Primary, Thrombectomy Capable and Comprehensive Stroke Centers are important and strongly encouraged. ASRHs are required to have written documentation of a plan for secondary transfer to a CSC, TSC, PSC, or another appropriate facility, if resources deemed necessary are not available at the ASRH.

The following are Louisiana Emergency Response Network contacts for the Louisiana Stroke System. Any questions on planning and operations can be directed to:

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Stroke Medical Director for Louisiana Emergency Response Network (LERN)
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Acute Stroke Ready Hospital Application Process

1) Hospitals wishing to become an Acute Stroke Ready Hospital must have their Chief Executive Officer submit a signed letter attesting to meeting the ASRH requirements.

   Attestation letters may be requested from and returned to:

   Paige B. Hargrove, BSN, RN
   Louisiana Emergency Response Network
   7979 Independence Blvd, Suite 207, B17
   Baton Rouge, LA 70806

   The attestation letter can also be accessed at:
   Hospital Stroke Level (la.gov)

   *Hospitals that obtain certification from the Joint Commission or the Healthcare Facilities Accreditation Program (HFAP) as an Acute Stroke Ready Hospital must submit a copy of the certification. Data submission to LERN **is** required for ASRHs who obtain HFAP certification.

2) Upon receipt of the completed attestation letter, the LERN Tri-Regional Registered Nurse Coordinator will schedule a meeting with hospital administration to discuss and verify key requirements.

3) Upon receipt of 2 consecutive quarters worth of ASRH data that meets the goal requirements, the hospital will be awarded Acute Stroke Ready Status.

4) Data elements identified on pages **20–25 of this toolkit** must be submitted with the initial application (2 quarters meeting goals) and then quarterly to the Louisiana Emergency Response Network.

Medical Treatment and Protocol

EMS Assessment and Management

Emergency Department Initial Evaluation and Treatment

The following are recommended "model" protocols for consideration by EMS agencies and Emergency Departments (ED). They are evidence-based recommendations developed by a panel of EMS and stroke experts. These have been approved by the LERN Board.

LERN PRE-HOSPITAL STROKE CARE GUIDELINE

Our crucial role in caring for stroke victims is geared toward early recognition and appropriate triage. The *Cincinnati Prehospital Stroke Scale* shall be used as a quick stroke screening tool (consider assessment of Balance and Eyes to BE-FAST). The VAN should be utilized to identify patients with high probability of having a stroke due to large vessel occlusion (LVO). The LERN Stroke Destination Protocol should be followed to appropriately triage the patient with suspected stroke from the field. If present, transport bystander/family member to the ED with pertinent medical information.

Standard Medical Care

↓

Supplemental oxygen to maintain SpO_2 > 94%

↓

Assess blood glucose. If < 60mg/dL, give Dextrose containing solution according to your agency's protocol

↓

Do NOT treat hypertension (unless directed by Med Control or receiving physician)

↓

Prehospital Stroke Assessment
Cincinnati Stroke Scale

F – A – S – T
- F – Facial Droop
- A – Arm Drift
- S – Speech
- T – Time Last Seen Normal

If any 1 of these 3 signs is abnormal, the probability of a stroke is 72%

Perform stroke screening exams (CPSS and VAN) and determine LSN

VAN Assessment

Any weakness PLUS any one of the following is considered positive:

Visual disturbance - field cut, double or blind vision
Aphasia – inability to speak or understand
Neglect – gaze to one side or ignoring one side

If the patient is VAN Positive and has a high probability of having LVO.

↓

Transport to closest appropriate Stroke Center based on LERN Stroke Destination Protocol

↓

Position patient supine for transport. If aspiration risk or decreased LOC, elevate head to 30°

↓

Notify receiving Stroke Center as soon as possible for Stroke Activation

- Prior to concluding the Medical Control radio report, identify who will be notifying the receiving ED (EMS or Medical Control).
- Transport to a hospital, based on LERN Stroke Destination Protocol, that has neurological services (on site or remote) and a functional CT scanner, capable of administering thrombolytic. This includes patients who awaken from sleep with neurological deficits and those found with deficits.
- Treat hypotension to improve perfusion as per protocol.
- Treat generalized seizure activity aggressively as per protocol.

Relevant Time Considerations:
- Last Seen Normal (LSN) = the time the patient was last seen or reports being in normal state
- Time Symptoms Noted (TSN) = the time the new symptoms were first noted by patient or witness
- If stroke witnessed or patient awake and able to provide onset, LSN = TSN = Time of Stroke Onset (TSO)
- If stroke unwitnessed and patient is unable to provide onset, LSN is before TSN and TSO is unknown, but sometime between LSN and TSN.

FOR ASSISTANCE WITH TRANSFERS, CALL THE LERN COMMUNICATION CENTER:

1-866-320-8293

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EMS Assessment and Management Guidelines

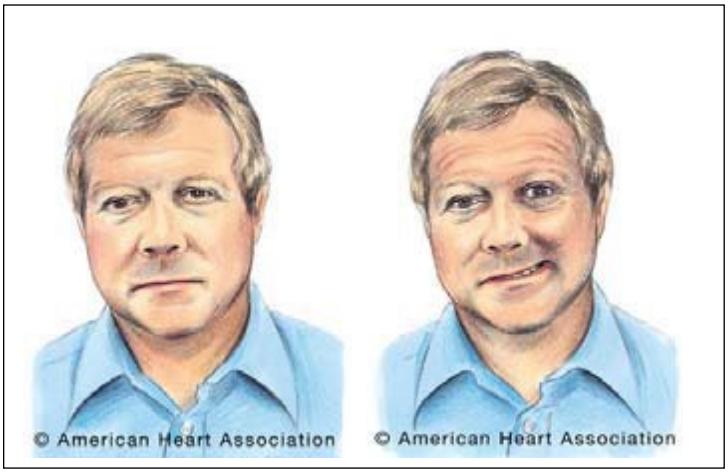
Prompt stroke recognition and treatment by EMS is a critical component of acute stroke care. As an integral part of the Louisiana Stroke System, we strongly encourage EMS to use a standardized pre-hospital treatment protocol for suspected stroke patients. The following model EMS stroke protocol is provided as a guideline.

Step-by-Step Instructions

On the Scene:

1) Manage ABCs (Airway, Breathing, and Circulation). Give oxygen if needed.
2) Perform pre-hospital stroke assessment using the *Cincinnati Stroke Scale*.
    a. Ask about Balance/Dizziness and a change in eyesight to encompass BE of BEFAST
    ***This improves detection of stroke from about 89% to 95%, by improved identification of deficits common in posterior circulation strokes.**

3) **Facial Droop** (have patient smile)
    - **Normal:** Both sides of face move equally



- **Arm Drift** (have patient hold arms out for 10 seconds)
    - **Normal:** Both arms move equally or not at all
    - **Abnormal:** One arm drifts compared to the other, or does not move at all

Patients with 1 of these 3 findings as a new event have a 72% probability of an ischemic stroke. If all 3 findings are present the probability of an acute stroke is more than 85%.

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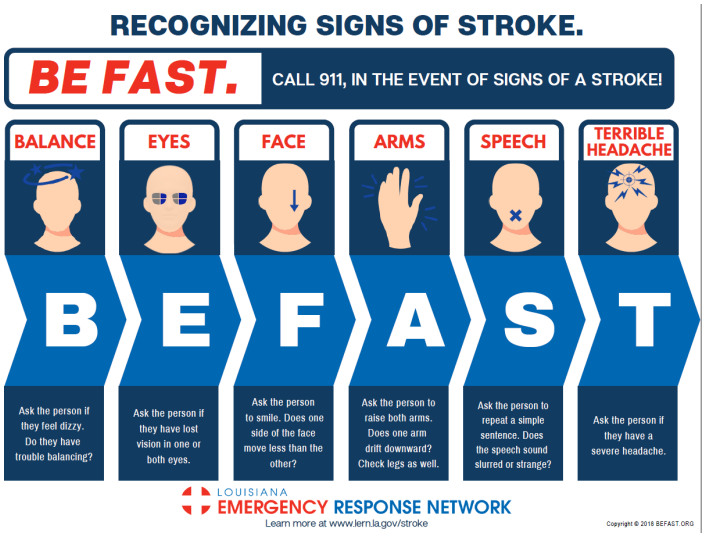
- **Speech** (have patient speak a simple sentence)
  - **Normal:** Patient uses correct words with no slurring
  - **Abnormal:** Slurred or inappropriate words, or mute



3) Perform Pre-Hospital VAN assessment

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Table 1 Vision, aphasia, neglect emergent large vessel occlusion screening tool

Stroke VAN

How weak is the patient? Raise both arms	☐ Mild (minor drift) ☐ Moderate (severe drift - touches or nearly touches ground) ☐ Severe (flaccid or no antigravity) ☐ Patient shows no weakness. Patient is VAN negative

(exceptions are confused or comatose patients with dizziness, focal findings, or no reason for their altered mental status then basilar artery thrombus must be considered; CTA is warranted)

Visual disturbance	☐ Field cut (which side) (4 quadrants) ☐ Double vision (ask patient to look to right then left; evaluate for uneven eyes) ☐ Blind new onset ☐ None
Aphasia	☐ Expressive (inability to speak or paraphasic errors); do not count slurring of words (repeat and name 2 objects) ☐ Receptive (not understanding or following commands) (close eyes, make fist) ☐ Mixed ☐ None
Neglect	☐ Forced gaze or inability to track to one side ☐ Unable to feel both sides at the same time, or unable to identify own arm ☐ Ignoring one side ☐ None

Patient must have weakness plus one or all of the V, A, or N to be VAN positive. VAN positive patients had 100% sensitivity, 90% specificity, positive predictive value 74%, and negative predictive value 100% for detecting large vessel occlusion.
CTA, CT angiography; VAN, vision, aphasia, and neglect.

Source: Teleb MS, Ver Hage A, Carter J, et al.J NeuroIntervent Surg Published Online First: doi:10.1136/ neurintsurg-2015-012131

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4) Establish and record an **exact time** (if possible), in military time, the "Time of Stroke Onset" (TSO), if witnessed. If unknown, establish and record when patient was "Last Seen Normal" (LSN) and the "Time Symptoms Noted" (TSN).

In Transit:

1) Rapidly transport to closest appropriate Stroke Receiving Facility (Comprehensive Stroke Center, Primary Stroke Center or Acute Stroke Ready Hospital), as directed by the LERN Communication Center (LCC number: **1-866-320-8293**), unless the patient is medically unstable.

