RBC FIRE AND EMS STROKE

American Heart Association | American Stroke Association

Together to End Stroke™

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ABOUT STROKE

STROKE FACTS

- A stroke is a medical emergency! Stroke occurs when blood flow is either cut off or is reduced, depriving the brain of blood and oxygen
- Approximately 795,000 strokes occur in the US each year
- Stroke is the fifth leading cause of death in the US
- Stroke is a leading cause of adult disability
- On average, every 40 seconds, someone in the United States has a stroke
- Over 4 million stroke survivors are in the US
- The indirect and direct cost of stroke: $38.6 billion annually (2009)
- Crosses all ethnic, racial and socioeconomic groups
- At 6 months 45 % functionally dependent

Berry, Jarett D., et al. Heart Disease and Stroke Statistics --2013 Update: A Report from the American Heart Association. *Circulation.* 127, 2013.

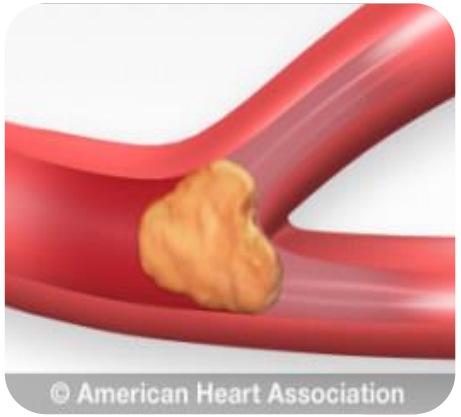
DIFFERENT TYPES OF STROKE

Hemorrhagic Stroke

- About 13% of strokes are caused by a hemorrhage
  - Caused by a breakage in a blood vessel within the brain
- Can be the result of trauma or a ruptured aneurysm
- There are two types of hemorrhagic stroke:
  - Intraparenchymal (within the brain tissue, sometimes referred to as intracerebral) Hemorrhage: A blood vessel bursts leaking blood into the brain tissue
  - Subarachnoid Hemorrhage: Occurs when a blood vessel bursts near the surface of the brain and blood pours into the area outside of the brain, between the brain and the skull

Berry, Jarett D., et al. Heart Disease and Stroke Statistics --2013 Update: A Report from the American Heart Association. *Circulation.* 127, 2013.
http://www.strokeassociation.org/STROKEORG/AboutStroke/TypesofStroke/HemorrhagicBleeds/Hemorrhagic-Strokes-Bleeds_UCM_310940_Article.jsp

DIFFERENT TYPES OF STROKE



Ischemic Stroke

- Caused by a blockage in an artery stopping normal blood and oxygen flow to the brain
- 87% of strokes are ischemic
- There are two types of ischemic strokes:
  - **Embolism:** Blood clot or plaque fragment from elsewhere in the body gets lodged in the brain
  - **Thrombosis:** Blood clot formed in an artery that provides blood to the brain

Berry, Jarett D., et al. Heart Disease and Stroke Statistics --2013 Update: A Report from the American Heart Association. *Circulation.* 127, 2013.
http://www.strokeassociation.org/STROKEORG/AboutStroke/TypesofStroke/IschemicClots/Ischemic-Strokes-Clots_UCM_310939_Article.jsp

DIFFERENT TYPES OF STROKE

Transient Ischemic Attack (TIA)

- A TIA or **Transient Ischemic Attack** produces stroke-like symptoms
- TIA is caused by a clot; but unlike a stroke, the blockage is temporary and usually causes no permanent damage to the brain
- Approximately 15% of all strokes occur after a TIA. **TIA is a medical emergency!**

STROKE RISK FACTORS

Controllable Risk Factors	Non-Controllable Risk Factors
High Blood Pressure	Age
High Cholesterol	Gender
Diabetes	Race
Tobacco Use	Family History
Alcohol Use	Previous Stroke or TIA
Physical Inactivity	
Obesity	
Heart Disease	
Atrial Fibrillation	

http://www.strokeassociation.org/STROKEORG/AboutStroke/UnderstandingRisk/Understanding-Stroke-Risk_UCM_308539_SubHomePage.jsp

BRAIN AREAS AND RELATED FUNCTIONS[1-5]

