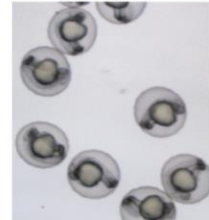


Acute Stroke Management in the Emergency Department

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UAB MEDICINE



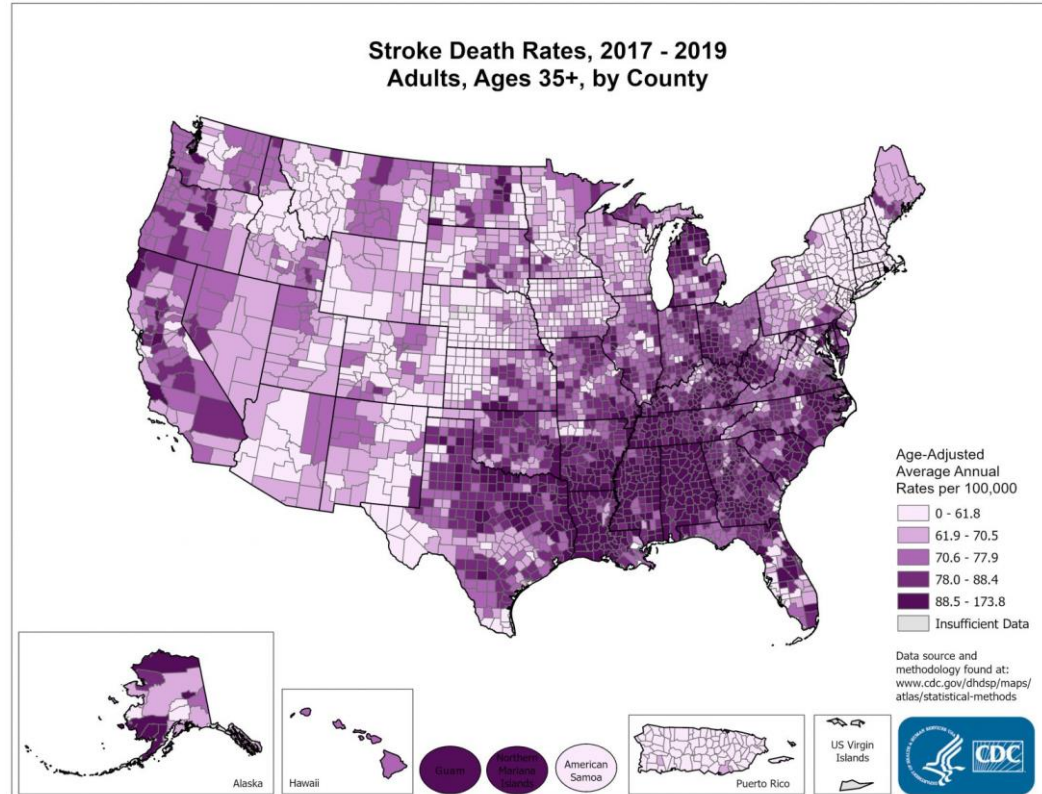
Outline

- The Burden of Cerebrovascular Disease
- Prehospital Care
- Initial ED Evaluation and Telestroke
- IV Thrombolytics for Ischemic Stroke
- Endovascular Thrombectomy for Ischemic Stroke
- Intracerebral Hemorrhage Management
- Resources

The Burden of Cerebrovascular Disease in the US

The Burden of Stroke

- 5th leading cause of death in the United States
- 800,000 acute strokes annually
 - 600,000 First Time Strokes
 - 200,000 Recurrent Strokes



www.cdc.gov

Systems of Stroke Care

- In an effort to improve access to stroke care in the United States, hospitals can be designated as Acute Stroke Ready Hospitals (ASR), Primary Stroke Centers (PSC), Thrombectomy-Capable Stroke Centers (TSC), or Comprehensive Stroke Centers (CSC)
- UAB serves as a tertiary level facility for stroke care in Alabama and was the first hospital in the state with Comprehensive Stroke Center status
 - 24/7 Vascular Neurology and Neurosurgery Coverage
 - Neurocritical Care Services
 - Endovascular Capabilities

Prehospital Care for Stroke Patients

Access into the Stroke System

- Stroke Chain of Survival
 - Detection: Patient or bystander recognition of stroke signs and symptoms
 - Dispatch: Immediate activation of 9-1-1 and priority EMS dispatch
 - Delivery: Prompt triage and transport to the most appropriate stroke hospital and prehospital notification
 - Door: Immediate ED triage to a high acuity area
 - Data: Prompt ED evaluation, stroke team activation, laboratory studies, and brain imaging
 - Decision: Diagnosis and determination of most appropriate therapy; discussion with patient and family
 - Drug/Device: Administration of appropriate drugs or other interventions
 - Disposition: Timely admission to a stroke unit, ICU, or transfer

EMS Transport

- In the Birmingham region, EMS (BREMSS) will route potential stroke patients to stroke capable hospitals
- EMS will typically start IV access, assess glucose levels, and may start isotonic fluids
- Patients will be kept NPO and antithrombotics will not be given en route



