



UC Irvine Health



**American Heart Association
American Stroke Association
CERTIFICATION**
Meets standards for
Comprehensive Stroke Center

Comprehensive Stroke and Cerebrovascular Center

Stroke Systems of Care

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UC Irvine Health

Why Stroke Systems?

- No. ~~4th~~ 5th cause of death in the U.S.
- No. 1 cause of adult disability
- Total annual stroke costs to the nation are about **\$38.6 billion**
- Transport of stroke patients to the hospital results in faster treatment, yet one-third of stroke patients do not call 9-1-1 and use EMS to get to the hospital
- Gaps remain in the quality of care provided to acute stroke patients

Higashida, R et al. (2013). Heart Association/American Stroke Association Interactions Within Stroke Systems of Care: A Policy Statement From the American Stroke, *Stroke*. 44:2961-2984 Retrieved from doi: 10.1161/STR.0b013e3182a6d2b2

What is a Stroke System of Care?



- A stroke system should coordinate and promote patient access to the full range of activities and services associated with stroke prevention, treatment, and rehabilitation, including the following key components:
 - ✓ Primary prevention
 - ✓ Community education
 - ✓ Notification and response of emergency medical services
 - ✓ Acute stroke treatment, including the hyperacute and emergency department phases
 - ✓ Subacute stroke treatment and secondary prevention
 - ✓ Rehabilitation
 - ✓ Continuous quality improvement (CQI) activities

Why Stroke Systems?

- A fully functional stroke system of care that reduces stroke related deaths by just 2% to 3% annually would translate into 20 000 fewer deaths in the United States alone and ≈400 000 fewer deaths worldwide.

- Post stroke disability would also be reduced, which would improve the quality of life, result in the more efficient use of healthcare resources, and reduce the financial burden.



Forecasting Stroke

- A recent study predicted that obesity rates in the United States will increase by 33% between 2010 and 2030.
- Hypertension rates in every state are currently >20%, whereas only 37 states had such rates 20 years ago.
- Diabetes mellitus rates have doubled in 10 states over the past 15 years, and 42 states have diabetes mellitus rates >7%.
- The total annual costs associated with stroke are projected to rise to \$240.67 billion by 2030, an increase of 129%.

Primary Prevention

- Biggest impact on Health
- Hypertension, hyperlipidemia, diabetes, atrial fib other modifiable risk factors, smoking, obesity, lack of exercise
- Education- high risk population- Know your community
 - **Orange County has the third highest concentration of Asians in the nation- 2011** (Asian Americans were more likely to experience a severe ischemic stroke and have worse outcomes than whites, according to preliminary research presented at the American Stroke Association's International Stroke Conference 2018)
 - **Santa Ana-6th largest Hispanic population-2018** (Hispanics have a different prevalence of risk factors for stroke when compared with non-Hispanic whites. For instance, they have strokes at younger ages. Diabetes is more prevalent among Hispanics, with estimates that 30 percent of adults have the disease. ASA 2018)

PAGE ONE

We have come a long way!