Clot location impacts symptoms based on associated neuroanatomy[3]

Frontal lobe[1,2]

- Control of mood, emotions, and thought
- Conveys emotion in speech, facial expressions, and gestures

Parietal lobe[1,2]

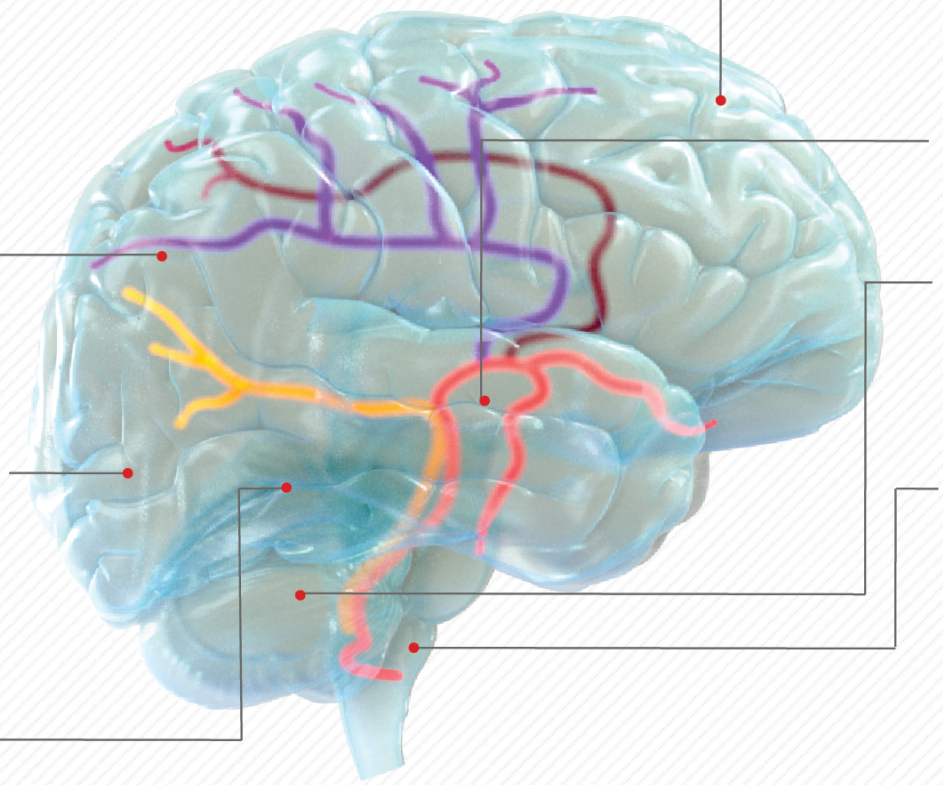
- Sensory perception

Occipital lobe[1]

- Occipitoparietal cortices mediate verbal and nonverbal material for immediate visual memory
- Occipitotemporal regions are used in object and facial recognition

Insula[1]

- Language processing and function



Temporal lobe[1,2]

- Emotional modulation of memories
- Fear conditioning
- May store long-term autobiographical memory

Cerebellum[1]

- Refines force and timing of movement
- Contributes to coordinated stepping

Brain stem[1,2,4,5]

- Balance and locomotion
  - Initiation and speed of locomotion
  - Postural tone
  - Modulation of muscle-generated force

Anterior cerebral artery (ACA)

Posterior cerebral artery (PCA)

Vertebrobasilar cerebral system

Middle cerebral artery (MCA)

References: 1. Goetz CG. *Textbook of Clinical Neurology*. 2007. **2.** Llinas R. *Stroke*. 2007. **3.** Martin-Schild S. *Ann Emerg Med*. 2001;42-45. **4.** MedlinePlus website. https:/medlineplus.gov/ency/imagepages/18007.htm. **5.** Snell RS. *Clinical Neuroanatomy*. 2010.