Prehospital Notification

- Prehospital notification using the Emergency Medical Stroke Assessment (EMSA) will be used for patients routed to UAB

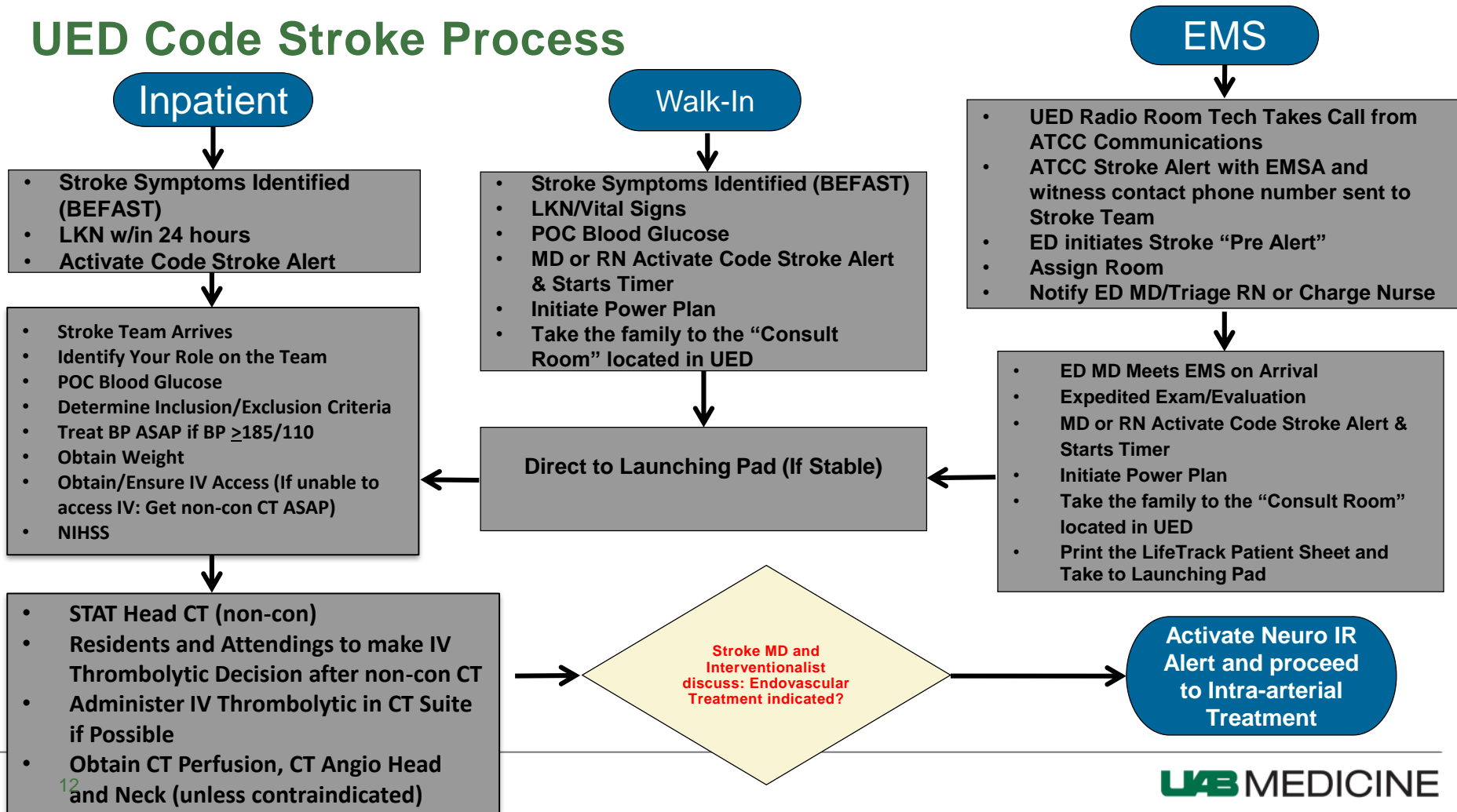
Emergency Medical Stroke Assessment (EMSA)		
	Abnormal?	Points if abnormal
E : Eye Movement		
Score 1 point if abnormal		
Horizontal Gaze Ask patient to keep their head still and follow your finger left to right with their eyes In aphasic patients, call the patient's name on one side and then the other Abnormal: Patient is unable to follow as well in one direction compared to the other	<input type="checkbox"/>	1
M: Motor – Asymmetric Face, Arm, or Leg Weakness		
Score 1 point for each abnormal element		
Facial Weakness Ask patient to show their teeth or smile In aphasic patients, look for asymmetric grimace to pain Abnormal: One side of the face does not move as well as the other	<input type="checkbox"/>	1
Arm Weakness Ask patient to hold out both arms, palms up, for 10 seconds with eyes closed In aphasic patients, hold the patients arms up and let go Abnormal: One arm does not move or drifts down compared to the other	<input type="checkbox"/>	1
Leg Weakness Ask patient to lift up one leg and then the other for 5 seconds In aphasic patients, hold up one leg and let go, then repeat on the other side Abnormal: One leg does not move or drifts down compared to the other	<input type="checkbox"/>	1
SA : Slurred Speech or Aphasia		
Score 1 point for each abnormal element		
Naming Ask patient to name your watch and pen Abnormal: Patient slurs words, says the wrong words, or is unable to speak	<input type="checkbox"/>	1
Repetition Ask patient to repeat "They heard him speak on the radio last night" after you Abnormal: Patient slurs words, says the wrong words, or is unable to speak	<input type="checkbox"/>	1
Total Points:		