Fatal Blockages

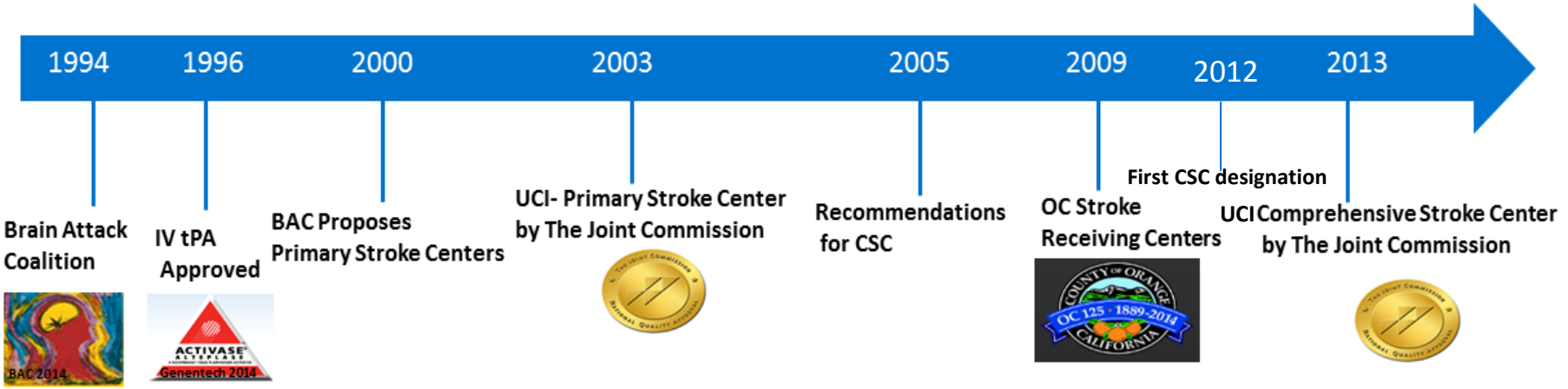
Stroke Victims

Are Often Taken

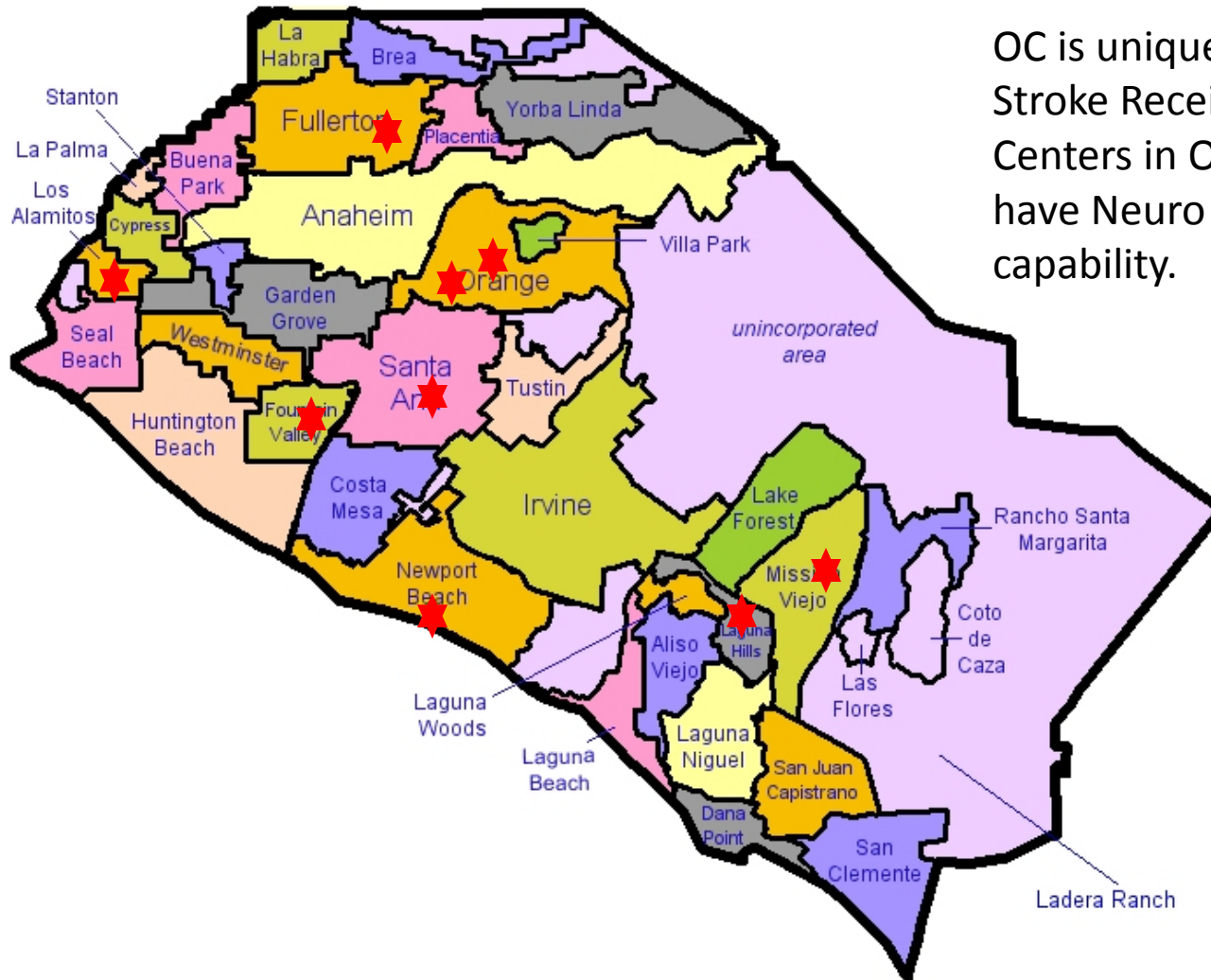
To Wrong Hospital

Outdated Ambulance Rules,
Inadequate ERs Make
Dangerous Ailment Worse

Stroke Timeline: UC Irvine/ASA/Orange County



Stroke Receiving Centers in OC



OC is unique! All Stroke Receiving Centers in OC must have Neuro IR capability.

