ACUTE STROKE CARE FOR THE EMS PROVIDER

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Disclosures

- No financial disclosures
- Will be discussing off-label uses
- Always follow your local and regional protocols

Objectives

- Review the impact of stroke
- Recognize signs and symptoms of stroke
- Define risk factors for stroke
- Identify types of stroke
- Learn Pre-hospital recommendations for Dispatch
- Review stroke care in the field
- Review medical management and treatment options for stroke
- Review national/regional guidelines and recommendations for stroke

Key Points

- EMS play a critical role in the Emergency care of acute stroke patients.
- Over 400,000 acute stroke patients are being transported annually by EMS providers.
- 50% of all stroke patients use EMS, but this is the majority of patients who present within the 3 hour treatment window.
- EMS use decreases time to hospital arrival and the ability to implement acute stroke intervention.
The Impact of Stroke

- 795,000 strokes in 2009
- 163,000 die from stroke every year in America
- Stroke is the third leading cause of death
- Stroke is the leading cause of disability in adults
- 4.4 million survivors; only 50-75% of stroke survivors regain functional independence
- Estimated direct/indirect costs for 2007 - $62.7 billion
- 14% of persons who survive a first stroke or TIA will have another within one year

Time is Brain!

- Every second 32,000 neurons die
- Every minute 1.9 million neurons die
- Every hour 120 million neurons die
- Completed stroke: Loss of 1.2 billion neurons
- Blockage of one blood vessel will cause ischemia within 5 minutes

What is our goal?

- Reduce stroke mortality
- Improve quality of life for stroke survivors and their families

Focus:
- Increasing public awareness
- Timely initiation of 911 system
- Deployment of informed EMS personnel
- Delivery to a stroke center
Did You Know?

- The average time from symptom onset to the ED is 17-22 hours.
- 42% of people over 50 do not recognize signs and symptoms of stroke.
- 17% of people over 50 can't name a single stroke symptom.
- Only 38% call 9-1-1.
- Only 20-25% arrive within 3 hours.

Signs and Symptoms of Stroke

- Sudden numbness/weakness of the face, arm, or leg, especially on one side of the body.
- Slurred speech/difficulty speaking/understanding.
- Sudden change in vision (blurred or decreased vision) in one or both eyes.
- Dizziness, loss of balance or coordination.
- Acute onset severe headache.
- Nausea or vomiting with any of the above symptoms.
- Confusion or disorientation with above symptoms.

Additional stroke symptoms

- Decrease level of consciousness.
- Difficulty with swallowing and secretions.
- Respiratory distress.
- Pupil changes.
- Convulsions.
Modifiable Risk Factors

- Hypertension
- Elevated cholesterol (statins reduce risk by 30%)
- Diabetes mellitus-independent risk factor
- Coronary Artery disease
- Heart disease-Valve disease/replacement, any factor that decreases ventricular contraction
- Atrial Fibrillation (3-4x risk)
- Previous stroke
- Obesity
- Excessive alcohol
- Smoking (2x risk ischemic; 4x risk hemorrhagic)
- Oral Contraceptives/HRT

Non-Modifiable Risk Factors

- Age-Risk doubles per decade over 55
- Gender-Men have greater risk, but women live longer.
- More women die from stroke (60% of stroke deaths)
- Race-African-American, Asian and Hispanic have greater risk, possibly due to hypertension
- Diabetes Mellitus- Exacerbated by hypertension or poor glucose control. Even diabetics with good control are at increased risk.
- Family history of stroke or TIA

3 Regions of the Brain

- Cerebrum
- Cerebellum
- Brain Stem
**Cerebrum**
- Conscious thought
- Memory
- Personality
- Speech
- Motor Function
- Vision
- Touch (tactile)

**Cerebellum**
- Coordination
- Balance
- Fine motor control
- Reflexes

Symptoms: dizziness, nausea, vomiting

**Brain Stem**
- Heart function
- Respiration
- Autonomic nervous system
- Digestion

Symptoms: Involuntary life-support functions (breathing, heartbeat, blood pressure), eye movement, hearing, speech, swallow, mobility on one or both sides of the body

**Cerebral Circulation**
- Anterior Circulation
  - Carotid arteries
  - Anterior cerebral arteries
  - Middle cerebral arteries
- Posterior Circulation
  - Vertebral arteries
  - Basilar artery
  - Posterior cerebral arteries
**Cerebral Circulation**

- Sudden interruption of blood supply to the brain
- Lack of oxygen and glucose to nerve cells
- Ischemia within 1 hour
- Cytotoxic and vasogenic edema
- Cellular death

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**Stroke: What is it?**

- Ischemic Penumbra
  - The ischemic penumbra is the viable but threatened brain tissue between the normal tissue and the tissue of the infarct.
  - Acute stroke therapies focus on reversing or preventing ischemic damage. "Penumbral Salvage"