Emergency Department Evaluation and Telestroke

Acute Stroke Care at UAB

- UED: Patients presenting by EMS or private vehicle with symptoms of acute stroke will be taken directly to Stroke Launch Pad (next to CT suite)
- HED/GFED: Patients presenting by EMS or private vehicle with symptoms of acute stroke will be taken directly to ED room
- The ED charge nurse and physician will be notified with a goal door-to-physician time of <10 minutes
- Nursing will obtain IV access and transport patient to CT
- Patient needs to be kept NPO until a bedside dysphagia screen is performed

UED Code Stroke Process

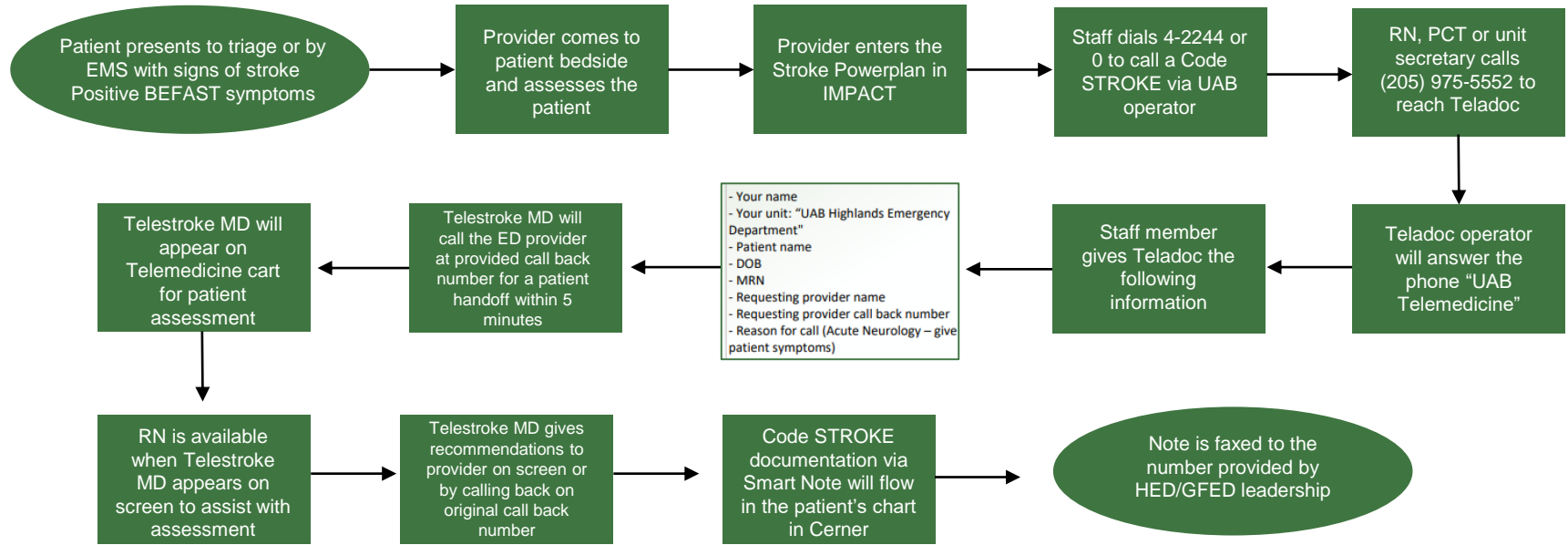


UED Stroke Launch Pad

- Located next to the UED CT suite
- Weighing capable stretcher
- Will help expedite patients through the code stroke process and decrease DTN (Door to Needle) times



HED/GFED Code Stroke Process



IMPORTANT PHONE NUMBERS

Teladoc
(205) 975-5552

Teladoc Technical Assistance (24/7)
(877) 484-9119

Head of Bed Positioning

- Typically, ischemic stroke patients are kept with their head of bed flat initially although there is inconsistent data to support this practice.
- For patients who are hypotensive, the head of bed should be placed flat and saline (0.9%) should be given to optimize cerebral perfusion.
- Patients at risk for airway obstruction/aspiration and those with suspected elevated intracranial pressure should have their head of bed elevated to 15 – 30°

Initial Evaluation

- Ensure medical stability
- Pertinent history
 - Time of onset/last seen normal
 - Medical history including history of stroke, vascular risk factors, recent surgeries or procedures, and recent bleeding
 - Medication list: anticoagulants, antiplatelets, diabetes medications, antiepileptics, and CNS altering medications
- Focused physical and neurologic exam
- Laboratory studies
- Imaging
- Treatment decision