COMMON STROKE SYMPTOMS

Right Hemispheric Stroke

- Slurred speech - dysarthria
- Weakness or numbness of left face, arm or leg
- Left sided neglect
- Right gaze preference

Left Hemispheric Stroke

- Speech problems – what is being said or inability to get words out
- Problems with comprehension
- Weakness or numbness of right face, arm, or leg
- Left gaze preference

Brainstem Stroke Symptoms

- Nausea, vomiting or vertigo
- Speech problems
- Swallowing problems
- Abnormal eye movements
- Decreased consciousness
- Crossed findings

Intracerbral Hemorrhage

Intraparenchymal Hemorrhage

- Nausea and Vomiting
- Headache
- One Sided Weakness
- Decreased Consciousness

Subarachnoid Hemorrhage

- Worst Headache of Life
- Intolerance to Light
- Neck Stiffness or Pain

Summers, D., Leonard, A., Wentworth, D., Saver, J. L., Simpson, J., Spilker, J. A., et al. Comprehensive Overview of Nursing and Interdisciplinary Care of the Acute Ischemic Stroke Patient. *American Heart Association* , 2911-2944, 2009.

COMMON STROKE MIMICS

STROKE MIMICS
Alcohol Intoxication
Cerebral Infections
Drug Overdose/Toxicity
Epidural Hematoma
Hypoglycemia
Metabolic Disorders
Migraines
Neuropathies (Bell's Palsy)
Seizure and post seizure, Todd's Paralysis
Brain Tumors
Hypertensive Encephalopathy

Summers, D., Leonard, A., Wentworth, D., Saver, J. L., Simpson, J., Spilker, J. A., et al. Comprehensive Overview of Nursing and Interdisciplinary Care of the Acute Ischemic Stroke Patient. *American Heart Association* , 2911-2944, 2009.

RBC FIRE AND EMS STROKE PROTOCOL

3030 STROKE

EMR	EMT/EMT-IV	AEMT	Intermediate	Paramedic

POSSIBL STROKE
Any acute onset neurological deficit not likely due to trauma

↓

Assess and stabilize ABCs, titrate oxygen 90-94%

↓

Assess Cincinnati Prehospital Strike Score
(Presence of single sign sufficient) ⇢

Cincinnati Prehospital Stroke Score
Think "FAST" (face, arm, speech, time)

Assess Facial Droop

Say, "Smile for me," or "Show me your teeth."

Assess Arm Pronator Drift

Demonstrate and say, "Put your arms up for me like this and hold them out while I count to 10."

Assess Speech

Say, "Repeat after me: you can't teach an old dog new tricks," or "No its, ands or buts."

CPSS does not identify all strokes. See below

↓

Check BG (BMK) and treat per hypoglycemia if low
Consider naloxone if respirations < 10

↓

Determine when last KNOWN to be normal and document SPECIFIC time
"At 14:15 hours," **not** "1 hour ago."

↓

- Obtain medical history
- Document medications
- Identify family or friend who may assist with history and decision-making. Get contact info and strongly encourage to come to ED as they may be needed for consent for treatments

↓

Consider common stroke mimics/symptoms ⇢

Stroke Mimics

- Hypoglycemia (BMK)
- Post-ictal paralysis
- Complex migraine
- Overdose
- Trauma
- Bell's palsy

↓

- Start IV and draw blood
- Document cardiac rhythm
- Ensure full monitoring in place: cardiac, SpO_2

↓

Continually reassess:
- Improvement or worsening of deficit
- Adequacy of ventilation and oxygenation
- Cardiovascular stability

↓

Notify receiving hospital of suspected stroke and time of onset of symptoms in order to provide hospital the opportunity for Stroke Alert
***It is more important that you know the timeline of your patient's symptoms than an individual hospital's Stroke Alert criteria, which may vary.**

The Cincinnati Prehospital Stroke Score (CPSS) is designed to be very reproducible and identify those strokes most likely to benefit from reperfusion therapy, but does not identify all strokes.

The CPSS has a high positive predictive value, but a low negative predictive value. Meaning if you have a positive CPSS, you are almost certainly having a stroke, but if you do not have a positive CPSS, you may still be having a stroke.