Delay

- The time from symptom onset to arrival at an emergency department (ED) is the greatest source of delay and a frequent cause of ineligibility for acute reperfusion therapies.
- More specifically, a lack of patient and public awareness of stroke signs and symptoms, the urgency of immediate care, and the need to call 9–1–1 for EMS activation are the main causes for delayed patient presentation to an ED.



IV tPA

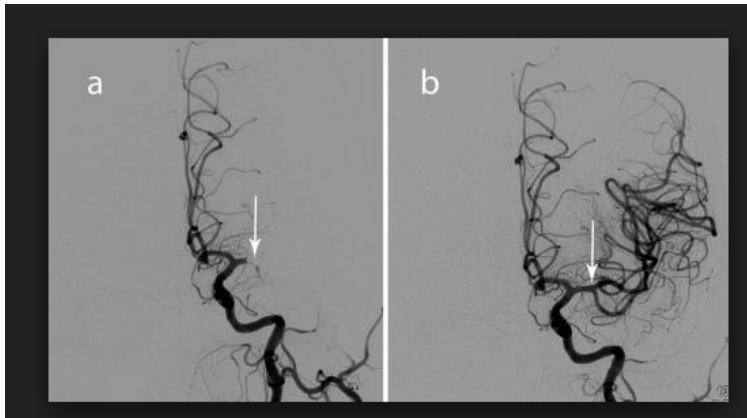
- 2016 marked the 20th anniversary of the FDA's approval of tissue plasminogen activator (tPA) for treating acute ischemic stroke.
- The proportion of patients who arrive at emergency departments in time to receive the benefits of tPA within 3-4.5 hours efficacy has remained at a frustratingly low level of less than approx. **4-10 percent nationwide**, according to best estimates.

2015 American Heart Association/American Stroke Association Focused Update of the 2013 Guidelines for the Early Management of Patients With Acute Ischemic Stroke Regarding Endovascular Treatment

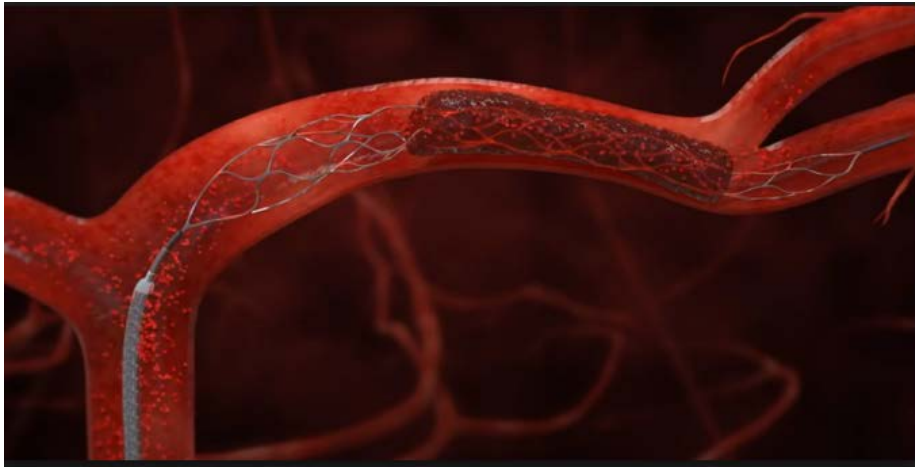
A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

Recommendations *Endovascular Interventions*

1. Patients eligible for intravenous r-tPA should receive intravenous r-tPA even if endovascular treatments are being considered (*Class I; Level of Evidence A*). (Unchanged from the 2013 guideline)
2. Patients should receive endovascular therapy with a stent retriever if they meet all the following criteria (*Class I; Level of Evidence A*). (New recommendation):
 - a. Prestroke mRS score 0 to 1,
 - b. Acute ischemic stroke receiving intravenous r-tPA within 4.5 hours of onset according to guidelines from professional medical societies,
 - c. Causative occlusion of the ICA or proximal MCA (M1),
 - d. Age ≥ 18 years,
 - e. NIHSS score of ≥ 6 ,
 - f. ASPECTS of ≥ 6 , and
 - g. Treatment can be initiated (groin puncture) **within 6 hours of symptom onset**



Thrombectomy



2018

New guidelines for the management of acute stroke include selection criteria for patients to receive mechanical endovascular thrombectomy **up to 24 hours** after their stroke.