Neurologic Exam

- EMSA should be done in triage
- ED Providers should perform a brief exam to determine if focal neurologic deficits are present
- The Stroke team will perform a more detailed exam using the NIH Stroke Scale
- All providers of acute stroke care should have some familiarity with this scale

National Institutes of Health Stroke Scale	
1a. Level of consciousness	0 = Alert; keenly responsive 1 = Not alert, but arousable by minor stimulation 2 = Not alert; requires repeated stimulation 3 = Unresponsive or responds only with reflex
1b. Level of consciousness questions: What is the month? What is your age?	0 = Answers two questions correctly 1 = Answers one question correctly 2 = Answers neither question correctly
1c. Level of consciousness commands: Open and close your eyes. Grip and release your hand.	0 = Performs both tasks correctly 1 = Performs one task correctly 2 = Performs neither task correctly
2. Best gaze	0 = Normal 1 = Partial gaze palsy 2 = Forced deviation
3. Visual	0 = No visual loss 1 = Partial hemianopia 2 = Complete hemianopia 3 = Bilateral hemianopia
4. Facial palsy	0 = Normal symmetric movements 1 = Minor paralysis 2 = Partial paralysis 3 = Complete paralysis of one or both sides
5. Motor arm 5a. Left arm 5b. Right arm	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity; limb falls 4 = No movement
6. Motor leg 6a. Left leg 6b. Right leg	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity 4 = No movement
7. Limb ataxia	0 = Absent 1 = Present in one limb 2 = Present in two limbs
8. Sensory	0 = Normal; no sensory loss 1 = Mild-to-moderate sensory loss 2 = Severe to total sensory loss
9. Best language	0 = No aphasia; normal 1 = Mild to moderate aphasia 2 = Severe aphasia 3 = Mute, global aphasia
10. Dysarthria	0 = Normal 1 = Mild to moderate dysarthria 2 = Severe dysarthria
11. Extinction and inattention	0 = No abnormality 1 = Visual, tactile, auditory, spatial, or personal inattention 2 = Profound hemi-inattention or extinction

Total score = 0-42.

The 5 D's of Posterior Circulation Strokes

- The NIH Stroke Scale does not always identify posterior circulation strokes
- Remembering the 5 D's can be helpful in identifying potential posterior circulation strokes
 - Dizziness
 - Diplopia
 - Dysarthria
 - Dysphagia
 - Dystaxia – Walk the patient to assess for disability due to ataxia!
- Unlike anterior circulation strokes, strokes affecting the brainstem are not stereotyped and can be easily missed

Disabling Deficits

- NIHSS is the best tool to assess and identify a possible stroke, but it does not capture all stroke symptoms and the impact of disability.
- Each patient may have a different perspective of disability depending on their baseline functioning, hobbies performed, type of work, etc.
- Determining disabling deficits will help determine the need for treatment.
- Consider asking the following questions:
 - Will the stroke impact how you perform your regular activities and hobbies?
 - Do you think you will be able to return to work as normal with how you are now?
 - Are you left or right-handed?
 - Do you consider your symptoms disabling?

Starting the Work Up

- Use the Stroke Powerplan “UED Stroke” to get basic orders entered including
 - IV Fluids
 - Non-contrast CT Head
 - CT Angiogram Head and Neck
 - CT Perfusion
 - Labs (BMP, CBC, Coagulation Profile, Cardiac Markers)
 - Point of Care INR may be used for any ischemic or hemorrhagic stroke patient to help determine and expedite treatment
 - EKG
 - CXR

Activating a Code Stroke

- UED:
 - For patients who present with symptoms of acute stroke with symptom onset within the past 6 hours, activate a **code stroke** by calling the operator (“0” or “4-2244”)
 - For patients who present with symptoms of acute stroke with symptom onset within the past 6 – 24 hours or as a drip and ship from an outside hospital, activate a **code stroke extended**
- GFED and HED:
 - For patients who present with symptoms of acute stroke with symptom onset within the past 24 hours activate a **code stroke**
 - Telestroke will respond at these 2 sites, however the code stroke page is needed to ensure that radiology, lab, and pharmacy are aware



Nurses can activate a Code Stroke for +BEFAST within the 24 hours of symptom onset

Activating a Code Stroke

- The code stroke page comes to all neurology residents, stroke attendings and APPs, stroke coordinators, radiology, pharmacy, and CPF
- A member of the stroke team should arrive within 5 – 10 minutes
- Calling a Code Stroke does not mean IV thrombolytic eligibility
- Some patients may be candidates for mechanical thrombectomy even if they have exclusions to IV thrombolytic
- **When in doubt, activate a code stroke**

Telestroke

- UAB Highlands ED and the Gardendale FED are covered by the UAB eMedicine stroke service (aka “telestroke”)
- This service is staffed 24/7 by a Vascular Neurologist
- Provider activates a code stroke and the stroke powerplan in Cerner (including consult to eMed Stroke)
- A staff member activates telestroke by calling (205) 975-5552. The call will go to the telemedicine call center who will answer as “UAB Telemedicine.” The staff member will provide the patient details to the call center who then notifies the on call stroke specialist/neurologist.
- The neurologist will call the requesting physician within 5 minutes to receive a warm handoff of the patient and can make initial recommendations about the need for advanced imaging (CT Angiography or Perfusion).
- As a back up, UAB MIST operators (4-MIST or 4-6478) can page the on-call telestroke attending in the event that there is not a call back.