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**Ischemic Penumbra**

**Types of Stroke**

- **Ischemic Stroke - 88%**: Embolic (24%):
  - Blood clot forms somewhere in the body and travels to the brain
  - Thrombotic (61%):
    - Clot forms on blood vessel deposits

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**Ischemic Stroke**

- Blood clot forms somewhere in the body and travels to the brain.
Hemorrhagic Stroke-12%

Intracerebral Bleed (ICB) Subarachnoid Hemorrhage (SAH)

Hemorrhagic Stroke

- Responsible for 30% of stroke deaths
- Intracerebral—within the brain tissue. Most commonly from high blood pressure
- Subarachnoid—around the brain's surface and under its protective layer—Most commonly from aneurysm rupture
- Risk factors: hypertension, alcohol, drug abuse, anti-clotting medication and blood clotting disorders

The Problem With TIA’s (Transient Ischemic Attack)

- A “TIA” has sudden onset and rapid resolution
  Rule of Thumb: The event should last 2-20 minutes
- If the event lasts more than 1 hour it is probably a minor stroke
- The likelihood of stroke is greatest in the first 48 hours after the event
- More than 1/3 of all persons who experience TIA’s will go on to have a stroke

The Problem with TIA’s

- TIAs should not be ignored
- Patients need to seek immediate medical attention in order to prevent a possible full blown stroke
- MRI may be needed to determine TIA VS. Stroke
Stroke is a Time Critical Transport
ACLS Guidelines

- IV Alteplase (tPA-tissue Plasminogen Activator) improves neurologic outcome in patients when administered within 3 hours of onset
- Stroke presenting within *3 hours should be triaged on an emergent basis with urgency similar to acute ST-elevation myocardial infarction
- Patients who may be candidates for fibrinolytic therapy should be transported to hospitals identified as capable of providing acute stroke care, including 24-hour availability of CT scan and interpretation

Goals for EMS Response and Acute Intervention

- Rapid Recognition and Reaction to Stroke warning signs
- Rapid EMS Dispatch
- Rapid EMS transport and hospital prenotification
- Rapid diagnosis and treatment

Emergency Dispatch

- Use of 911 system is recommended for symptoms of stroke
- Many callers do not use the word "stroke"
- Dispatchers should recognize the seriousness of stroke and be familiar with stroke symptoms.
- Strokes should be dispatched as a high priority call, send closest unit- similar to acute MI or trauma
- An EMD call-receiving algorithm is recommended to ask appropriate questions to callers
**Emergency Dispatch**

- Dispatch should ask the caller when (what time) the patient was last seen normal (without weakness, facial droop, loss of speech)?
- Try to determine pertinent past medical history
- Relay information to Responder
- Request feedback from Responder regarding outcome
- Dispatchers should receive education recognizing stroke symptoms

**EMS Stroke Care**

- Rapid Identification of stroke as the cause of the patient’s findings
- Elimination of conditions that could mimic stroke
- Stabilization
- Rapid transportation of the patient to the closest appropriate ED
- Pre-notification to the receiving hospital about impending arrival of a patient with suspected stroke

**Suspected Stroke Prehospital Protocol Guidelines**

*Washington State Emergency Stroke Care System*

**Scene Size-Up/Initial Patient Assessment**

(Sick or Not Sick)

A. Support ABCs
B. Check glucose, temperature, SpO2
C. Treat hypoglycemia
D. NPO

**Focused History and Physical Exam**

A. FAST Assessment (Face/Arms/Speech/Time last normal)
   - If one component abnormal, high probability of stroke. Refer to stroke destination triage tool. Time from last normal will determine destination.
B. Limit scene time with goal of ≤ 15 minutes

*Washington State Emergency Stroke Care System*
Time is Brain and you must act FAST!

Key Components of Taking Patient History (SAMPLE)

S-Symptoms/ onset (When was the person last seen normal?)
A-Allergies
M-Medications-anticoagulants (warfarin), antithrombotics, Insulin, antihypertensives, antiepileptics
P-Past Medical History-Hypertension, Diabetes (hypoglycemic patients may have symptoms that mimic stroke), seizures, prior stroke, aneurysms
L-Last oral intake
E-Events Prior-stroke, MI, trauma, surgery, bleeding

F-A-S-T

- Face – smile
- Arm raise
- Say a phrase
- Time – Time Last Normal
**Suspected Stroke Prehospital Protocol Guidelines**
(Washington State Emergency Stroke Care System)

**Transport**
A. Early hospital notification—specify FAST findings (abnormal physical findings and time last normal)
B. If closest appropriate facility greater than 30 minutes, consider air transport when appropriate

**Management/Ongoing Assessment en route**
A. Lay patient flat unless signs of airway compromise, in which case elevate no higher than 20 degrees.
   (Protocols vary! Follow your local protocol)
A. IV access (as able)
   1. Normal saline (avoid glucose-containing solutions)
   2. 16 or 18 ga IV in unaffected arm (affected arm is acceptable)
   3. Optional: Blood draw with IV start
   4. 2nd exam/neuro reassess
   5. Optional: Perform tPA checklist