2) Bring witness or family member if possible, or record the names and phone numbers of witnesses.

3) Alert the receiving emergency department that a suspected stroke patient is en-route, so they can begin to activate their acute stroke team and be ready on arrival. Include time of stroke onset, or last seen normal (if known) and time symptoms noted, as well as, VAN status.

4) Check and record blood glucose to assess for hypoglycemia.

5) Check and record blood pressure. Do NOT administer any hypertensive medication without physician approval.

6) Establish cardiac monitoring and IV access with large bore catheter, if possible.

7) Keep NPO.

8) HOB flat, unless concern for volume overload or protection of airway/secretion management.

9) Bring medications or medication list.

*Photos from http://www.strokecenter.org/trials/scales/cincinnati.html

Physician Acute Stroke Checklist
To Determine thrombolytic Eligibility and Administration

Indications for use of IV Thrombolytic*

- Symptoms suggestive of ischemic stroke that are deemed to be disabling* (regardless of improvement)
- Able to initiate treatment within 4.5 hours of Time Last Seen Normal
- Able to treat within 4.5 hours of symptom detection, when guided by MRI diffusion weighted imaging without completed stroke on FLAIR imaging (unknown LSN time frame)
- Head CT shows no hemorrhage or tumor
- Age ≥18 years

AHA/ASA Contraindications for use:

- CT scan demonstrating intracranial hemorrhage or subarachnoid hemorrhage
- CT exhibits extensive regions of clear hypo attenuation
- Unable to maintain BP SBP <185mmHg or DBP > 110mmHg, despite aggressive treatment
- Ischemic stroke within the last 3 months
- Evidence of active internal bleeding
- Aortic Dissection known or suspected
- Arterial puncture-noncompressible site ≤ 7 days
- Infective endocarditis
- Gastrointestinal bleeding within 21 days or active GI malignancy
- Intracranial or spinal surgery within last 3 months
- Blood glucose <60 mg/dL (however, should treat if stroke symptoms persist after glucose normalized)
- Active bleeding diathesis (including Platelets <100,000, Heparin w/in 48 hrs & elevated aPTT, anticoagulant with PT/INR > 15/1.7, DOAC within last 48hrs)

**** The reason for withholding thrombolytic to all patients with suspected stroke must be concisely documented as this is a CMS Stroke Core Measure.***

Intravenous tPA is a Class I: Level of Evidence A recommendation for patients who have no exclusion and can be treated within three hours of onset. The door-to-needle time should be within 60 minutes.

Intravenous tPA is a Class I: Level of Evidence B recommendation for patients who can be treated within 3-4.5 hours of onset.

*Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. William J. Powers, Alejandro A. Rabinstein, Teri Ackerson, Opeolu M. Adeoye, Nicholas C. Bambakidis, Kyra Becker, José Biller, Michael Brown, Bart M. Demaerschalk, Brian Hoh, Edward C. Jauch, Chelsea S. Kidwell, Thabele M. Leslie-Mazwi, Bruce Ovbiagele, Phillip A. Scott, Kevin N. Sheth, Andrew M. Southerland, Deborah V. Summers, David L. Tirschwell and ...

Complications with thrombolytic

All treatment decisions should be made in collaboration with your facility's neurological expert.

Angioedema

- Angioedema occurs in about 5 percent of cases (higher risk if taking ACE-inhibitor) and typically involves the tongue, lips, or oropharynx. Monitoring after thrombolytic is recommended.

- If angioedema occurs, close monitoring of the airway is necessary. Empiric treatment with intravenous Histamine 2 blocker, antihistamine, and a steroid is recommended for signs of angioedema.

COR IIb	LOE C-EO
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.	
Awake fiberoptic intubation is optimal. Nasal-tracheal intubation may be required but poses risk of epistaxis after IV alteplase. Cricothyroidotomy is rarely needed and also problematic after IV alteplase.	
Discontinue IV alteplase infusion and hold ACE inhibitors	
Administer IV methylprednisolone 125 mg	
Administer IV diphenhydramine 50 mg	
Administer ranitidine 50 mg IV or famotidine 20 mg IV	
If there is further increase in angioedema, administer epinephrine (0.1%) 0.3 mL subcutaneously or by nebulizer 0.5 mL	
Icatibant, a selective bradykinin B_2 receptor antagonist, 3 mL (30 mg) subcutaneously in abdominal area; additional injection of 30 mg may be administered at intervals of 6 h not to exceed a total of 3 injections in 24 h; and plasma-derived C1 esterase inhibitor (20 IU/kg) has been successfully used in hereditary angioedema and ACE inhibitor-related angioedema	
Supportive care	

ACE indicates angiotensin-converting enzyme; AIS, acute ischemic stroke; COR, class of recommendation; IV, intravenous; and LOE, Level of Evidence.

Sources: Foster-Goldman and McCarthy,[147] Gorski and Schmidt,[148] Lewis,[149] Lin et al,[150] Correia et al,[151] O'Carroll and Aguilar,[152] Myslimi et al,[153] and Pahs et al.[154]

* Duymun, S., Reddy, V., Bentley, E., & Bose-Kolanu, A. (2021). Tissue plasminogen activator-induced angioedema involving a posterior cerebral artery infarct: a case presentation. *The American Journal of Case Reports*, *22*, e927137-1.

Reasons to Suspect thrombolytic Related Hemorrhage

- Neurological decline (suggest using mini NIHSS increase of ≥ two points)
- Sudden changes in blood pressure or heart rate
- Decline in level of consciousness
- Seizure
- Nausea/vomiting
- Severe or worsening headache

Post-thrombolytic symptomatic intracranial hemorrhage

Who should get treated?

- Neurological deterioration with parenchymal hemorrhage (PH) thought to be causing or contributing to the acute worsening, within 24hrs of when thrombolytic was administered with anticipated risk for hemorrhage expansion
- Consider treated patients with identified PH who have not demonstrated neurological deterioration, within 24hrs of when thrombolytic was administered when the risk of hemorrhage expansion ishigh
- Consider treating hemorrhage occurring beyond 24hrs of when thrombolyticwas administered, if fibrinogen is low
- The median time from thrombolytic administration to detection of symptomatic intracranial hemorrhages is 8 hours.
- Most are classified as parenchymal hemorrhage type 2 (PH2), which is defined as >30% of the infarcted volume with mass effect OR hemorrhage outside of the area ofinfarct.
- PH2 is associated with worse outcome, including close to 50% mortality
- Cryoprecipitate is considered first-line treatment for post-thrombolytic intracranial hemorrhage, despite low-level data supporting efficacy at preventing further hemorrhage and death
- Tranexamic acid and aminocaproic acid inhibit plasmin, which causes breakdown of fibrin into its split products, thereby halting the action of alteplase. The data to support efficacy of either of these treatments, alone or in combination with cryoprecipitate, is severely limited. One small series of patients treated for post-thrombolytic ICH found no advantage of adjunctive tranexamic acid with cryoprecipitate vs cryoprecipitate alone (n=16). A smaller series demonstrated increased rate of hemostasis with aminocaproic acid combined with cryoprecipitate (n=6).
- If no reversal agent is available, transfusion of 8 units of platelets is reasonable as emergent transfer to a higher-level center is arranged.

Table 6. Management of Symptomatic Intracranial Bleeding Occurring Within 24 Hours After Administration of IV Alteplase for Treatment of AIS

COR IIb	LOE C-EO
Stop alteplase infusion	
CBC, PT (INR), aPTT, fibrinogen level, and type and cross-match	
Emergent nonenhanced head CT	
Cryoprecipitate (includes factor VIII): 10 U infused over 10–30 min (onset in 1 h, peaks in 12 h); administer additional dose for fibrinogen level of <150 mg/dL	
Tranexamic acid 1000 mg IV infused over 10 min OR ε-aminocaproic acid 4–5 g over 1 h, followed by 1 g IV until bleeding is controlled (peak onset in 3 h) (Potential for benefit in all patients, but particularly when blood products are contraindicated or declined by patient/family or if cryoprecipitate is not available in a timely manner.)	
Hematology and neurosurgery consultations	
Supportive therapy, including BP management, ICP, CPP, MAP, temperature, and glucose control	

Check fibrinogen level 30 minutes after infusion. Goal 100-200mg/dL.

AIS indicates acute ischemic stroke; aPTT, activated partial thromboplastin time; BP, blood pressure; CBC, complete blood count; COR, class of recommendation; CPP, cerebral perfusion pressure; CT, computed tomography; ICP, intracranial pressure; INR, international normalized ratio; IV, intravenous; LOE, Level of Evidence; MAP, mean arterial pressure; and PT, prothrombin time.

Sources: Sloan et al,[138] Mahaffey et al,[139] Goldstein et al,[140] French et al,[141] Yaghi et al,[142–144] Stone et al,[145] and Frontera et al.[146]

Intracranial Hemorrhage

All treatment decisions should be made in collaboration with your facility's neurological expert.

Initial Assessment of ICH

- Airway/breathing–low threshold for intubation
- Measure GCS; brainstem reflexes
- Send coagulation profile and platelets
- CT of head without contrast
  - Determine location and volume
  - Identify intraventricular blood or hydrocephalus
- Guidelines recommend SBP 130-150 with a target of 140; achieved with labetalol boluses (10-20mg) for SBP 160-200 and nicardipine infusion for SBP > 200, if available
- If suspicion for ICP or herniation, consider:
  - Head-of-bed elevated at 30°
  - Patient's neck in a neutral position to maximize venous outflow

- Minimizing the patient's agitation and pain
- Hyperventilation
- Hyperosmolar therapies–mannitol and hypertonic saline
- Alert neurosurgery for possible clot evacuation and/or ventriculostomy

*AHA/ASA Guideline for the Management of Spontaneous Intracerebral Hemorrhage. Stroke. 2010;41:2108-2129.

*AHA/ASA Guideline for the Early Management of Patients with Acuth Ischemic Stroke. Stroke. 2103;44:870-947.