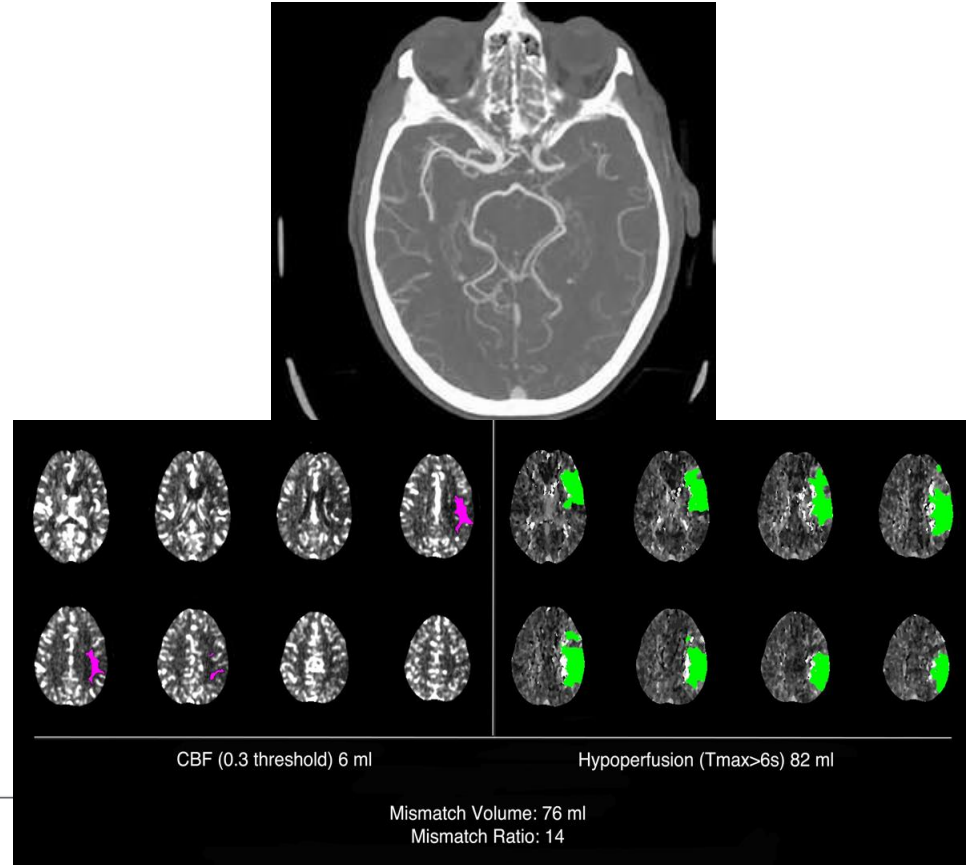
CT Scan

- Does not rule in an ischemic stroke
- Used to rule out a hemorrhage
- Priority should be given to stabilizing the patient and moving to CT as soon as possible (Door-to-CT goal is 20 minutes)



CT Angiography and CT Perfusion

- CTA allows for quick visualization of the major cervical and cerebral vessels
- CTP is a valuable tool to identify patients with large vessel occlusions who may benefit from mechanical thrombectomy



Intravenous Thrombolytics for Ischemic Stroke

Acute Ischemic Stroke Treatment Decisions

- After reviewing the patient's history, exam, lab studies, and CT, treatment options can be reviewed with the patient
- Tenecteplase is a thrombolytic medication for acute ischemic stroke for use up to 3 hours from symptom onset but can be considered in select patients up to 4.5 hours
- UAB uses Tenecteplase as the thrombolytic of choice. Patients coming from OSH (“drip & ship”) may be receiving or have received Alteplase

Indications for IV thrombolytics

- Disabling deficits thought to be vascular in nature
- Non-contrasted CT head without evidence of hemorrhage
- Onset to Needle < 4.5 hours

Absolute Contraindications to IV thrombolytics

- Evidence of hemorrhage on baseline CT
- Previous allergic reaction to a thrombolytic
- Uncontrolled hypertension at the time of treatment (>185/110)
 - This may be treated with IV antihypertensives and the patient may be offered treatment once below 185/110
- Active internal bleeding
- Any intracranial or spinal surgery or serious head trauma
- Acute bleeding diathesis
 - Current use of oral anticoagulants with PT >15 sec or INR >1.7
 - Use of direct thrombin inhibitors or Factor Xa inhibitors within the last 48 hours
 - Administration of unfractionated heparin or LMWH with elevated PTT or Anti Xa level
 - Platelet count >100,000/mm³
- Arterial puncture at a noncompressible site in the previous seven days
- CT demonstrates multilobar infarction (hypodensity >1/3 cerebral hemisphere)
- Acute Aortic Dissection

Novel Anticoagulants

- All patients should be directly questioned about the use of these novel anticoagulants in addition to Coumadin
- Many patients may consider aspirin and clopidogrel (Plavix) as “blood thinners”, so direct questions on types of medications is helpful