Certifications for Stroke

- Acute Stroke Ready
- Primary Stroke Center
- Thrombectomy-Capable Stroke Center
- Comprehensive Stroke Center

The Joint Commission Stroke Certification Programs – Program Concept Comparison

Program Concept	ASRH	PSC	TSC	CSC
Eligibility	General eligibility requirements; use of a standardized method of delivering care centered on evidence-based guidelines for stroke care.	General eligibility requirements; use of a standardized method of delivering care centered on evidence-based guidelines for stroke care.	General eligibility requirements; use of a standardized method of delivering care centered on evidence-based guidelines for stroke care. Organization must have performed mechanical thrombectomy and performed at least 15 patients with stroke within the past 12 months (or 30 over past 24 months) (procedures performed at hospitals other than the one applying for TSC certification can be included) -Be CAST certified; -Completed ACGME neurosurgery/neurology fellowship; -Completed neurointerventionist fellowship; -Completed neurointerventionist fellowship accredited or similar; -Performed 15 mechanical thrombectomies over the past 12 months (or 30 over past 24 months)	<p>Treatment of 20 SAH caused by aneurysm annually (40 over 2 years) Capable of treating aneurysms by performing 15 endovascular coiling or microsurgical clipping procedures annually (30 over 2 years) Administering IV thrombolytic therapy 25 times annually (50 times over 2 years)</p> <p>**CSCs will be required to meet a minimum mechanical thrombectomy volume for eligibility in the future**</p>
Program Medical Director	Sufficient knowledge of cerebrovascular disease	Sufficient knowledge of cerebrovascular disease	Neurology background with clinical and administrative expertise	Has extensive expertise; available 24/7
Acute Stroke Team	Available 24/7, at bedside within 15 minutes	Available 24/7, at bedside within 15 minutes	Available 24/7, at bedside	
Emergency Medical Services Collaboration	Access to protocols used by EMS	Access to protocols used by EMS	Access to protocols used by EMS, routing plans; records from transfer	Access to protocols used by EMS, routing plans; records from transfer
Stroke Unit	No designated beds for acute care of stroke patients	Stroke unit or designated beds for the acute care of stroke patients	Dedicated neuro intensive care beds for complex stroke patients available 24/7; on-site critical care coverage 24/7	Dedicated neuro intensive care beds for complex stroke patients available 24/7; on-site neurointensivist coverage 24/7
Initial Assessment of Patient	Emergency Department physician, nurse practitioner, or physician assistant	Emergency Department physician	Emergency Department physician	Emergency Department physician
Diagnostic Testing Capability	CT, labs 24/7 (MRI 24/7 if used)	CT, MRI (if used), labs 24/7; CTA and MRA (to guide treatment decisions), at least one modality for cardiac imaging when necessary	CT, MRI, labs, CTA, MRA, catheter angiography 24/7; other cranial and cardiac ultrasound, TEE as indicated	CT, MRI, labs, CTA, MRA, catheter angiography 24/7
Neurologist Accessibility	24/7 via in person or telemedicine	24/7 via in person or telemedicine	24/7 via in person or telemedicine schedule for attending physicians providing availability 24/7	Meets concurrently emergent needs of multiple complex stroke patients; Written call schedule for attending physicians providing availability 24/7
Neurosurgical Services	Within 3 hours (provided through transferring the patient)	Within 2 hours; OR is available 24/7 in PSCs providing neurosurgical services	Within 2 hours; OR is available 24/7 in TSCs providing neurosurgical services	24/7 availability: Neurointerventionist; Neuroradiologist; Neurologist; Neurosurgeon
Telemedicine	Within 20 minutes of it being necessary	Available if necessary	Available if necessary	

Comprehensive Stroke Designation

- Highest Level of Stroke Care which includes:
 - Advance Treatments 24/7
 - Volume criteria
 - Advanced Stroke Education
 - Participation in Stroke Research
 - CSC Performance Measures
 - **Personnel with Expertise in Vascular Neurology/Neurosurg, Neuro Intensivist, Neurointerventional, Neuro Rad**
 - Neuro ICU beds with Neuro Nurses
Expertise in Stroke



EMS: Emergency Medical Services or Maybe.. *Emergency Management of Stroke!*

- Establishing programs that provide ongoing education for field EMS personnel
- **EMS plays a significant role in this system of care!**
- **Training & collaboration are imperative for success!**
- Typically the first medical professionals with direct patient contact
- Their initial assessments, actions, treatments, and decisions have significant impact on the patient's subsequent care
- Their role in patient triage, diversion, and routing cannot be underestimated



EMS Assessment and Triage

- Stroke-recognition tools have been developed that assist EMS personnel in identifying patients with acute cerebral ischemia and intracranial hemorrhage with high sensitivity and specificity
- Stroke **Assessment** Scales in the Field
- Stroke **Severity** Assessment Scales in the Field

Emergent Large Vessel Occlusion (LVO) is much like how a major coronary artery is blocked with STEMI. LVO strokes have the highest rate of mortality and poor outcomes. Thrombolytics alone usually do not work for large vessel occlusions. Combined thrombolytics and endovascular procedure is the standard of care.