2022 Guideline for the Management of Patients With Spontaneous Intracerebral Hemorrhage: A Guideline From the American Heart Association/American Stroke Association
Steven M. Greenberg, Wendy C. Ziai, Charlotte Cordonnier, Dar Dowlatshahi, Brandon Francis, Joshua N. Goldstein, J. Claude Hemphill III, Ronda Johnson, Kiffon M. Keigher, William J. Mack, J. Mocco, Eileena J. Newton, Ilana M. Ruff, Lauren H. Sansing, Sam Schulman, Magdy H. Selim, Kevin N. Sheth, Nikola Sprigg, Katharina S. Sunnerhagen and ... See all authors
Originally published17 May 2022https://doi.org/10.1161/STR.0000000000000407Stroke. 2022;53:e282–e361

Recommendations for Acute BP Lowering (Continued)

COR	LOE	Recommendations
2b	B-R	3. In patients with spontaneous ICH of mild to moderate severity presenting with SBP between 150 and 220 mm Hg, acute lowering of SBP to a target of 140 mm Hg with the goal of maintaining in the range of 130 to 150 mm Hg is safe and may be reasonable for improving functional outcomes.[138,141–147]
2b	C-LD	4. In patients with spontaneous ICH presenting with large or severe ICH or those requiring surgical decompression, the safety and efficacy of intensive BP lowering are not well established.[148]
3: Harm	B-R	5. In patients with spontaneous ICH of mild to moderate severity presenting with SBP >150 mm Hg, acute lowering of SBP to <130 mm Hg is potentially harmful.[146,149,150]

Suggested Methods For Reversal of coagulopathy in ICH

All treatment decisions should be made in collaboration with your facility's neurological expert.

If INR is elevated, consider:

- Give 10mg IV vitamin K (slow infusion)
- Type & Cross for:
  - Prothrombin complex concentrate (PCC) containing Factors II, VII, IX, and X at 30 units/kg
    Or
  - 4 units FFP
    Or
  - Consider activated Factor VII (Novo 7) 40mcg/kg
    - Off-label/compassionate use
    - Must be followed by FFP or INR will increase after a few hours

*AHA/ASA Guideline for the Management of Spontaneous Intracerebral Hemorrhage. Stroke. 2010;41:2108-2129.

5.2.1. Anticoagulant-Related Hemorrhage

Recommendations for Anticoagulant-Related Hemorrhage
Referenced studies that support recommendations are summarized in Data Supplements 18 and 19.

COR	LOE	Recommendations
1	C-LD	1. In patients with anticoagulant-associated spontaneous ICH, anticoagulation should be discontinued immediately and rapid reversal of anticoagulation should be performed as soon as possible after diagnosis of spontaneous ICH to improve survival.[162]
VKAs		
1	B-R	2. In patients with VKA-associated spontaneous ICH and INR ≥2.0, 4-factor (4-F) prothrombin complex concentrate (PCC) is recommended in preference to fresh-frozen plasma (FFP) to achieve rapid correction of INR and limit HE.[163]
1	C-LD	3. In patients with VKA-associated spontaneous ICH, intravenous vitamin K should be administered directly after coagulation factor replacement (PCC or other) to prevent later increase in INR and subsequent HE.[164,165]
2b	C-LD	4. In patients with VKA-associated spontaneous ICH with INR of 1.3 to 1.9, it may be reasonable to use PCC to achieve rapid correction of INR and limit HE.[162,164]
DOACs		
2a	B-NR	5. In patients with direct factor Xa inhibitor–associated spontaneous ICH, andexanet alfa is reasonable to reverse the anticoagulant effect of factor Xa inhibitors.[166,167]
2a	B-NR	6. In patients with dabigatran-associated spontaneous ICH, idarucizumab is reasonable to reverse the anticoagulant effect of dabigatran.[168]

LOUISIANA EMERGENCY RESPONSE NETWORK

Recommendations for Anticoagulant-Related Hemorrhage (Continued)		
COR	**LOE**	**Recommendations**
2b	B-NR	7. In patients with direct factor Xa inhibitor–associated spontaneous ICH, a 4-F PCC or activated PCC (aPCC) may be considered to improve hemostasis.[169–171]
2b	C-LD	8. In patients with dabigatran- or factor Xa inhibitor–associated spontaneous ICH, when the DOAC agent was taken within the previous few hours, activated charcoal may be reasonable to prevent absorption of the DOAC.[172–174]
2b	C-LD	9. In patients with dabigatran-associated spontaneous ICH, when idarucizumab is not available, aPCC or PCCs may be considered to improve hemostasis.[175,176]
2b	C-LD	10. In patients with dabigatran-associated spontaneous ICH, when idarucizumab is not available, renal replacement therapy (RRT) may be considered to reduce dabigatran concentration.[177]
Heparins		
2a	C-LD	11. In patients with unfractionated heparin (UFH)–associated spontaneous ICH, intravenous protamine is reasonable to reverse the anticoagulant effect of heparin.[178]
2b	C-LD	12. In patients with low-molecular-weight heparin (LMWH)–associated spontaneous ICH, intravenous protamine may be considered to partially reverse the anticoagulant effect of heparin.[178]

Suggested Goals for Stroke Care

All treatment decisions should be made in collaboration with your facility's neurological expert.

- Temperature < 37.2°C
- Blood Glucose < 160mg/dl
- HOB
  - Ischemic flat for 24 hours, unless poor control of secretions
  - ICH 30 degrees elevation
- Blood Pressure
  1) During thombolytic and Post thrombolytic < 180/105 x 24 hours
  2) For patients NOT treated with thrombolytic - Permissive HTN up to SBP < 220, DBP <110 (should be individualized)

Guidelines for the Early Management of Patients with Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke: A Guideline for Healthcare Professionals from the American Heart Association/American Stroke Association | Stroke, www.ahajournals.org/doi/10.1161/STR.0000000000000211.

2022 Guideline for the Management of Patients With Spontaneous Intracerebral Hemorrhage: A Guideline From the American Heart Association/American Stroke Association Steven M. Greenberg, Wendy C. Ziai, Charlotte Cordonnier, Dar Dowlatshahi, Brandon Francis, Joshua N. Goldstein, J. Claude Hemphill III, Ronda Johnson, Kiffon M. Keigher, William J. Mack, J. Mocco, Eileena J. Newton, Ilana M. Ruff, Lauren H. Sansing, Sam Schulman, Magdy H. Selim, Kevin N. Sheth, Nikola Sprigg, Katharina S. Sunnerhagen and … See all authors
Originally published17 May 2022https://doi.org/10.1161/STR.0000000000000407Stroke. 2022;53:e282–e361

LOUISIANA EMERGENCY RESPONSE NETWORK

Mini NIH Stroke Scale

For patients receiving thrombolytic, the nurse should perform:

- Neuro checks (GCS and mini-NIHSS) every 15 minutes; notify physician for signs of neurological worsening (decline in GCS or increase in mini-NIHSS by 2 or more points).

	Time of lytic bolus	15 Minutes	30 Minutes	45 Minutes	1 Hour	1 Hour, 15 Minutes	1 Hour, 30 Minutes	1 Hour, 45 Minutes	2 Hours
Time									
BP									
HR									
GCS – eyes									
GCS – verbal									
GCS – motor									
GCS total									
LOC 1a									
LOC 1b									
LOC 1c									
Motor RUE									
Motor LUE									
Motor RLE									
Motor LLE									
Total mini-NIHSS									
Initials									
Intervention ? Y/N*									

1a. **LOC Responsiveness**: The examiner assesses patient's level of alertness and evaluates patient according to the stimuli required to arouse him/her.	0 = Alert; keenly responsive. 1 = Drowsy; arousable by **minor stimulation** 2 = Stuporous; requires **repeated stimulation** to attend, or is obtunded and requires **strong or painful stimulation** to make movements. 3 = Coma; responds only with reflex motor or autonomic effects or totally unresponsive, flaccid, and areflexic.
1b. **LOC Questions:** The patient is asked the month and his/her age. The answer must be correct-there is no partial credit for being close. If intubated, arbitrarily score 1.	0 = Answers **both** questions correctly. 1 = Answers **one** question correctly. 2 = Answers **neither** question correctly.
1c. **LOC Commands:** The patient is asked to open and close the eyes and then to grip and release the non-paretic hand. Demonstration is permitted.	0 = Performs **both** tasks correctly. 1 = Performs **one** task correctly. 2 = Performs **neither** task correctly.
Motor Arm: The limb is placed in the appropriate position: extend the arms (palms down) 45 degrees. Ten second count for arm. **Motor Leg:** The limb is placed at 30°. Five second count for leg. Demonstration is permitted. Each limb is tested in turn, beginning with the non-paretic side.	0 = **No drift**; limbs holds for full count. 1 = **Drift**; drifts before full count; does not hit the bed or other support. 2 = **Some effort against gravity**; limb cannot get to, or maintain position, drifts to bed, but has some effort against gravity. 3 = **No effort against gravity**; limb falls. 4 = **No movement.**

Performance Evaluation and Improvement

Quality Improvement | Educational Resources | Other Resources

Who?

All LERN Acute Stroke Ready Hospitals, Primary, Thrombectomy Capable, and Comprehensive Stroke Centers have reporting requirements to The Joint Commission or other Board-approved credentialing agency as a part of the credentialing and maintenance of certification processes. LERN Stroke Bypass Hospitals have no reporting requirements. All certified stroke centers submit quarterly data on IV lytic performance and LVO transfer efficiency to LERN.

Why?

The primary aim of LERN's stroke system of care efforts is to develop a comprehensive stroke system of care in Louisiana to provide timely access to proven treatments necessary to reduce death and dependency. Your center has attested to LERN Acute Stroke Ready Hospital capability. While Primary, Thrombectomy Capable, and Comprehensive Stroke Centers are held accountable by The Joint Commission or other Board-approved credentialing agency through quarterly reports and on-site reviews, LERN developed a mechanism of confirming that LERN Acute Stroke Ready Hospitals are functioning as Stroke Enabled Centers. The data collected by the Acute Stroke Ready Hospitals provides the LERN Stroke Medical Director with the opportunity to provide direction for improvement, when the need is identified or when assistance is requested. Persons who present with acute stroke deserve the opportunity to receive time-sensitive treatment with intravenous tissue plasminogen activator (IV tPA) or tenecteplase (TNK); IV thrombolysis, which is the foundation of acute stroke care. LERN Acute Stroke Ready Hospitals must demonstrate the timely administration of IV tPA to eligible patients. Further, Acute Stroke Ready Hospitals must recognize and respond to stroke caused by large vessel occlusion in order to gain access to thrombectomy, when appropriate, via rapid transfer to stroke centers with endovascular capability and other needed resources. The data collection requirements focus on the time stamps for evaluation and management of the stroke patient who presents within the first few hours after onset.