Pradaxa[®]
dabigatran etexilate
CAPSULES

 **Xarelto**
rivaroxaban

 *Eliquis*[®]
apixaban

Relative Contraindications

- The risk of hemorrhage may be increased with these conditions and the anticipated benefits for each individual should be weighed against the potential risks.
 - Patients with non-disabling or rapidly improving symptoms
 - Pregnancy
 - Lumbar puncture within 10 days
 - INR 1.4 – 1.7
 - Recent myocardial infarction within 3 months
 - Recent subarachnoid or intracranial hemorrhage
 - Previous stroke within the past 3 months
 - Major surgery or serious trauma within 14 days
 - Recent GI or GU bleeding within 21 days
 - Known untreated intracranial neoplasm, aneurysm, or vascular malformation
 - Blood Glucose <50 mg/dL or >400 mg/dL

Additional Relative Exclusion Criteria for Patients treated between 3 and 4.5 hours

- Based on data from extended window trials, these additional factors may be considered exclusionary but should be assessed on a case by case basis:
 - Age >80
 - NIHSS >25
 - Prior history of stroke and diabetes mellitus
 - Oral anticoagulant use regardless of INR

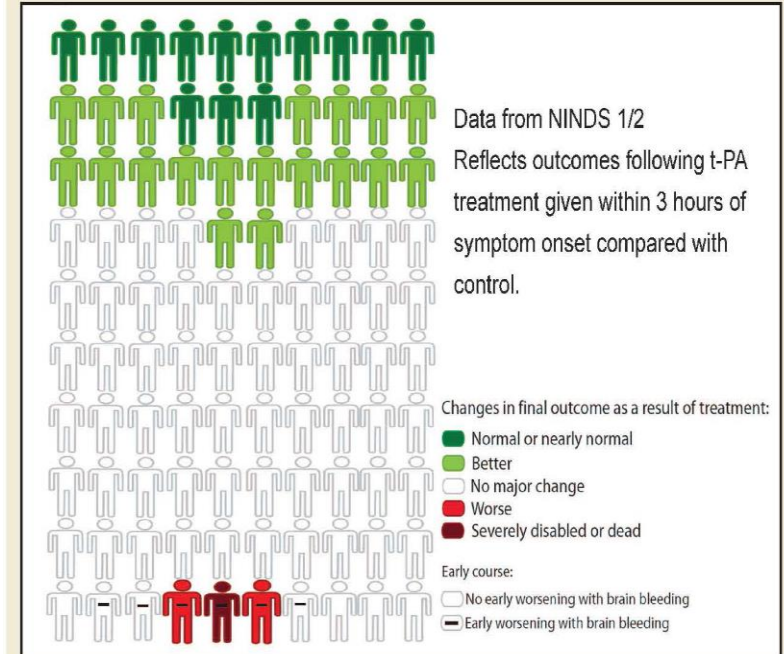
IV thrombolytic Decision Making

- The decision to administer Tenecteplase is a joint decision between the stroke team and the emergency department team
- The ED and Stroke Attendings should briefly discuss the risks and benefits of treatment and be in agreement before the medication is given

Tenecteplase Consent

- Consent cards are available in the Code Stroke boxes to assist in the verbiage of consent based off of research trial statistics
- Verbal consent should be obtained for all patients
 - Should include a discussion of risks, benefits, and treatment alternatives
 - Risk of intracerebral hemorrhage is typically quoted at 6% but may be higher in patients with more severe strokes
 - Benefits are estimated that patients are 30% more likely to have minimal or no neurologic deficit at three months

Figure. Change in Stroke Outcomes with t-PA



Outcomes reflected following t-PA treatment given within 3 hours of symptom onset.

SOURCE: UCLA Resource: <http://stroke.ucla.edu/workfiles/VDA-for-TPA.pdf>

Tenecteplase Dose

- 0.25 mg/kg (maximum dose 25 mg)
- Given as a one time bolus over 5 seconds
- Reconstitute with 10mL of SWFI (included in kit) → swirl vial for ~1 min → Withdraw appropriate dose based on patient's weight in kg
- Flush with 10mL NS → Tenecteplase bolus → Flush with 10mL NS
- **NOTE:** Tenecteplase dosing for ischemic stroke is not the same as it is for acute myocardial infarction or pulmonary thromboembolism



Tenecteplase Dose

Tenecteplase for Acute Ischemic Stroke			
Dose is 0.25 mg/kg (rounded to nearest 1 mg) Final concentration of tenecteplase vial is 5 mg/mL			
Patient Wt (kg)	Tenecteplase (mg)	Volume to be administered (mL)	Volume to waste (mL)
30-33	8	1.6	8.4
34-37	9	1.8	8.2
38-41	10	2	8
42-45	11	2.2	7.8
46-49	12	2.4	7.6
50-53	13	2.6	7.4
54-57	14	2.8	7.2
58-61	15	3	7
62-65	16	3.2	6.8
66-69	17	3.4	6.6
70-73	18	3.6	6.4
74-77	19	3.8	6.2
78-81	20	4	6
82-85	21	4.2	5.8
86-89	22	4.4	5.6
90-93	23	4.6	5.4
94-97	24	4.8	5.2
greater than or equal to 98	25	5	5