EMSWORLD EXPO
NORTH AMERICA'S LARGEST EMS EVENT

OCT 3-7 2016

NEW ORLEANS LOUISIANA

JOIN US AS WE CHART THE FUTURE OF EMS

» LEARN MORE

PATIENT CARE

PATIENT CARE



A Revolution in Stroke Care

PATIENT CARE



Cleveland Clinic Mobile Stroke Treatment Unit

MEDIA CENTER



Stefan's Story: A Stroke Survivor's Story

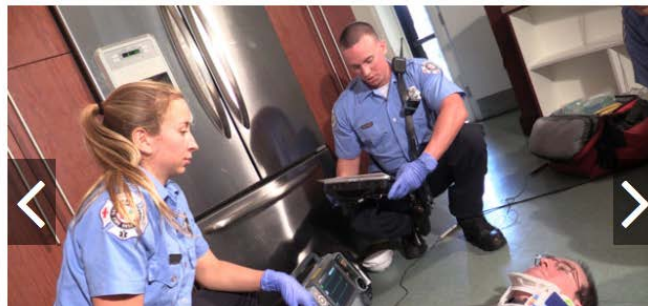
PATIENT CARE

PATIENT CARE

A Revolution in Stroke Care

EMSWORLD

BY PETER ANTEVY, MD, RYAN A. MCTAGGART MD, MAHESH V. JAYARAMAN MD ON MAY 1, 2015

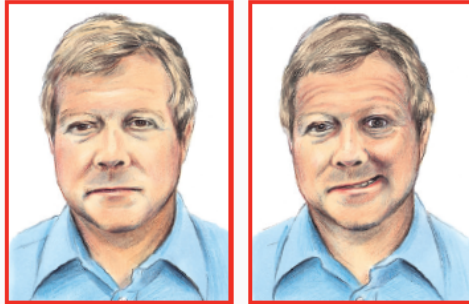


“EMS agencies now have a real obligation to develop innovative triage strategies and consider direct transport of stroke patients only to facilities that offer both IV tPA and mechanical embolectomy in a timely, efficient manner. Indeed, the clinical impact of **untreated large vessel occlusions** is devastating, as more than 25% of patients will die and the rest will be disabled if denied access to direct clot removal.” —**2015 EMS World**

The Cincinnati Prehospital Stroke Scale

Facial Droop (have patient show teeth or smile):

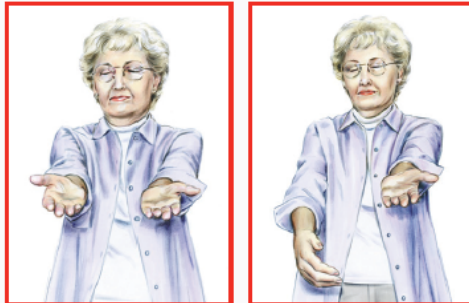
- Normal—both sides of face move equally
- Abnormal—one side of face does not move as well as the other side



Left: Normal. Right: Stroke patient with facial droop (right side of face).

Arm Drift (patient closes eyes and extends both arms straight out, with palms up, for 10 seconds):

- Normal—both arms move the same or both arms do not move at all (other findings, such as pronator drift, may be helpful)
- Abnormal—one arm does not move or one arm drifts down compared with the other



Left: Normal. Right: One-sided motor weakness (right arm).

Abnormal Speech (have the patient say “you can’t teach an old dog new tricks”):

- Normal—patient uses correct words with no slurring
- Abnormal—patient slurs words, uses the wrong words, or is unable to speak

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

Modified from Kothari RU, Pancioli A, Liu T, Brott T, Broderick J. Cincinnati Prehospital Stroke Scale: reproducibility and validity. *Ann Emerg Med.* 1999;33:373-378. With permission from Elsevier.