What?

Which patients get entered into the spreadsheet?

- All patients who present to your ED with suspected stroke
- DIDO data elements are only for patients who present within 24hrs of LSN or could be within 24 hrs LSN

1) **Hospital Identifier** = Column A
   A unique letter code given to each hospital to anonymously distinguish one hospital's data from another's. For example, hospital A may be "abc" and hospital B may be "bcd". This identifier will be assigned by LERN.

2) **Quarter** = Column B
The quarter of the calendar year in which the data is being reported in the format of Q-YY (e.g., 1-24). Data should be submitted once per quarter.

For patient info:	Submit no later than:	Quarter reported:
January 1 – March 31	April 30	1-YY (e.g., 1-24)
April 1 – June 30	July 31	2-YY (e.g., 2-24)
July 1 – September 30	October 31	3-YY (e.g., 3-24)
October 1 – December 31	January 31	4-YY (e.g., 4-24)

2) **Date** = Column C
The date the patient arrived at the hospital. This should be in the format of Month/Date/Year (e.g., June 10th, 2024 would be 06/10/24).

3) **Patient ID #** = Column D
This shall be a facility-dependent "Dummy ID" so that identifiers can be eliminated from the transferred dataset to LERN. Please use the Hospital Identifier, followed by the quarter, followed by 001. For example, if your hospital identifier is CCC, and it is the 1st quarter of 2024, your first patient's Dummy ID should be: CCC-1-24-001. The next patient would be: CCC-1-24-002, and so on. If you click and hold the left mouse button on the bottom right corner of the cell containing CCC-1-24-001 and drag it down, the patient ID #s will automatically populate. **Do not include patients who experienced an in-hospital stroke. This dataset is designed to reflect your Acute Stroke Ready Hospital's capability of rapidly evaluating patients with suspected stroke who present to your Emergency Department.**

4) **Time Last Seen Normal (LSN)** = Column E
This is the time (military time) that the patient was last seen/known/witnessed to be at his or her normal neurological condition. This time = the time of onset for:

   a. A person who was awake at onset and can provide his or her own history and

   b. A person with witnessed onset.

   If the LSN time is known, enter that time in military format (e.g, 1:35pm would be 13:35). If the LSN time is between 4.5 hours and 24 hours, simply enter ">4.5 hours." If the LSN time is >24 hours, enter ">24 hours". If the LSN time is unknown, leave the cell blank.

5) **Time of Arrival to the Emergency Department Door** = Column F
This is the date and time (military time) that the patient was first acknowledged as being present at the LERN Acute Stroke Ready Hospital. If the patient arrives by ambulance, this is the time the ambulance arrives at the LERN Acute Stroke Ready Hospital. If the patient arrives by private vehicle or as a walk-in, this is the time stamp on the ED triage form. This timestamp should be documented for all patients who present within the first 24 hours of LSN. This timestamp may be left blank for patients arriving >24 hours from LSN.

*If the interval between LSN and arrival to the ED Door is **MORE THAN 4.5 HOURS**, then data elements in columns **G through O** are **not** required for reporting. Collecting this data will assist in determining the proportion of patients who present to the hospital within the "window of opportunity". Knowing the true numerator for tPA treatment and denominator for your population informs of your possible "missed opportunities" and will serve as a key metric for community education to improve the proportion of patients who present within the "window of opportunity" for treatment. Data collection for #1-5 applies to all patients admitted with ICD-10 diagnoses codes of I63.xxx (Acute Ischemic Stroke), I60.xx (Subarachnoid Hemorrhage), I61.x (Intracerebral Hemorrhage), or G45.9 (Transient Ischemic Attack). **Columns P through X are mandatory for all patients who arrive within 24 hours of LSN.***

6) **Time of ED MD Evaluation** = Column G
This is the first documented date and time (military time) which indicates the ED physician had a face-toface encounter with the patient with suspected stroke who presents within the first 3.5 hours after last seen normal. The goal is <10 minutes from the Time of Arrival to the Emergency Department Door. It is ok if another provider documents the ED physician saw the patient.

7) **Time of communication with Neurological Expertise** = Column H
This is the date and time (military time) when a neurological expert is first contacted (in person, by telephone, or by telemedicine) by a physician at the LERN Acute Stroke Ready Hospital to discuss the patient with suspected stroke who presents within the first 3.5 hours after last seen normal. The best practice **goal is <15 minutes** from the Time of Arrival to the Emergency Department Door. A LERN Acute Stroke Ready Hospital may have a neurological expert who prefers to have the CT scan and laboratory findings available prior to the first communication. LERN strongly recommends that LERN Acute Stroke Ready Hospital initiate contact with their neurological expert to inform him or her of the patient with suspected stroke within the first 15 minutes s from the Time of Arrival to the Emergency Department Door and document this time. A follow-up communication with the neurological expert can follow when the CT scan +/- laboratory findings are available. If your ED doc has sufficient experience and expertise AND accepts the role of neurological expert for the purposes of determining thrombolytic and thrombectomy eligibility, then the time of ED doc evaluate would be the same as the time of accessing your neurological expertise.

8) **Credentials of Neurological Expertise** = Column I
Please indicate: Neurologist, Vascular Neurologist, Emergency Medicine Physician, or Other. A drop-down box (pick list) is provided on the electronic data collection tool.

9) **Time of CT Performed** = Column J
This is the date and time (military time) of the time stamp on the baseline CT scan of the head. The **goal is <20 minutes** from Time of Arrival to the Emergency Department Door in at least 50% of patients who present <4.5 hours from LSN.

10) **Time of CT Interpretation** = Column K
This is the date and time (military time) when the interpretation of the baseline CT scan of the head becomes available by whomever is responsible for reading it (on-site or off-site radiologist or neurological expert, provided he or she is credentialed for interpretation of neuroimaging at the center). The **goal is <45 minutes** from the Time of Arrival to the Emergency Department Door for patients with suspected stroke who present within the first 4.5 hours after LSN. Each Acute Stroke Ready Hospital defines who is credentialed to interpret the CT scan via internal hospital by-laws.

11) **Time to Labs Complete** = Column **L**
This is the date and time (military time) when necessary laboratory values are available for patients with suspected stroke who present within the first 3.5 hours after LSN, which may include

platelet count, PT/INR (PTT, when appropriate), and glucose. The **goal is <45 minutes** from the Time of Arrival to the Emergency Department Door. The time documented for labs resulted can be the time of the blood glucose measurement, if this is the only required test for your patient; however, you should insure that you can obtain necessary additional lab tests for the population of patients who require them in order to determine eligibility for IV thrombolytic.

NOTE: The American Heart Association/American Stroke Association has issued this statement in the 2013 Guidelines for the Early Management of Patients With Acute Ischemic Stroke: "Although it is desirable to know the results of these tests before giving intravenous recombinant tissue-type plasminogen activator, fibrinolytic therapy should not be delayed while awaiting the results unless:

a. There is clinical suspicion of a bleeding abnormality or thrombocytopenia,

b. The patient has received heparin or warfarin, or

c. The patient has received other anticoagulants (direct thrombin inhibitors or direct factor Xa inhibitors)."

12) **Time to Thrombolytic Bolus** = Column M

This is the date and time (military time) when the bolus of thrombolytic is pushed IV in the patient with suspected stroke who presents within the first 4.5 hours after last seen normal. The **goal is <60 minutes** from the Time of Arrival to the Emergency Department Door and represents the "Door-to-Needle time". Every minute, up to 2 million brain cells are destroyed during a large artery occlusive stroke. Systematic improvement in the Door-to-Needle time should be a priority for all LERN Stroke Centers. Feedback reports from the LERN Stroke Medical Director will push for efforts to reduce the median door-to-needle time, in recognition of the new **target door-to-needle time of 45min** (AHA Target Stroke).

13) **Reason why patient who presents in less than 4.5 hours of last seen normal (LSN) not treated with thrombolytic** = Column N

The LERN Documentation Tool lists the following pick list to facilitate tracking of this metric:

- Symptoms completely resolved
- Hemorrhage on CT scan
- Unable to treat within 4.5 hours of LSN
- Stroke mimic
- Mild deficits which are not disabling
- Ischemic stroke within 3 months
- Severe head trauma within 3 months
- Recent major trauma, not involving the head within 14 days
- Intracranial or intra-spinal surgery within 3 months
- Recent major surgery within 14 days
- History of ICH
- Suspicion of SAH
- GI malignancy or GI bleed within 21 day
- Platelets <100K
- INR >1.7
- Elevated PTT
- Full anticoagulation (treatment dose of LMWH, thrombin inhibitor, or factor Xa inhibitor; prophylactic doses of LMWH are not a contraindication)

- Active use of GIIb/IIIa inhibitor
- Other known bleeding diathesis
- Infective endocarditis
- Aortic arch dissection
- Intra-axial intracranial neoplasm

If the BP or glucose could not be controlled in time to treat by 4.5 hours, the option of "unable to treat within 4.5 hours of LSN" would cover these scenarios. Stroke mimic would include seizure.

Reason why thrombolytic administration was delayed = Column O

Recognizing that at times there are justifiable reasons for delay in thrombolytic administration causing facilities to miss the 60-minute window, the following pick list has been added:

- Ongoing HTN despite 2 or more IVP or IV drip initiated
- Further dx evaluation to confirm stroke in pt w/ blood glucose <50
- Further dx evaluation to confirm stroke in patients who present with seizure
- Further dx evaluation to confirm stroke in patient who have other major metabolic disorder –
    - Include other major metabolic disorder in comment section
- Management of cardiopulmonary arrest, respiratory failure (requiring intubation), major
- trauma/bleeding event
- Management of other emergent/acute condition – Include other emergent/acute condition in comment section
- Eligibility initially unclear due to timeline evolved after discussion with family/friends
- Eligibility initially unclear due to unclear recent procedure/surgery
- Eligibility initially unclear due to incomplete history
- Initial refusal by patient or family
- Consent delay due to patient wanting to discuss with family/proxy/spiritual guide first
- Consent delay due to inability to contact family/proxy
- Wake-up or Unknown symptom onset requiring additional imaging to determine eligibility
- Difficulty obtaining IV access
- Delayed/missed diagnosis
- Equipment related delay
- Provider wanted additional imaging to confirm stroke before treating (excluding glucose < 50, seizure, or major metabolic disorder)
- Social/Religious beliefs

The following variables should be completed for all patients who present <24 hours from LSN

Mode of arrival = Column P

A drop-down menu allows for selection of private vehicle, ambulance, air ambulance, and unknown.