Stoke signs may be very subtle, therefore it is important to know other signs of stoke:

- Impaired balance or coordination
- Vision loss
- Headache
- Confusion or altered mental status
- Seizure

STROKE CARE

The goal of stroke care is to minimize brain injury and maximize the patient's recovery

The **Stroke Chain of Survival** links actions to be taken by patients, family members, and healthcare providers to maximize stroke recovery. The links include:

- Family member, friend or bystander recognizes stroke warning signs and rapidly calls 9-1-1
- EMS rapidly arrives at scene and performs stroke assessment
- EMS rapidly notifies receiving hospital that patient will be arriving and EMS transports patient to the receiving hospital
- Hospital rapidly diagnoses and treats patient

http://www.strokeassociation.org/idc/groups/heart-public/@wcm/@private/@hcm/@gwtg/documents/downloadable/ucm_310253.pdf

THE ROLE OF EMS IN THE MANAGEMENT OF ACUTE STROKE[1,*]

Prehospital notification

EMS personnel should provide prehospital notification to the receiving hospital that a suspected stroke patient is en route so that the appropriate hospital resources may be mobilized before patient arrival. (Class 1; Level of Evidence B-NR).[1]

–AHA/ASA 2018 Guidelines

En route, EMS should inform the hospital of[2]:

- Time of stroke symptom onset or time patient was last seen normal
- Patient's medical history
- Medication patient is currently taking

How often do you prenotify a hospital in case of suspected stroke? What are the challenges of prenotification?

ON SCENE*

EMS guidelines for management of patients with suspected stroke[1,2]

- Manage CABs (chest compression-airway-breathing); give oxygen if needed
- Perform prehospital stroke assessment
- Establish and record exact time patient was last seen normal
- If possible, bring a witness to the hospital; alternatively, record name and phone number (preferably cell phone number) of the witness
- Medical history:
  - Identify current medications taken by patient, especially any anticoagulants (aspirin, warfarin, etc)
  - Record recent illnesses, surgery, or trauma and any history of stroke, drug abuse, migraine, infection, and/or pregnancy

PREHOSPITAL STROKE ASSESSMENT TOOLS

Enable identification and prioritization of stroke patients[1,2]

- Formal stroke assessment tools can increase paramedic sensitivity to stroke identification to ≥90%
- Frequently used screening tools include*
  - Cincinnati Prehospital Stroke Severity Scale
  - Los Angeles Prehospital Stroke Screen (LAPSS)

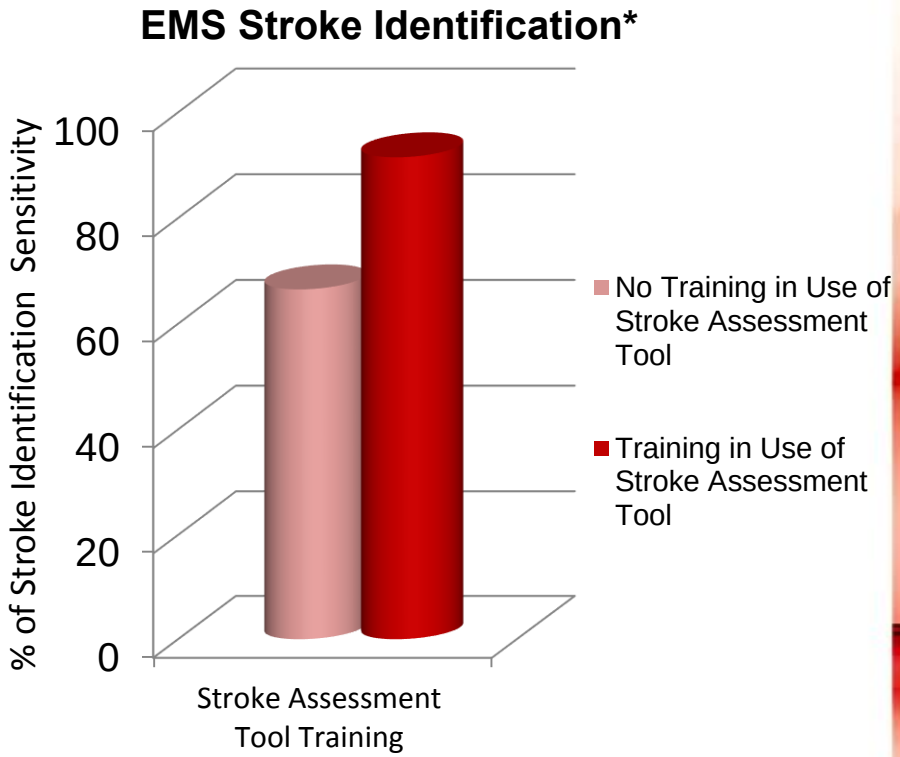
CARE EN ROUTE[1,2,*]