STROKE SEVERITY SCALE: CINCINNATI STROKE TRIAGE ASSESSMENT TOOL (CSTAT)

*CSTAT positive if score is 2 or greater

ITEM	SCALE DEFINITION
CONJUGATE GAZE DEVIATION	<p>Normal: Absent</p> <p>Abnormal: Present—2 points</p>
LEVEL OF CONSCIOUSNESS FOLLOWS COMMANDS	<p>Normal: Answers questions correctly (Age or current month) AND Follows commands (close eyes, open and close hands)</p> <p>Abnormal: Incorrectly answers at least one question AND does not follow at least one command—1 Point</p>
ARM WEAKNESS	<p>Normal: Holds arms up for 10 seconds</p> <p>Abnormal: Cannot hold arms (either right, left or both) up for 10 seconds before arm(s) falls to bed—1 Point</p>

Stroke Assessment Apps-Fast-ED

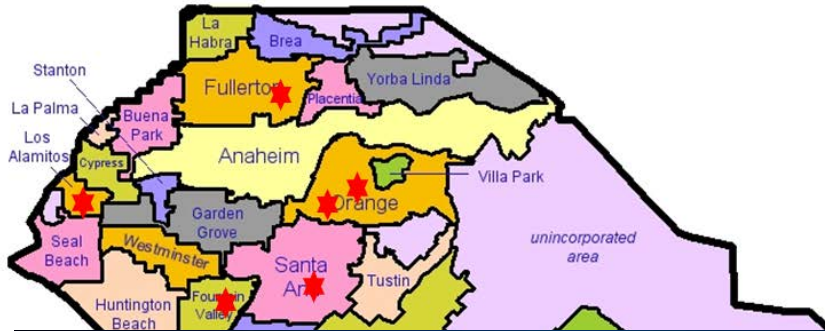


FAST ED ANTICOAGULANTS	ANTICOAGULANTS OLDER THAN 80	OLDER THAN 80 TIME SYMPTOMS STARTED	TIME SYMPTOMS STARTED LAST SEEN WELL
IS THE PATIENT ON ANTICOAGULANT / BLOOD THINNERS?	HOW OLD IS THE PATIENT?	DID ANYONE SEE WHEN THE SYMPTOMS STARTED?	WHAT TIME WAS THE PATIENT LAST SEEN WELL?
		YES, ENTER TIME	YES, ENTER TIME