NIHSS total score = Column Q

The NIHSS exam should be performed by certified examiners on all patients with suspected stroke based on 2018 AHA Guidelines for the Emergency Management of Patients with Acute Ischemic Stroke. The total score, performed prior to thrombolytic, if given, should be recorded.

Was the patient screened for LVO? = Column R

A drop-down menu allows for selection of yes, no, or not applicable (not applicable applies only to symptoms resolved, stroke mimic, hemorrhage).

Method of screening patient for LVO. = Column S

A drop-down menu of check boxes allows for multiple choices including VAN (Visual, Aphasia, Neglect assessment), CT Angiography (CTA), other clinical scale or score (RACE, FAST-ED, CPSS, total NIHSS), and other vascular imaging (MRA, TCD, and/or angiography).

Result of LVO screening = Column T

A drop-down menu of choices LVO Positive and LVO Negative.

Decision Time = Column U

This is the date and time (military time) that the decision to transfer the patient was made for or against emergent transfer for possible thrombectomy for a patient who screen positive for LVO. We want to know how long it took for your site to decide that the patient needed to be transferred.

Ideally, this is within minutes of arrival.

If the patient screened negative for LVO, leave blank (ASRH), even if the patient was transferred for higher level of care.

If the decision was made against transfer for possible thrombectomy, do not include the time of acceptance or time of transfer/departure/door out, even if transferred, and include the reason the patient was determined to not be a candidate for thrombectomy in the Details Column

Transfer Request Time = Column V

Enter the date and time of transfer request in military time or n/a if the patient was not transferred. Leave the field blank if the time cannot be determined. If your site does not have a consistent method for source documentation of the time of transfer request, then this is a target for process improvement.

Ideally, the transfer request will be within minutes of the decision time, for patients who screened positive for LVO and were presumed to be candidates for thrombectomy. We want to know how long it took from the time you decided the patient needed to be transferred until the time you initiated that process.

Acceptance Time = Column W

Enter the date and time (military time) that the receiving hospital agreed to take the transfer. If the LERN Communication Center was used to facilitate acceptance, please indicate this in the Details Column.

If it took so long to get accepted, that the patient was no longer transferred with the intent of offering thrombectomy, leave this blank and indicate the patient could not be transferred in time for thrombectomy in the Details Column.

EMS on Scene Time = Column X

Enter the date and time (military time) that EMS arrived to transfer the patient**. This variable is required only for sites who are active in the remediation process for DIDO.** However, voluntary submission of this information is appreciated, as on scene time is a potential modifiable source for delay.

This is the time that the secondary transfer EMS ground or air ambulance arrived to transfer the patient for thrombectomy to a thrombectomy center.

Transfer time = Column Y

Enter the time the patient left your facility, in military time or n/a if the patient was not transferred.

Reason/s for transfer delay = Column Z

A drop-down check box allows for multiple choices for:

- Management of cardiopulmonary arrest, respiratory failure (requiring intubation), major trauma/bleeding event
- Initial refusal of treatment or transfer by patient or family
- Endovascular eligibility initially unclear due to timeline
- Delayed/missed recognition of LVO due to altered LOC, seizure, other metabolic disorders
- Delayed/missed recognition of LVO due to initial negative VAN screening
- Delay in determination of IR candidacy by accepting facility
- Delay in vascular imaging completion or interpretation
- Delay in your facility initiating transfer
- Delay in finding accepting center independently
- Delay in finding accepting center through LCC
- Bed unavailable at initial requested facility (?add multiple facilities)
- Delay in EMS arrival due to delayed dispatch
- Delay in EMS arrival due to weather conditions
- Delay in EMS arrival due to unit not available
- Social/religious beliefs

Optional field for details of reason/s for transfer delay = Column AA

This is a free text cell which allows you to provide any information you think is helpful in understanding what happened. If additional details are thought to be necessary or add value to understanding your barrier/s to efficient door in-to-door out, this field allows for a free-text description.

If a patient presents within 24 hours of LSN and screens positive for LVO (clinical and/or imaging), but has been ruled out for thrombectomy, please document why the patient is not being transferred for thrombectomy

- Large core infarct on imaging
- No large vessel occlusion identified on imaging
- No ischemic penumbra
- Chronic occlusion not amenable to IR
- Distal occlusion not amenable to IR

Data Submission to LERN

LERN expects to receive quarterly data report including Data Elements 1-5 (Columns A-E) for all patients presenting with suspected stroke and Data Elements 6-12 (Columns F-L) for patients with suspected stroke who presents within the first 4.5 hours after last seen normal. If thrombolyticis given, the time of thromboytic bolus must be documented in Column M. If thrombolytic is not given for a patient with suspected stroke who presents within the first 4.5 hours after last seen normal, a reason must be documented in Column N. For all patients who present within the first 24 hours of last seen normal, the expanded data elements in Columns P-X must be documented. The maximum interval between close of a quarter and receipt of the data is 30 days.

Email the completed data form quarterly to Justin.Schleis3@LA.GOV

Date of end of quarter	Date data report is last acceptable
March 31st	April 30th
June 30th	July 31st
September 30th	October 31st
December 31st	January 31st

How much time is involved in the data collection process?

The data collection (if retrospective) would take a maximum of 20 minutes per case, for patients who present within the first 4.5 hours from last seen normal. For cases only requiring Dummy ID, (those presenting >24hrs LSN), time of last seen normal, and time of Arrival to the Emergency Department Door, each case would take a maximum of 5 minutes.

To get a better estimate of your time commitment:

1. Ask one of your hospital coders to pull a list of all patients with stroke diagnosis codes over the last 3 month period. The ICD-10 diagnoses codes of I63.xxx (Acute Ischemic Stroke), I60.xx (Subarachnoid Hemorrhage), I61.x (Intracerebral Hemorrhage), or G45.9 (Transient Ischemic Attack).
2. Get with the Guidelines (GWTG) estimates of % patients presenting within 3 hrs is <25%. Calculate what 25% of all patients with stroke diagnosis codes would represent. This would be an estimate of total quarterly sample size.
3. Divide that # by 3 (3 cases can be collected per hour) => estimated # hours per quarter devoted to the process of data collection.

Who should be responsible for collecting this data?

This will vary and is to be determined by each hospital. Some facilities assign data collection to the following existing employees:

- Stroke director
- Stroke coordinator
- Quality department
- Emergency department nursing director
- Emergency department clinical supervisor
- Emergency department charge nurse

What are your options if you decline participation?

1) Change attestation to LERN Stroke Bypass Hospital

How can you improve the acquisition of these data elements?

One tip from your LERN Stroke Medical Director is to create a template in the ED medical chart (whether paper or electronic) that includes these timestamp data points and encourage your ED staff (MD and RNs) to document the data points that consume time when collected retrospectively (time last seen normal, time of Arrival of Emergency Department MD, time of communication with Neurological Expertise). The mock code documentation tool can be used in real time to document the timestamps.

https://lern.la.gov/wp-content/uploads/Mock-Stroke-Code-documentation-tool-006.pdf

*****LERN Stroke Data will be accumulated and organized in summary form. LERN will not release any identified data related to a participating hospital. If disseminated, LERN data will be in aggregate form.*****

Data Collection Form

Help with FAQ

LOUISIANA EMERGENCY RESPONSE NETWORK

STROKE DATA POINT ENTRY FORM

Hospital Identifier	Quarter Format: Q-YY e.g., 1-15	Date	Patient ID #	Last Seen Normal (Military Time)	Arrival Time at Door (Military Time)	Arrival of ED Doc (Military Time) (Goal=10 minutes)	Communication with Neurological Expertise (Military Time) (Goal=15 minutes from time of arrival at ED door)	Credential of Neurological Expertise	Time CT Performed (Military Time) (Goal=25 minutes from time of arrival at ED door)	Time CT Interpreted (Military Time) (Goal=45 minutes from time of arrival at ED door)	Time to Completed Labs (Military Time) (Goal=45 minutes from time of arrival at ED door)	Time to Needle (Military Time) (Goal=60 minutes from time of arrival at ED door)	Reason patient LSN <2 hours was not treated with tPA

Each hospital will be issued a unique hospital identifier, which will only be shared with the associated hospital. ALL data will be accumulated and organized in summary form. LERN will not release any identified data related to a participating hospital. To obtain the unique hospital identifier, please contact Justin Schleis at (225) 756-3440.

The data collection tool is located on the LERN website at *http://lern.la.gov/lern-stroke-system/stroke-data-collection/*

Tele-Medicine Contacts (HUB Hospitals)

The following hospitals are providing neurological consultations via tele-medicine or a phone consultation.