- Provide supplemental oxygen to maintain oxygen saturation >94%[2]
- Monitor blood pressure (BP), but do not treat arterial hypertension.[2]
  The benefit of prehospital BP intervention is not proven
- Check and record blood glucose to assess for hypoglycemia and manage appropriately[2]
- Hypoglycemia is frequently found in patients with stroke-like symptoms[1]
  - Hypoglycemia can be corrected rapidly in most patients with 50% dextrose
  - Do not administer dextrose in nonhypoglycemic patients
- Establish cardiac monitoring and intravenous (IV) access, if possible[2]

STROKE ASSESSMENT TOOLS

STROKE ASSESSMENT TOOLS

- Stroke assessment tools help EMS identify a stroke quickly and transport the individual to the appropriate center
- Pre-hospital stroke assessment training raises the accuracy of stroke identification
- Paramedics demonstrated a sensitivity of 61-66% without stroke assessment training and **86-97%** with training



Maggiore, W. A. (2012). 'Time is Brain' in Prehospital Stroke Treatment . *Journal of Emergency Medical Services* , 1-9. http://www.jems.com/article/patient-care/time-brain-prehospital-stroke-treatment

CONSUMER ASSESSMENT OF STROKE

Face Drooping - Ask the person to smile. Does one side of the face droop or is it numb?

Arm Weakness - Ask the person to raise both arms. Is one arm weak or numb? Does one arm drift downward?

Speech Difficulty - Ask the person to repeat a simple sentence, like "the sky is blue." Is the sentence repeated correctly? Are they unable to speak, or are they hard to understand?

Time to call 9-1-1 - If the person shows any of these symptoms, even if the symptoms go away, call 9-1-1 and get them to the hospital immediately.

http://www.strokeassociation.org/STROKEORG/WarningSigns/Warning-Signs_UCM_308528_SubHomePage.jsp

PREHOSPITAL STROKE EMERGENT LARGE VESSEL OCCLUSION (ELVO) SCALES[1]

What scale does your system use?

Prehospital Stroke Scale	Sensitivity	Specificity
Cincinnati Prehospital Stroke Severity Scale (CPSSS)	83%	40%
3-item stroke scale (3I-SS)	67%	92%
Los Angeles Motor Scale (LAMS)	81%	89%
Legs, eyes, gaze, speech (LEGS)	69%	81%
Rapid Arterial Occlusion Evaluation Scale (RACE)	85%	68%
Severe hemiparesis	27%-48%	
Vision, aphasia, neglect (VAN)	100%	90%

CINCINNATI PREHOSPITAL STROKE SEVERITY SCALE (CPSSS)[1]

Facial droop (have patient smile)

Normal: Both sides of face move equally

Abnormal: One side of face does not move as well

Arm drift (have patient hold arms out for 10 seconds)

Normal: Both arms move equally or not at all

Abnormal: One arm drifts compared with the other or does not move at all

Speech (have patient speak a simple sentence)

Normal: Patient uses correct words with no slurring

Abnormal: Slurred or inappropriate words or mute

Reference: 1. Kothari RU, et al. *Ann Emerg Med*. 1999;33:373-378.