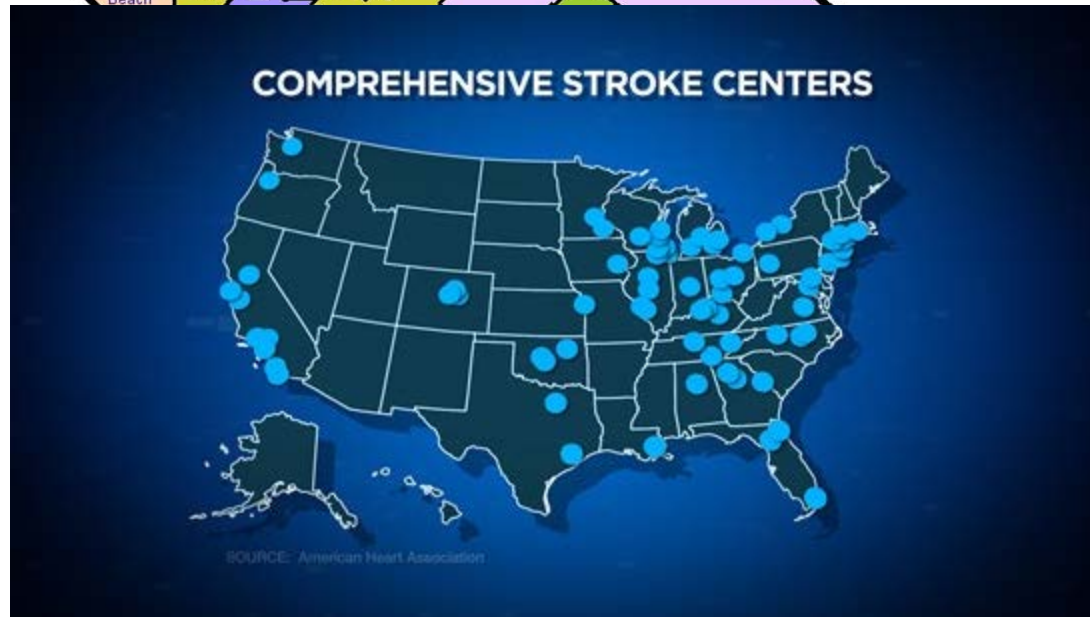
<p>11:13 PM 28%</p> <p>EYE DEVIATION ASSESSMENT</p> <p>FAST ED SCORE = 3</p> <p>Large Vessel Occlusion Probability ~30%</p> <p>The assessment indicates that the patient should be taken to the closest stroke center.</p> <p>Go to closest Stroke center</p>	<p>11:09 PM 29%</p> <p>EYE DEVIATION ASSESSMENT</p> <p>FAST ED SCORE = 7</p> <p>Large Vessel Occlusion Probability ~60%-80%</p> <p>The assessment indicates that the patient should be taken to the closest Comprehensive stroke center (CSC).</p> <p>Critical</p> <p>Go to Comprehensive Stroke Center</p>	<p>11:10 PM 28%</p> <p>ASSESSMENT</p> <p>OK</p> <p>Map showing Atlanta area with hospitals listed:</p> <ul style="list-style-type: none"> Emory University Hospital: 14 mins 6.9 km Grady Memorial Hospital: 20 mins 18.2 km Well Star Kennestone Hospital: 32 mins 41.4 km 	<p>11:10 PM 28%</p> <p>BACK YOUR ROUTE</p> <p>Map showing a route from Atlanta to Decatur.</p>
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<p>Some patients will follow your face better than your finger so can try that instead.</p> <p>NORMAL No deviation, eyes move to both sides equally. (Score: 0)</p> <p>GAZE PREFERENCE patient has clear difficulty when looking to one side(left or right). (Score: 1)</p> <p>FORCED DEVIATION Eyes are deviated to one side and do not move to the other side (e.g. cannot follow finger). (Score: 2)</p>	<p>NORMAL The patient recognizes the weakness (Score: 0)</p> <p>ABNORMAL The patient is weak but does NOT recognize the weakness (Score: 1)</p>	<p>NORMAL Patient recognizes his/her weak arm. (Score: 0)</p> <p>ABNORMAL Patient does NOT recognize his/her weak arm. (Score: 1)</p>
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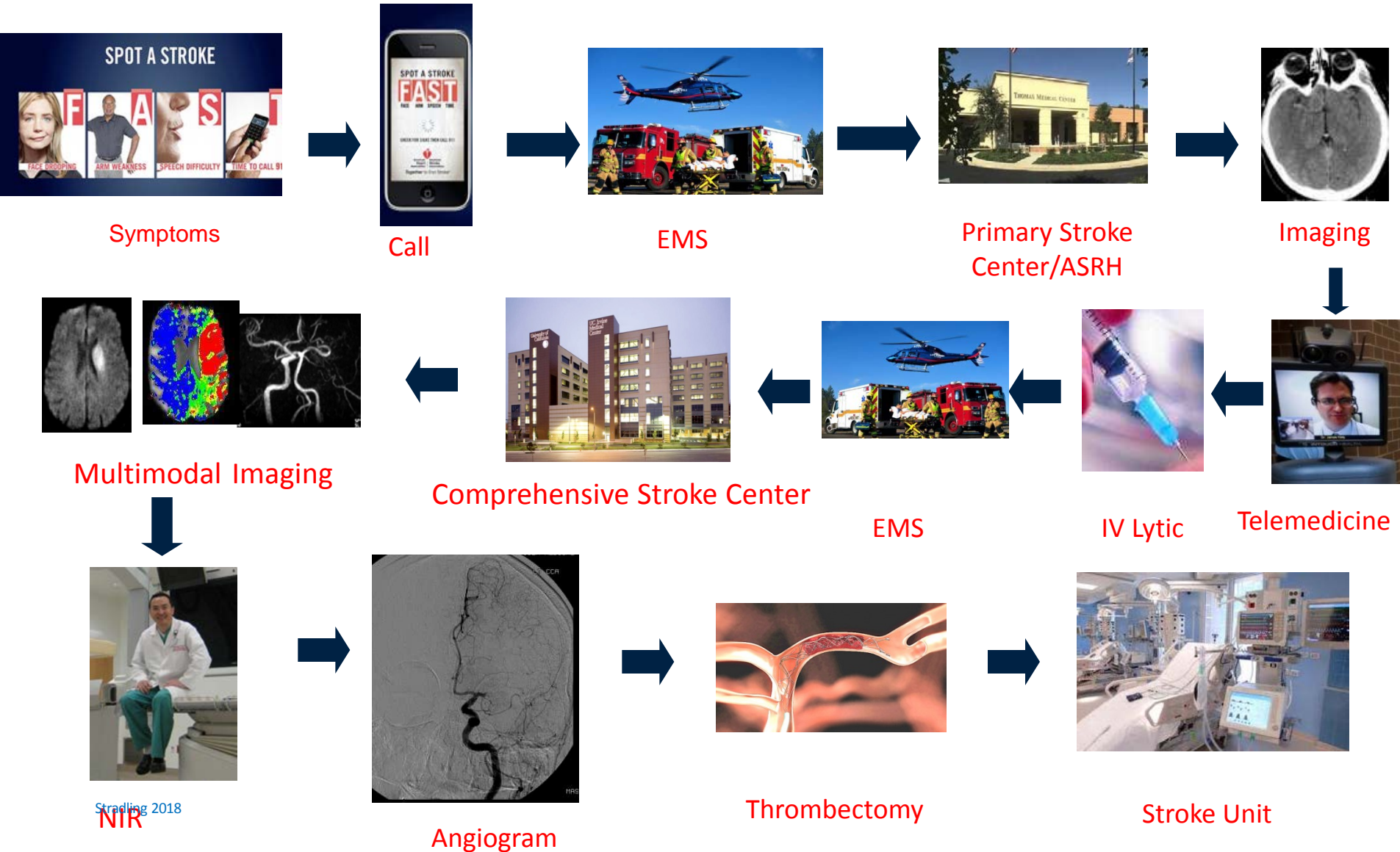
Stroke Systems of Care Vary