1) **Ochsner**
   Todd Mule': 504-703-7255 / tmule@ochsner.org

2) **Our Lady of the Lake**
   Amy Booth: 225-765-6649 / Amy.booth@fmolhs.org

3) **Our Lady of Lourdes**
   Eric Arceneaux: 337-470-4806 / eric.arceneaux@fmolhs.org

4) **LCMC Health**
   Alyana Samai: 504-349-6020 / alyana.samai@LCMChealth.org

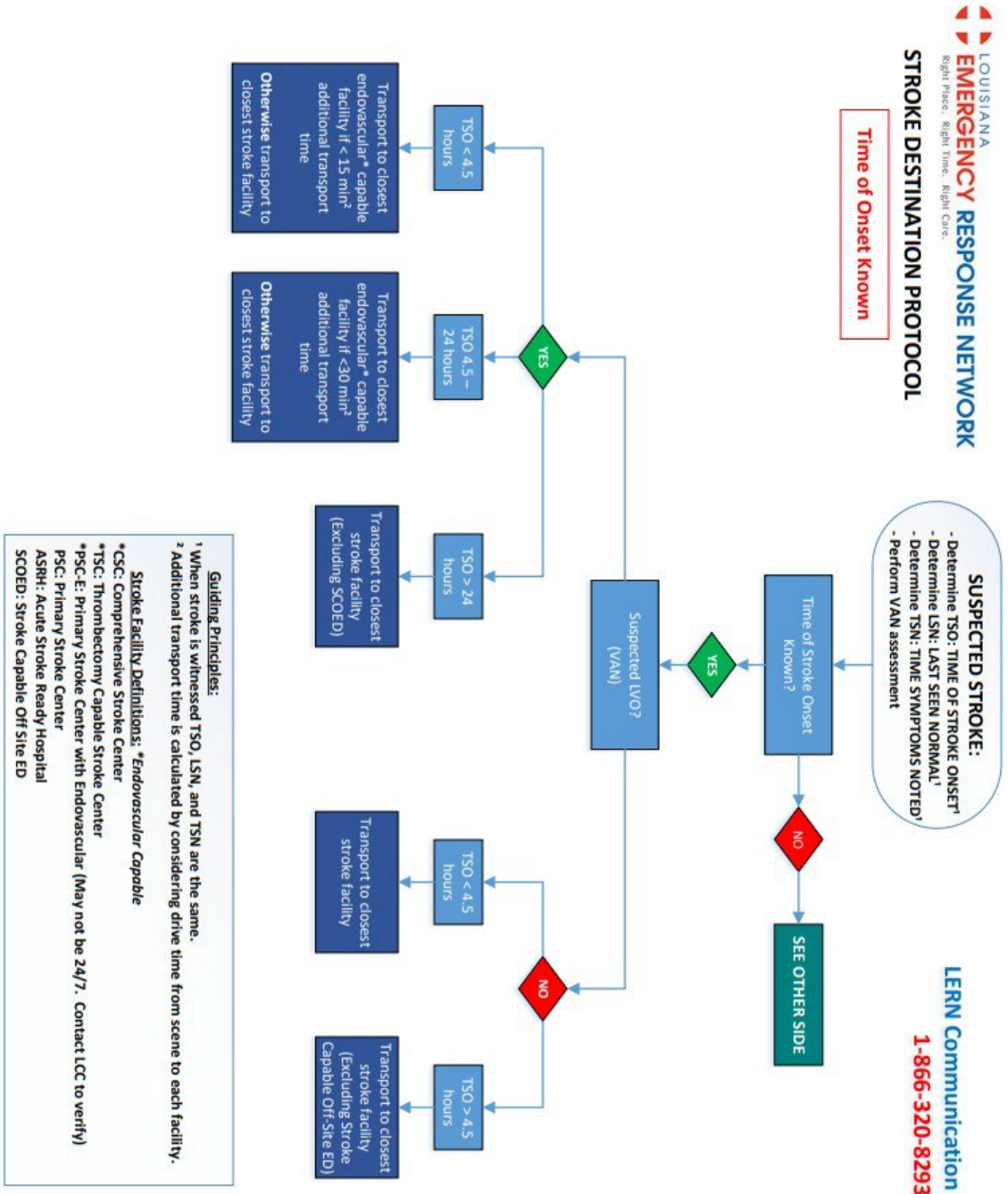
The 10 P's of stroke

Causes, Pathophysiology, Evaluation, and Management Tool

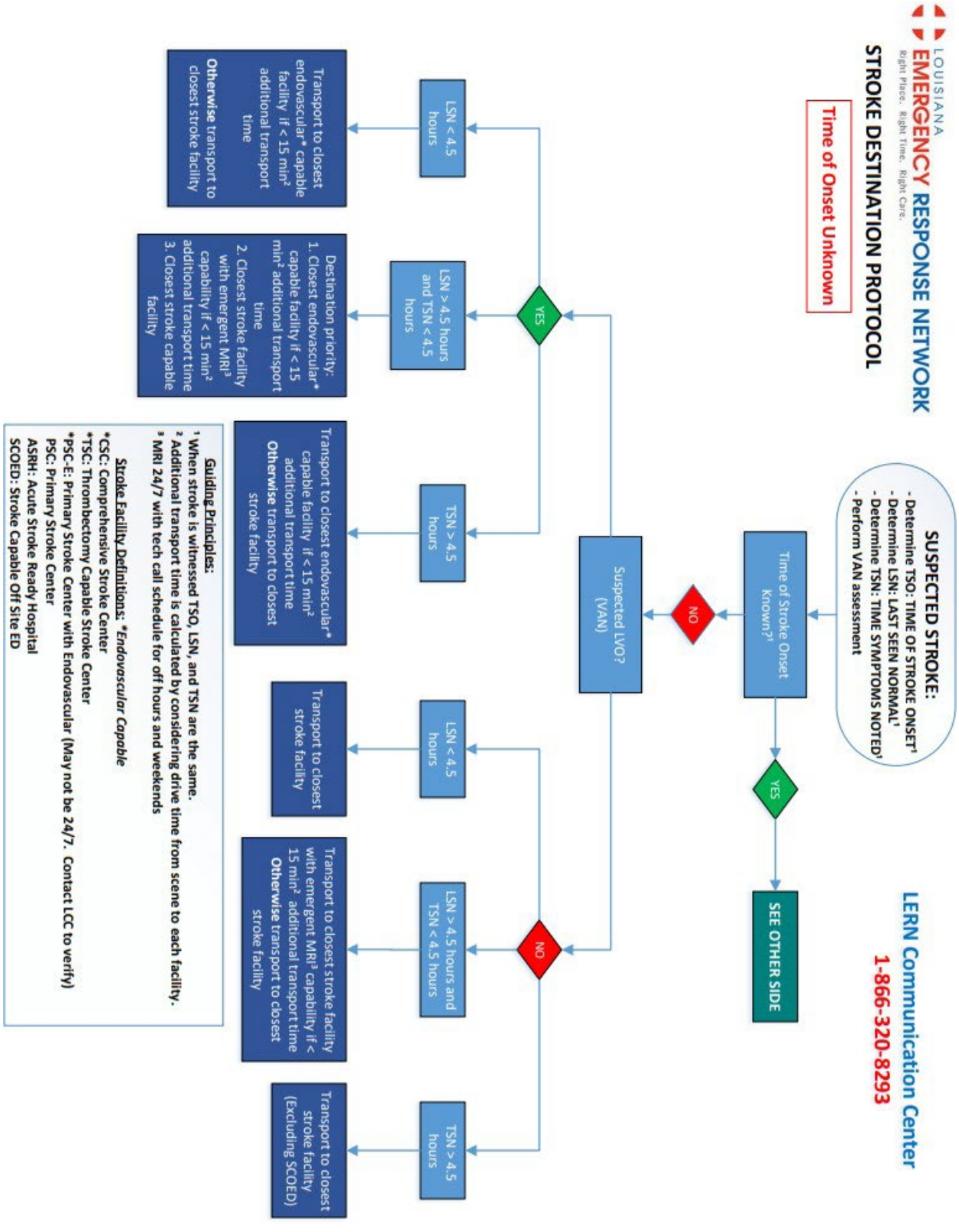
1. Pump	• Abnormal Structure, function, or rhythm can cause or complicate stroke • Work-up will include telemetry and echocardiography
2. Pressure	• High Blood Pressure (BP) is the #1 risk factor for stroke • Pressure or blood reaching the brain = systemic presure = pressure inside of the head
3. Perfusate	• This is blood, which must have sufficient volume, oxygen, and glucose and must not be too viscous or prone to clotting • Lab tests will be ordered
4. Pipes	• Arteries that carry blood to the brain • Can be blocked by clots and plaques, leading to ischemic stroke • Can break, leading to hemorrhagic stroke • Will be assessed by diagnostic tests
5. Plumbing	• Communication of arteries to the brain • If there is good plumbing, the damage from loss of an artery is minimized
6. Perfusion	• The movement of blood through the brain • Diagnostic tests can determine if flow is adequate
7. Parenchyma	• CT and/or MRI scans provide information on ischemic and hemorragic brain injury
8. Penumbra	• Penumbra is the part of the brain that has inadequate flow, but has not yet died • Up to two million brain cells die each minute during stroke
9. Physical rehablilitation and Recovery	• Physical therapy for gait training and strengthening • Occupational therapy for activities of daily living training, fine motor movements, visual issues, and neglect • Speech therapy for production of speech, language, swallowing, and cognition. • Intensive rehab increases the likelihood of going home rather than being institutionalized

10. Prevention	• Behavioral changes and medications to keep:
	  • BP < 120/80
	  • Fasting glucose < 110mg/dl
	  • Antiplatelet or anticoagulant to prevent clotting
	  • No smoking, illicit drugs, or excessive alcohol use

LERN Destination Protocol (Pre-Hospital)



LOUISIANA EMERGENCY RESPONSE NETWORK



LOUISIANA EMERGENCY RESPONSE NETWORK

LERN Transfer Guideline: Stroke

LVO positive = VAN positive and/or vessel imaging demonstrating causal large vessel occlusion

Ischemic stroke

Patient LVO negative or LVO positive received/receiving thrombolytic –>

- Transfer, emergent 911 level, with ALS Unit
- Use the Inter-hospital Post-tPA Transfer Guideline
- Receiving hospital to determine potential for thrombectomy candidacy

Patient LVO positive, no thrombolytic, being transferred for consideration of thrombectomy (LSN <24hours) ->

- Transfer, emergent 911 level, with ALS Unit – every minute matters.
- HOB flat
- Do not treat hypertension
- Treat hypotension for MAP of < 90 or at the discretion of the physician at the receiving hospital
- Maintain oxygen saturation > 94%

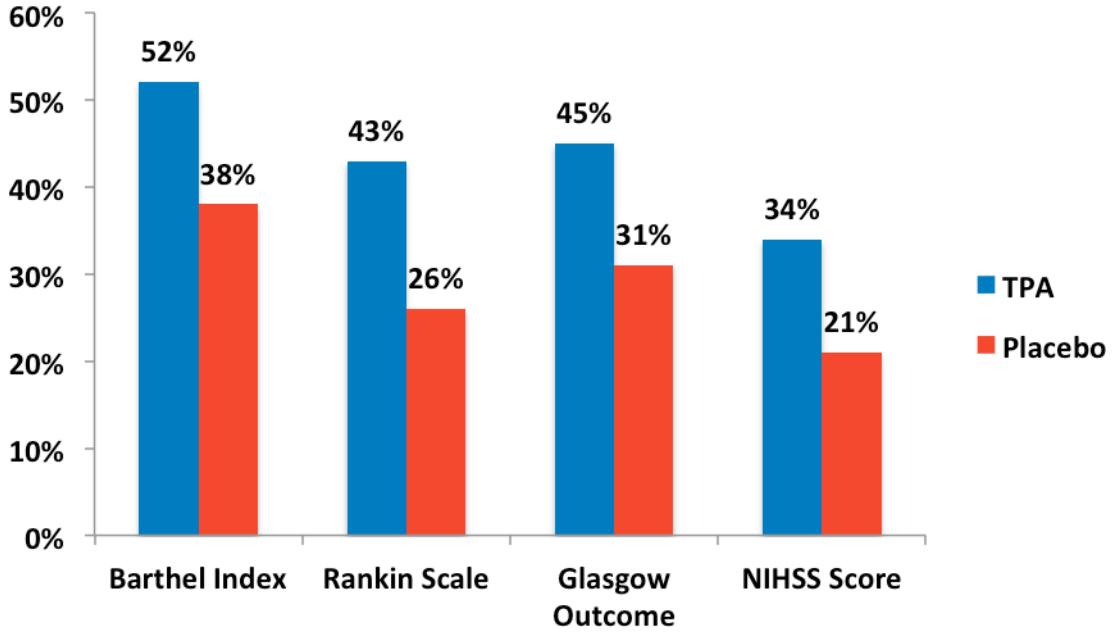
Patient LVO negative, no thrombolytic ->