STROKE TREATMENT OPTIONS

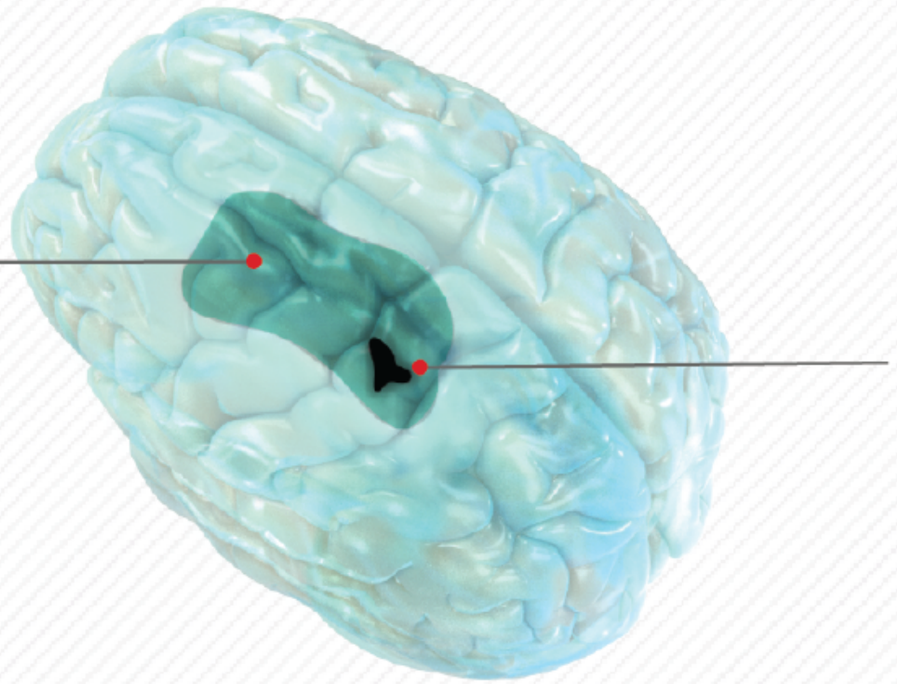
GOAL FOR ISCHEMIC STROKE: SAVE THE PENUMBRA

The penumbra is an area of potentially salvageable tissue beyond the blood-starved infarct[1,2]

- The infarct expands in the penumbra over time, increasing the area of irreversible brain damage[3]
- The average stroke patient can lose tens of thousands of brain cells every second[4]

Penumbra

- Potentially salvageable tissue around the infarct
- Supported by collateral blood flow[1,2]



Area of infarct

- Permanently damaged by lack of blood flow[1]

Image is for illustrative purposes only.

As the infarction expands, the area of irreversible brain damage increases—**TIME IS BRAIN.**[3]

TYPES OF STROKE CENTERS[1,2]

CERTIFIED COMPREHENSIVE STROKE CENTERS (CSCs)
For multifaceted 24/7 stroke care

CERTIFIED PRIMARY STROKE CENTERS (PSCs)
For rapid, uniform, evidence-based care for stroke patients

ACUTE STROKE-READY HOSPITALS (ASRHs)
For effective diagnosis and treatment of most stroke patients, without fully organized inpatient systems of care

THROMBECTOMY-CAPABLE STROKE CENTERS (TSC)
For performing endovascular thrombectomy (EVT) and caring for patients after the procedure

STROKE CENTER CAPABILITIES[1]

What should you expect from your certified centers?

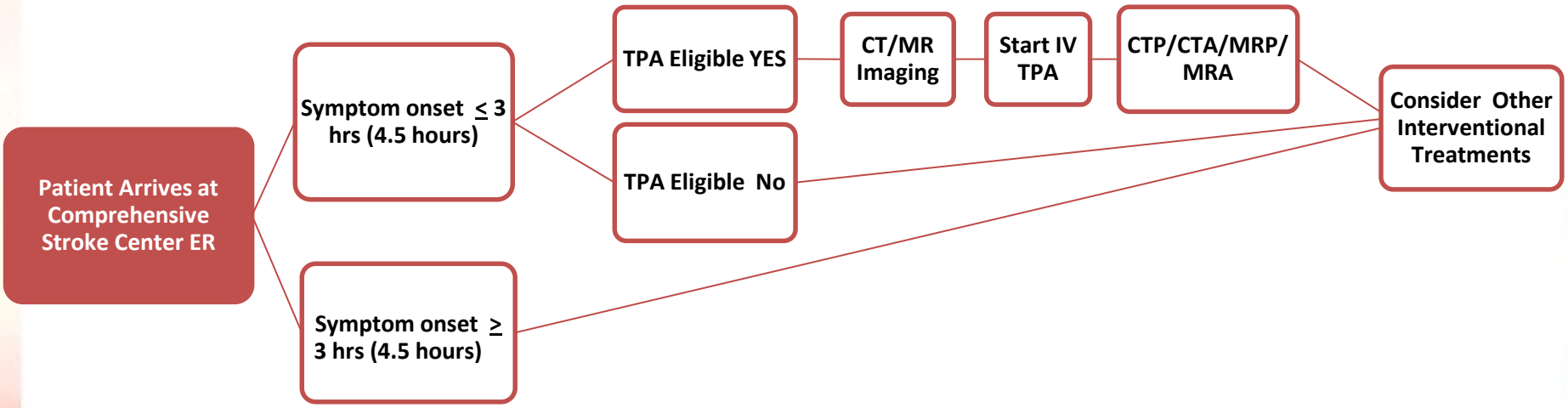
	Primary Stroke Centers (PSCs)	Comprehensive Stroke Centers (CSCs)
Treatment Capabilities	IV thrombolytics and medical management of stroke	IV thrombolytics; endovascular therapy
Stroke Unit	Stroke unit of designated beds for the acute care of stroke patients	Dedicated neuro intensive care beds for complex stroke patients available 24/7; on-site neurointensivist coverage 24/7
Guidelines	Recommendations from Brain Attack Coalition for Primary Stroke Centers, 2011	Recommendations from Brain Attack Coalition for Comprehensive Stroke Centers, 2005
Neurosurgical Services	Within 2 hours; OR is available 24/7 in PSCs providing neurosurgical services	24/7 availability; neurointerventionist; neuroradiologist; neurologist; neurosurgeon
EMS Collaboration	Access to protocols used by EMS	Access to protocols used by EMS, routing plans; records from transfer