Tenecteplase Administration



- Before the drug can be given...
 - Make sure that the patient has two peripheral IVs (18 gauge preferred)
 - If the patient is going to need a Foley, this should be placed prior to the Tenecteplase bolus, but should not delay administration
 - Ensure that the patient's blood pressure is below 185/110
 - Nicardipine, Clevidipine, or Labetalol can be used
 - The blood pressure cuff should be placed on the arm opposite from the arm where Tenecteplase is administered

Post Tenecteplase Management

- Maintain blood pressure <180/105
- The patient will require frequent vital sign checks and neuro assessments:
 - Every 15 minutes for the first two hours from the administration time, then
 - Every 30 minutes for 6 hours, then
 - Every hour for 16 hours, then
 - At a minimum every 4 hours thereafter
- No anticoagulants or antiplatelet agents can be given for the first 24 hours after infusion
 - This includes prophylactic doses of heparin or enoxaparin
- Avoid nasogastric tubes, invasive procedures, IM injections, or unnecessary blood draws for the first 24 hours following infusion

What to Watch For

- Deterioration in Neurologic Status
- Decrease in Level of Consciousness
- Nausea and Vomiting
- New Headache
- Any Bleeding (gingival bleeding, ecchymoses, hemoptysis, hematemesis)
- Abdominal/Flank Pain
- Shortness of Breath
- Arrhythmias
- Facial/Oropharyngeal Edema

Complications

- Neurological Deterioration
 - This may be due to worsening of the existing stroke, hemorrhagic conversion of the stroke, or seizure
 - If there is any suspicion for hemorrhage, order a stat CT scan and notify the stroke team



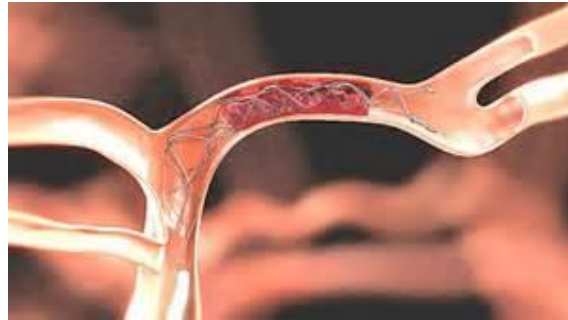
Complications

- Oropharyngeal Edema
 - Seen in less than 5% of patients
 - If mild, may be treated with diphenhydramine, methylprednisolone, and/or epinephrine
 - Severe cases may lead to respiratory distress, in which case intubation should be considered

Endovascular Thrombectomy for Ischemic Stroke

Intra-arterial Therapy for Stroke

- Select stroke patients may be eligible for intra-arterial (IA) reperfusion therapies
- Several clinical trials emerged since late 2014 showing benefit of Intra-arterial therapy for selected stroke patients with large vessel occlusions (LVO) up to 24 hours after onset (time last known well)



Stent Retriever Trials

Study	Total N	Window From LKW (hours)	% Rx tPA	Brain Imaging Selection	% mRS \leq 2 MT group	Increase in % mRS \leq 2	NNT for mRS \leq 2
MR CLEAN	500	< 6	89	CT no bleed	33	14	7.1
ESCAPE	315	< 12	76	ASPECTS 6-10 Mod-good collaterals	53	24	4.2
REVASCAT	206	< 6	73	ASPECTS 7-10 CT APECTS 6-10 MRI	44	16	6.3
SWIFT PRIME	196	< 6	100	Penumbra imaging Small-mod core	60	25	4.0
EXTEND-IA	70	< 6	100	CTP mismatch	72	33	3.0
DAWN	206	6-24	9	DWI or CTP core	49	36	2.8
DEFUSE 3	182	6-16	10	Penumbra imaging	45	28	3.6

From 2015 AHA Recommendations for IA Therapy

- Patients eligible for IV thrombolytics should still receive this therapy even if endovascular therapies are being considered
 - It is not necessary to observe patients after IV thrombolytics to see if they improve before proceeding with endovascular therapy
- Endovascular therapy should be offered to patients with the following criteria (Class I, Level A evidence)
 - Pre-stroke mRS 0-1
 - Causative occlusion of the ICA or proximal MCA (M1)
 - Age \geq 18
 - NIHSS \geq 6
 - Groin puncture within 6 hours of symptom onset

2018 Guidelines Update on Late Window ET

- In selected patients with AIS within 6 to 16 hours of last known normal who have LVO in the anterior circulation and meet other DAWN or DEFUSE 3 eligibility criteria, mechanical thrombectomy is recommended. (I, A)
- In selected patients with AIS within 6 to 24 hours of last known normal who have LVO in the anterior circulation and meet other DAWN eligibility criteria, mechanical thrombectomy is reasonable. (IIa, B-R)

Transition from UED to HVC

- The patient should not be taken up to HVC unless 2 people are able to stay with the patient until the HVC team arrives.
- UED RNs need to call or give verbal report to the HVC RN prior to taking the patient up to HVC.