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**Recommended**
- Manage ABCs
- Cardiac monitoring
- Intravenous access-18gauge w/leur-lok preferred
- Oxygen (as required 02 saturation <92%)
- Assess for hypoglycemia
- NPO
- Alert receiving ED
- Rapid transport to closest appropriate facility capable of treating acute stroke

**Not Recommended**
- Dextrose-containing fluids in nonhypoglycemic patients
- Excessive blood pressure reduction (can cause hypotension, decrease cerebral perfusion and worsen stroke)
- Excessive intravenous fluids (can cause increased intracranial pressure)
In Addition:

- If local protocol allows, take a family member to the hospital/phone number
- Minimize scene time; procedures can be performed during transport
- Transport patient to the nearest appropriate hospital per local transport protocols
- Notify receiving hospital en route

Recommendations from NINDS (National Institute of Neurological Disorder and Stroke)

1. Take the patient to the nearest hospital if there are no stroke centers nearby
2. Bypass hospitals unable to provide care if there are stroke centers close by. Follow local destination protocols
3. If remote, consider air-evacuation if:
   - The closest center is > 1 hour away, OR
   - The closest center cannot provide stroke care, OR
   - If the patient can reach a center within the *3-hour time window or tPA treatment

Destination Protocols

Coming soon!
Washington State destination protocols for stroke

Northwest Medstar Response Times

[Map of Northwest Medstar Response Times]
National Stroke Association Recommendations

“EMS System Medical Directors should have a process to identify and provide transport protocols to authorize EMS to transport stroke patients to the nearest appropriate hospitals, including recognized stroke centers”

Evaluation of Current Systems

- What is your general EMS environment in your state?
- What processes are in place that provide rapid access to EMS for patients with acute stroke?
- What are your EMS dispatch protocols?
- Where are suspected stroke patients transported?
- What communications occur between local hospitals and EMS systems?

Stroke is a time critical

- IV tPA (Alteplase)-Time from last normal to 3 hours. (Extended window 3-4.5 hours)
- Dose is based on patient's weight. 10% of determined dose as an IV bolus, remaining 90% over one hour
- May cause intracranial bleeding but has not been shown to increase mortality

CT Imaging

- Large ischemic stroke with midline shift
CT Imaging

CT Angiogram  CT Perfusion

Acute Stroke Interventions

Intraarterial tPA
- Time last normal to 6 hours.

Mechanical clot retrieval
- 0-8 hours - anterior circulation
- 0-12 hours (or longer) - posterior circulation

Merci™ - Mechanical Clot Retrieval Device

Anterior Circulation – AP View
**Patient History**

- 47 year old male, history of excessive alcohol abuse
- Last seen normal at midnight, found at 4 am unable to move his right side and unable to speak
- Family called 911, transfer to stroke center
- Not a candidate for IV t-PA, symptom onset >3 hours
- ER Physicians notified interventional team and arranged for transfer
- Patient arrived to and was in the angiography suite by 6:30 am
- Clinical Neurologic exam: unable to move right arm and leg, confused and unable to express language, NIHSS 18 (0 – 42)

**The cerebral artery is opened post procedure.**
**Patient had a dramatic clinical improvement.**

Post Intervention

Clinical Outcome

Post Intervention Cerebral Angio Retriever

1st pass Merci

Vert

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EMS Role in Research

- Identification of an effective neuroprotective therapy may further expand the role of EMS in the treatment of acute stroke.
- **Hypothermia** - Reduces cytotoxic cascade, stabilizes blood-brain barrier, reduces free-radical formation, may prevent neurotoxicity of tPA.
- **IV Magnesium** (FASTMAG Trial)
  IV Magnesium loading dose given in the field. Cytoprotective and vasodilating effects.

Public Education - Reducing Risk

**Lifestyle Modification**
- Low fat diet/Controlling weight/Exercise
- Treating Atrial Fibrillation
- Monitoring Alcohol consumption
- Quit smoking

**Medical Management**
- Antihypertensive Medication - For blood pressure greater than 140/90. (Tighter control for diabetics)
- Cholesterol reducing medication for cholesterol > 200 mg/dl or LDL > 100 (statins)
- Clot prevention medication (Anticoagulants) - Warfarin
- Antiplatelet drugs - Aspirin, Aggrenox, Plavix, Ticlid

Questions?

Donald Rumsfeld

- There are known knowns. These are things we know that we know. There are known unknowns. That is to say, there are things that we know we don't know. But there are also unknown unknowns. There are things we don't know we don't know.
You are dispatched to a call of a 75-year-old female with sudden onset of trouble walking; she has become dizzy and very nauseated. She cannot walk without holding onto furniture. Her blood pressure is 160/90. Her blood sugar is normal. The cardiac monitor shows sinus rhythm. She has no c/o chest pain. She is a non-drinker/non-smoker, but takes medication for high blood pressure. She has no facial droop or arm weakness. You suspect this could be stroke. What area of the brain could give you these symptoms?