There is no one size fits all stroke system. Some Counties rely on ASRH's for their rapid assessment, tPA administration and quick transfer.



Example of a Stroke System of Care in Many Counties



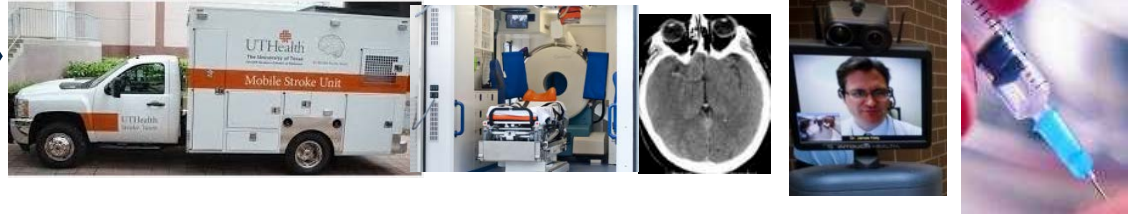
Future Stroke System of Care?



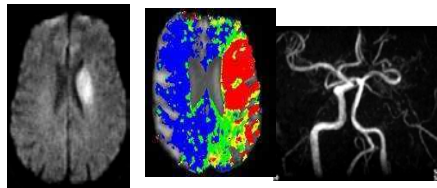
Symptoms



Call



Mobile Stroke Unit with CT Imaging Capability/Telemedicine/IV Lytic



Multimodal Imaging



Comprehensive Stroke Center



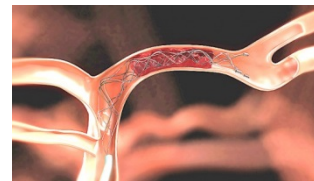
Primary Stroke Center



Stradling 2018
NIR



Angiogram



Thrombectomy



Stroke Unit

Mobile Stroke Unit



- Mobile stroke units seem revolutionary
- The hope is that the mobile units will improve outcomes for selected stroke patients
- Expensive and some research shows perhaps financially not-sustainable- The newest stroke units cost an estimated \$1.2 million, which does not include the cost to operate and sustain them.

Future Stroke System of Care?



Symptoms



Call 9-1-1



EMS- Fast ED App



IV tPA



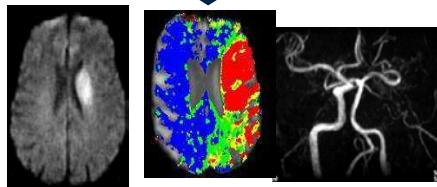
Head CT



Comprehensive Stroke Center



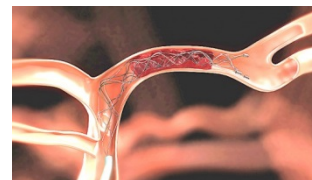
Primary Stroke Center



Multimodal Imaging



Neuro IR



Thrombectomy



Stroke Unit

Let's Not Forget About Hemorrhagic Stroke

- ICH and SAH are highly morbid conditions with case fatality rates of 40% to 50%. The Brain Attack Coalition has advocated for creation and certification of specialized comprehensive stroke centers to manage these complex patients.
- Patients treated at CSCs were significantly more likely to receive neurosurgical and/or endovascular treatment for their stroke.
- Patients with hemorrhagic stroke admitted to CSCs had significantly lower adjusted mortality than those admitted to PSCs and Non Stroke Centers.

Stroke

Comprehensive Stroke Centers May Be Associated With Improved Survival in Hemorrhagic Stroke

James S. McKinney, MD^{1,2}; Jerry Q. Cheng, PhD²; Ig
John B. Kostis, MD², the Myocardial Infarction Data Acquisition System (MIDAS
22) Study Group

Received September 16, 2014.
Accepted March 20, 2015.

Thank you!

Questions?



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