Intracerebral Hemorrhage Management

ICH Management

- The initial triage and management process of a hemorrhage patient does not differ from an ischemic stroke patient.
- Once a hemorrhage has been diagnosed, the head of the bed should be placed at 30° and the patient should be monitored closely for signs/symptoms of increased intracranial pressure.
- Avoid use of antithrombotics

ICH Management

- Blood Pressure
 - The BP target for an ICH patient has not been well established however current recommendations are to try to maintain SBP between 130-150
 - IV Nicardipine, Clevidipine, or Labetalol may be used
- Coagulopathy
 - Correct if INR is 1.4 or greater due to warfarin.
 - Reversal of novel anticoagulants will be considered on a case-by-case basis.
 - May use point-of-care INR in UED to expedite treatment.
- Patients with a GCS score of <8, those with clinical evidence of herniation, or those with significant intraventricular hemorrhage or hydrocephalus will be considered for external ventricular drain or ICP monitoring and may require neurosurgery or neurointerventional treatment.

Resources

The Neurology Team

- A neurology resident is in-house at all time to evaluate acute stroke patients
 - Should be called for patients with Ischemic Stroke, TIA, and Primary Intracerebral Hemorrhage
- A stroke attending is on call at all times to review cases and will be involved in treatment decisions for all acute stroke cases
- A different stroke attending is also always on call for the UAB emedicine stroke service
- Treatment decisions will be a collaborative effort between the emergency room and stroke teams

The Endovascular and Neurosurgery Teams

- The Endovascular Team
 - A Neurointerventionalist is on call at UAB at all times as well as a dedicated cath lab team

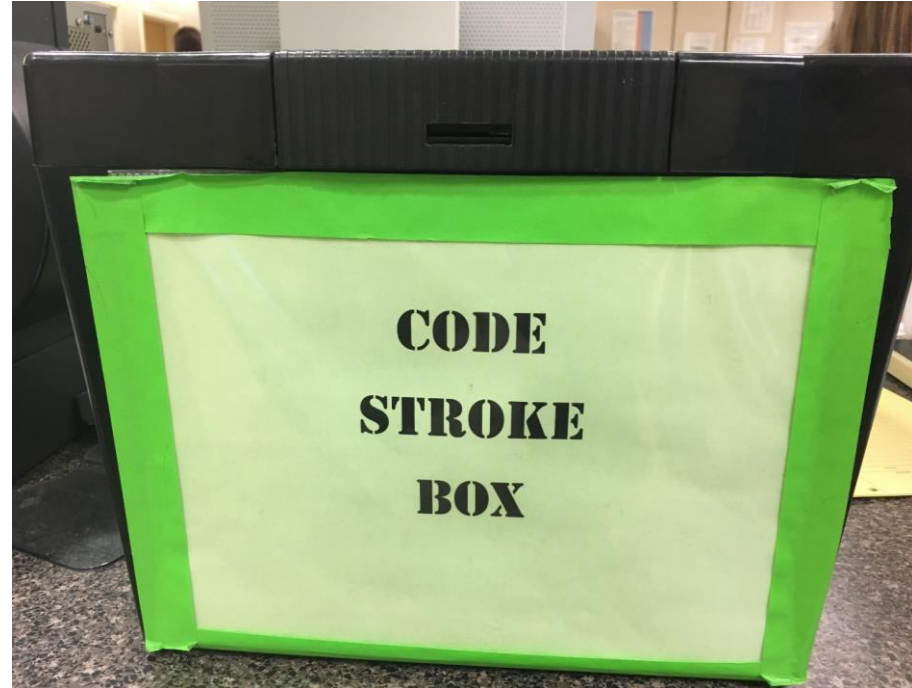
- The Neurosurgery Team
 - A neurosurgery resident is in-house at all times and is available to consult on intracerebral, epidural, subdural, and subarachnoid hemorrhages
 - A vascular neurosurgery attending is on call at all times as well

Stroke Guidelines

- Acute Ischemic Stroke
- Intravenous Administration of Tenecteplase for Acute Ischemic Stroke
- Primary Intracerebral Hemorrhage
- Aneurysmal Subarachnoid Hemorrhage
- Intra-Arterial Treatment of Acute Ischemic Stroke
- Revised guidelines for acute stroke management are available on the SCR and Compliance 360 website

Code Stroke Boxes

- What is in the Code Stroke boxes?
 - Code Stroke and Neuro IR Alert flowcharts
 - Stroke Guidelines
 - NIH Stroke Scale
 - Tenecteplase Resources
 - Mixing instructions
 - Dosing cards/charts
 - Post-assessment checklists and instructions
 - Nicardipine and Clevidipine tip sheets
 - Code Stroke lab labels



UAB Hospital Stroke Program Coordinators

- Please contact one of our Stroke Program Coordinators if you have additional questions or educational needs regarding stroke care at UAB or Comprehensive Stroke Center certification.
 - Karen Thompson: kathompson@uabmc.edu
 - Danielle Taylor: dkaylor@uabmc.edu
 - Tonya Reid (Telestroke Coordinator): tmanfre@uabmc.edu