STROKE CENTER CAPABILITIES (CONT.)[1]

What should you expect from your certified centers?

	Acute Stroke-Ready Hospitals (ASRHs)	Thrombectomy-Capable Stroke Center (TSC)
Treatment Capabilities	IV thrombolytics: Anticipate transfer of patients who have received IV thrombolytics	IV thrombolytics; mechanical thrombectomy, IA thrombolytics
Stroke Unit	No designated beds for acute care of stroke patients	Dedicated neuro intensive care beds for complex stroke patients available 24/7; on-site critical care coverage 24/7
Guidelines	Recommendations from Brain Attack Coalition for Acute Stroke Ready Hospitals, 2013	AHA/ASA Focused Update for the Early Management of Patients with Acute Ischemic Stroke Regarding Endovascular Treatment, 2015
Neurosurgical Services	Within 3 hours (provided through transferring the patient)	Within 2 hours; OR is available 24/7 in TSCs providing neurosurgical services
EMS Collaboration	Access to protocols used by EMS	Access to protocols used by EMS, routing plans; records from transfer

STROKE TREATMENT PROTOCOLS



Stroke Protocol Map Covidien Part Number 76552-001 (A) JUN/12

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STROKE TREATMENT OPTIONS

Medical Management

- IV-tPA is the clot busting drug used with stroke patients
- Patients must be within the time window of 0-3 (or 3-4.5 hour window (in certain eligible patients) hours from symptom onset
- There are other contraindications associated with the use of the drug

Intra-arterial Thrombolysis

- IA thrombolysis is a technique where the doctor uses a catheter (like a heart catherization) to administer tPA directly into the blood clot blocking blood flow to part of the brain
- This treatment can be administered up to 6 hours after stroke symptoms onset
- Patients must meet strict criteria in order to receive this procedure

Mechanical Thrombectomy

- This procedure uses a device to retrieve the clot
- The time window for mechanical thrombectomy is up to 8 hours from symptom onset
- If the patient fails IV-tPA or is ineligible for IV-tPA, they may be eligible for mechanical thrombectomy

SUMMARY[1-4]

EMS responsibilities[1-4]

- ✓ Performance of stroke assessment measures and rapid transport to closest appropriate facility capable of treating stroke
- ✓ Management of CABs
- ✓ Acquisition of history of event, preferably with assistance of a witness
- ✓ Establish cardiac monitoring and IV access, if possible
- ✓ Provide rapid transport to closest appropriate stroke center
- ✓ Provide prehospital notification that a potential stroke patient is en route
- ✓ Present patient to the ED

Systems of care can improve patient outcomes[1-6]

- ✓ Recommendations provide that suspected stroke patients be taken to CSCs, if possible
  - Prehospital notification is critical
  - Quality improvement initiatives should include EMS feedback

RBC Case Review