- Admit per facility capability or Transfer → not a critical 911 level transfer
- HOB flat
- Do not treat hypertension
- Treat hypotension for MAP of < 90 or at the discretion of the physician at the receiving hospital
- Maintain oxygen saturation > 94%

Intracerebral hemorrhage

- Transfer, emergent 911 level, with ALS Unit
- HOB 30 degrees
- Assess the ability to maintain airway and adequate ventilation prior to departure
- Blood pressure should be controlled; SBP 130-150 with a target of 140 prior to departure or at discretion of receiving hospital
- Ensure sufficient quantity of medication is available to maintain BP control during transportation
- Initiate coagulopathy reversal prior to departure, if necessary reversal agent available

NINDS tPA Stroke Trial

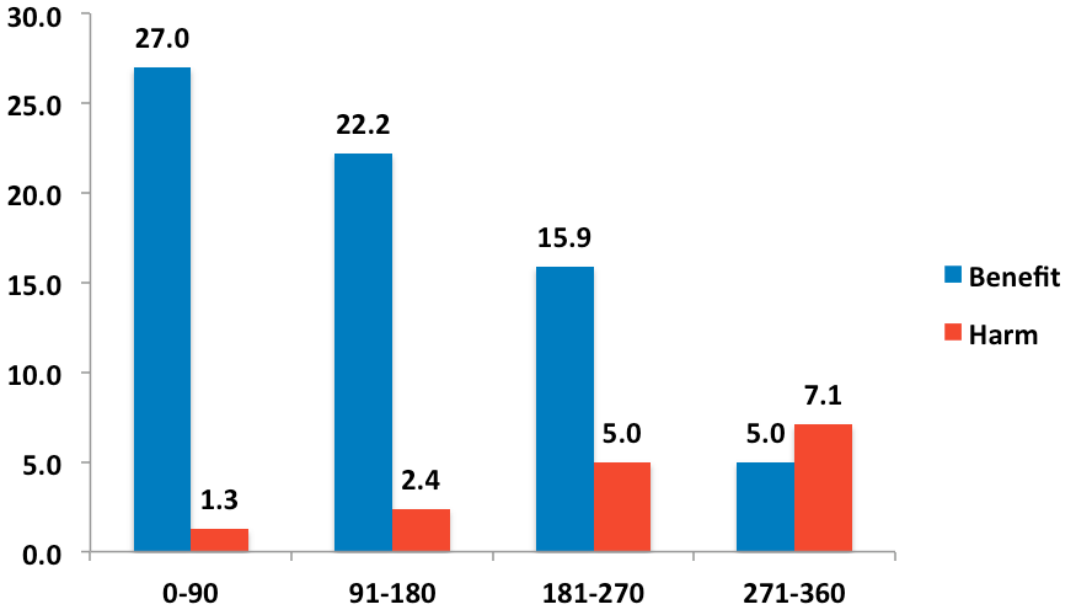


Global outcome statistic: OR = 1.7, 50% v. 38% = 12% benefit

N Engl J Med 1995;333;1581-7

From American Heart Association, Target: Stroke

Number of Patients Who Benefit and Are Harmed per 100 Patients tPA Treated in Each Time Window



Lansberg et al, Stroke 2009

From American Heart Association, Target: Stroke

LOUISIANA EMERGENCY RESPONSE NETWORK

Number Needed to Treat to Benefit from IV tPA Across Full Range of Functional Outcomes

Outcome	NNT
Normal/Near Normal	8.3
Improved	3.1

For every 100 patients treated with tPA,
32 benefit, 3 harmed

Better outcome by 1 or more grades on the mRS

Saver JL et al Stroke 2007; 38:2279-2283

From American Heart Association, Target: Stroke

All the Necessary Components

For timely, but safe and effective, acute ischemic stroke care, the following components are necessary:

- Early identification of a candidate for thrombolysis
- Activation of a stroke team
- Evidence-based, readily assessable, effective protocols
- Rapid ordering, acquisition, and interpretation of brain imaging
- Accurate and rapid physician orders
- Reliable intravenous tPA treatment administration
- Coordinated patient monitoring
- Ongoing assessment
- Accurate time logs for tracking and timely data feedback

From American Heart Association, Target: Stroke

Post-thrombolytic symptomatic intracranial hemorrhage

Who should get treated?

- Neurological deterioration with parenchymal hemorrhage (PH) thought to be causing or contributing to the acute worsening, within 24hrs of when thrombolytic was administered with anticipated risk for hemorrhage expansion
- Consider treated patients with identified PH who have not demonstrated neurological deterioration, within 24hrs of when thrombolytic was administered when the risk of hemorrhage expansion is high
- Consider treating hemorrhage occurring beyond 24hrs of when thrombolytic was administered, if fibrinogen is low
- The median time from thrombolytic administration to detection of symptomatic intracranial hemorrhages is 8 hours.
- Most are classified as parenchymal hemorrhage type 2 (PH2), which is defined as >30% of the infarcted volume with mass effect OR hemorrhage outside of the area of infarct.
- PH2 is associated with worse outcome, including close to 50% mortality

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- Cryoprecipitate is considered first-line treatment for post-thrombolytic intracranial hemorrhage, despite low-level data supporting efficacy at preventing further hemorrhage and death
- Tranexamic acid and aminocaproic acid inhibit plasmin, which causes breakdown of fibrin into its split products, thereby halting the action of alteplase. The data to support efficacy of either of these treatments, alone or in combination with cryoprecipitate, is severely limited. One small series of patients treated for post-thrombolytic ICH found no advantage of adjunctive tranexamic acid with cryoprecipitate vs cryoprecipitate alone (n=16). A smaller series demonstrated increased rate of hemostasis with aminocaproic acid combined with cryoprecipitate (n=6).
- If no reversal agent is available, transfusion of 8 units of platelets is reasonable as emergent transfer to a higher-level center is arranged.

Table 6. Management of Symptomatic Intracranial Bleeding Occurring Within 24 Hours After Administration of IV Alteplase for Treatment of AIS

COR IIb	LOE C-EO
Stop alteplase infusion	
CBC, PT (INR), aPTT, fibrinogen level, and type and cross-match	
Emergent nonenhanced head CT	
Cryoprecipitate (includes factor VIII): 10 U infused over 10–30 min (onset in 1 h, peaks in 12 h); administer additional dose for fibrinogen level of <150 mg/dL Check fibrinogen level 30 minutes after infusion. Goal 100-200mg/dL.	
Tranexamic acid 1000 mg IV infused over 10 min OR ε-aminocaproic acid 4–5 g over 1 h, followed by 1 g IV until bleeding is controlled (peak onset in 3 h) (Potential for benefit in all patients, but particularly when blood products are contraindicated or declined by patient/family or if cryoprecipitate is not available in a timely manner.)	
Hematology and neurosurgery consultations	
Supportive therapy, including BP management, ICP, CPP, MAP, temperature, and glucose control SBP goal should be lowered to <140mmHg.	

AIS indicates acute ischemic stroke; aPTT, activated partial thromboplastin time; BP, blood pressure; CBC, complete blood count; COR, class of recommendation; CPP, cerebral perfusion pressure; CT, computed tomography; ICP, intracranial pressure; INR, international normalized ratio; IV, intravenous; LOE, Level of Evidence; MAP, mean arterial pressure; and PT, prothrombin time.

Sources: Sloan et al,[138] Mahaffey et al,[139] Goldstein et al,[140] French et al,[141] Yaghi et al,[142–144] Stone et al,[145] and Frontera et al.[146]

Spontaneous intracranial hemorrhage

Background

- The most common cause is uncontrolled hypertension.
- Most hemorrhage expansion occurs in the first 6 hours and is associated with worse outcome. Hemorrhagic expansion can be prevented by controlling blood pressure
- CTA head should be considered to identify patients at risk of hematoma expansion and to evaluate for underlying vascular malformations, particularly if lobar or involving brainstem or cerebellum; post contrast CT scan may identify a slowly expanding hemorrhage or underlying brain tumor.
- If patient is deteriorating, **do NOT** keep HOB flat for advanced imaging.

Determine severity with ICH Score:

Intracerebral Haemorrhage

ICH Score (Hemphill et al.)

Feature	Finding	Points
GCS	3-4	2
	5-12	1
	13-15	0
Age	>=80	1
	<80	0
Location	Infratentorial	1
	Supratentorial	0
ICH volume	>=30cc	1
	<30cc	0
Intraventricular Blood	Yes	1
	No	0
ICH SCORE		0-6 points

ICH Score	30 Day Mortality
0	0%
1	13%
2	26%
3	72%
4	97%
5	100%
6	100%

Recommendations:

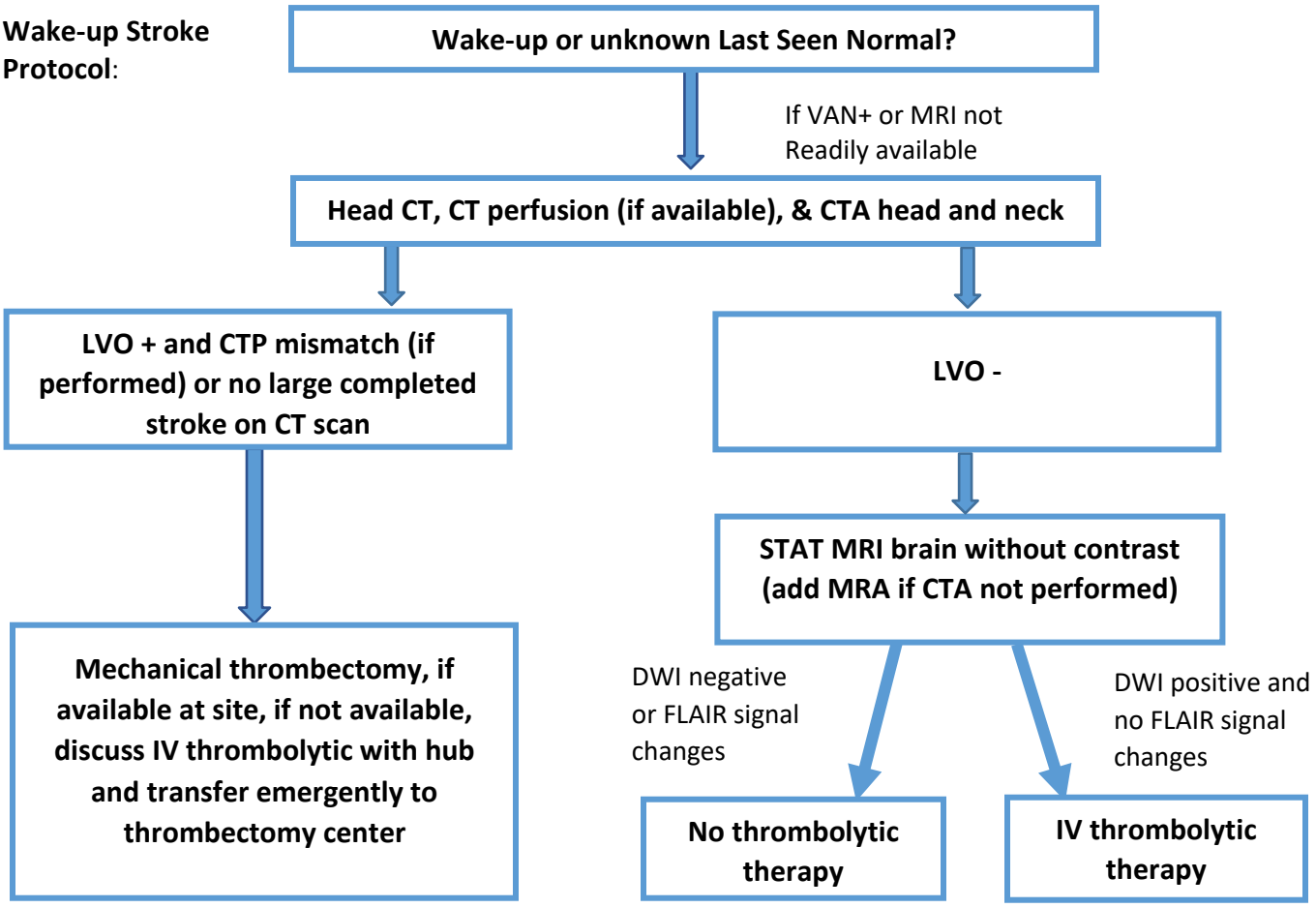
- Please defer to anticoagulant-associated Intracranial Hemorrhage for patients taking an anticoagulant.
  - Outside of patients with ICH going to surgery, there is no defined role for platelet transfusion in patients taking antiplatelet prior to ICH
- For most patients, reduce SBP to 130-140mmHg, to reduce hemorrhagic expansion and mortality; if transferred, ensure BP has reached target before sending
  - AHA Guidelines do not specify the antihypertensive to use, but IV nicardipine is the most frequently used medication in modern clinical trials; other options include labetalol (if not bradycardic), clevidipine, hydralazine (if bradycardic), enalapril
- HOB elevated to 30 degrees; do not leave HOB flat for prolonged imaging or during transfer
- Prophylactic antiseizure medication is not recommended
- Treatment of glucose <60mg/dL is recommended; if >180mg/dL, it is reasonable.
- Cardiac monitoring for at least 24hrs
- Frequent neurocheck and vital signs
  - 0-6 hours from symptom detection – every 30 minutes
  - 6-24 hours from symptom detection – every 1 hour
  - >24 hours and blood pressure not at goal or worsening exam – every 1 hour
  - >24 hours and blood pressure at goal – every 4 hours, in neurologically stable patient
- Consult with neurology and/or neurosurgery for determination of neurosurgical intervention
- Repeat head CT without contrast, if neurological deterioration occurs

WAKE-UP / UNKNOWN SYMPTOM ONSET STROKE GUIDELINE

Background

- About 20% of strokes are detected upon awakening. Historically, these patients were excluded from treatment with IV lytic due to being "out of the window" from last seen normal.
- Radiographic studies of patients with wake-up strokes support the onset is likely shortly upon awakening.
- A randomized controlled study demonstrated efficacy of IV lytic (alteplase) in improving the odds of an independent outcome when selected by MRI of the brain, performed within 4.5 hours of symptom detection. The number needed to treat was nine. The symptomatic hemorrhage rate was only 2.4%.
- Since 2019, our AHA/ASA Guidelines for the Emergency Management of Acute Ischemic Stroke issued a Class 11a, level of evidence B recommendation for IV alteplase (0.9mg/kg, maximum dose 90mg) within 4.5 hours of symptom detection for patients who have MRI confirmation of DWI lesion less than one-third of the MCA territory and no visible signal change on FLAIR. This applies to patients who are found with stroke symptoms whose last seen normal is more than 4.5 hours prior.

Wake-up Stroke Protocol:

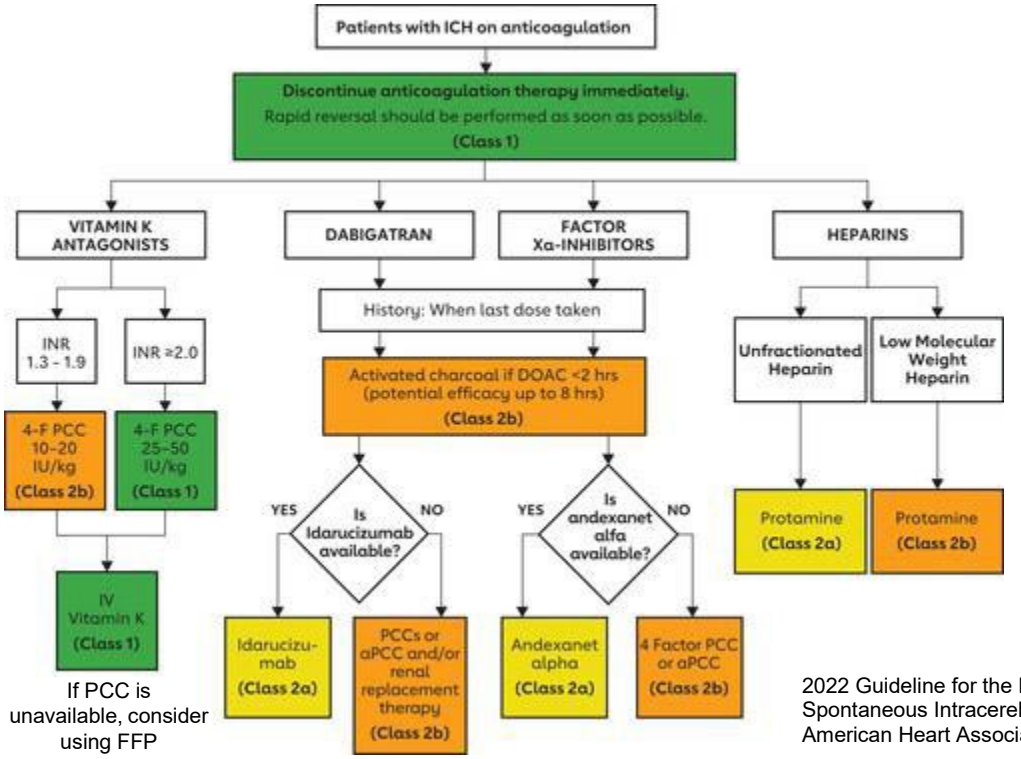


- If your center does not have CT perfusion imaging and the patient has LVO, emergently transfer to a thrombectomy center.
- If your center does not have emergent MRI capability and the patient does not have LVO, emergently transfer to closest hospital with MRI capability, if feasible within 4.5 hours of symptom detection.

Anticoagulant-associated intracranial hemorrhage

Background

- Most hemorrhage expansion occurs in the first 6 hours and is associated with worse outcome. Hemorrhagic expansion can be prevented by controlling blood pressure and emergent reversal of anticoagulation.
- CTA head should be considered to identify patients at risk of hematoma expansion and to evaluate for underlying vascular malformations, particularly if lobar or involving brainstem or cerebellum; post contrast CT scan may identify a slowly expanding hemorrhage or underlying brain tumor.
- If patient is deteriorating, **do NOT** keep HOB flat for advanced imaging.



If PCC is unavailable, consider using FFP

2022 Guideline for the Management of Patients With Spontaneous Intracerebral Hemorrhage: A Guideline From the American Heart Association/American Stroke Association

Recommendations:

- For most patients, reduce SBP to 130-140mmHg, to reduce hemorrhagic expansion and mortality; if transferred, ensure BP has reached target before sending
    - AHA Guidelines do not specify the antihypertensive to use, but IV nicardipine is the most frequently used medication in modern clinical trials; other options include labetalol (if not bradycardic), clevidipine, hydralazine (if bradycardic), enalapril
- HOB elevated to 30 degrees; do not leave HOB flat for prolonged imaging or during transfer
- Frequent neurocheck and vital signs
    - 0-6 hours from symptom detection – every 30 minutes
    - 6-24 hours from symptom detection – every 1 hour
    - >24 hours and blood pressure not at goal or worsening exam – every 1 hour
    - >24 hours and blood pressure at goal – every 4 hours, in neurologically stable patient
- Consult with neurology and/or neurosurgery for determination of neurosurgical intervention
- Document the severity of the ICH with the ICH score (refer to Spontaneous intracranial hemorrhage)
- Prophylactic antiseizure medication is not recommended
- Treatment of glucose <60mg/dL is recommended; if >180mg/dL, it is reasonable.
- Cardiac monitoring for at least 24hrs