

Current Issues in Stroke Systems Development



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Objectives

- Review AHA/JC Stroke Center Classifications
- Discuss recent evidence in favor of endovascular treatment for certain strokes
- Discuss the role of EMS and state stroke systems in optimizing patient destination and treatment decisions
- Discuss Utah's Stroke System Development



Stroke by the Numbers

1 cause of disability among adults in the US

795,000
Americans each year suffer a stroke

33-40%
are large-vessel occlusion (LVOs)^{1,2}

5

cause of death among adults in the US

KILLS 128,000
people a year—that's about 1 out of every 19 deaths

EVERY 40 SECONDS
someone has a stroke

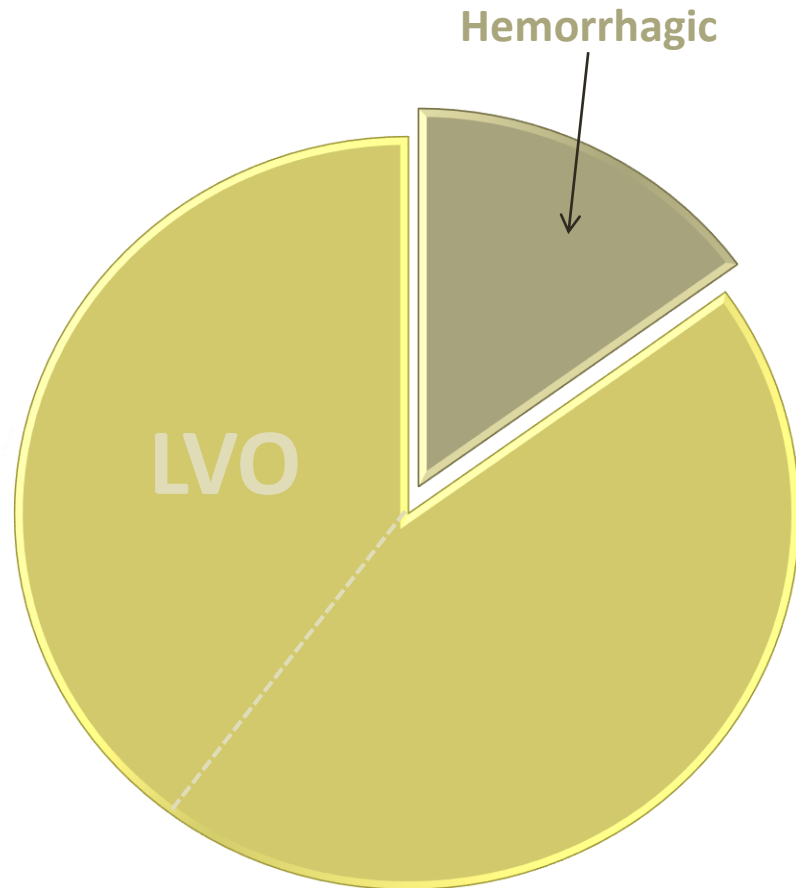
Statistics from: AHA/ASA, https://www.heart.org/HEARTORG/General/Heart-and-Stroke-Association-Statistics_UCM_319064_SubHomePage.jsp; CDC, <http://www.cdc.gov/stroke/facts.htm> (03/15); WHO, http://www.who.int/topics/cerebrovascular_accident/en/.

1. Skagen K, et al. *J Stroke Cerebrovasc Dis*. 2015;24(7):1532-1539.
2. Turc G, et al. *Stroke*. 2016;47:1466-1472.



Stroke Types

- **Ischemic 87%**
 - Embolic
 - Large vessels
 - Small vessels
 - Others
- **Hemorrhagic 13%**
 - ICH
 - SAH



Current Stroke Certifications



**The Joint
Commission®**



**American Heart
Association®
American Stroke
Association®**

CERTIFICATION

Meets standards for

Comprehensive Stroke Center



**The Joint
Commission®**



**American Heart
Association®
American Stroke
Association®**

CERTIFICATION

Meets standards for

Primary Stroke Center



**The Joint
Commission®**



**American Heart
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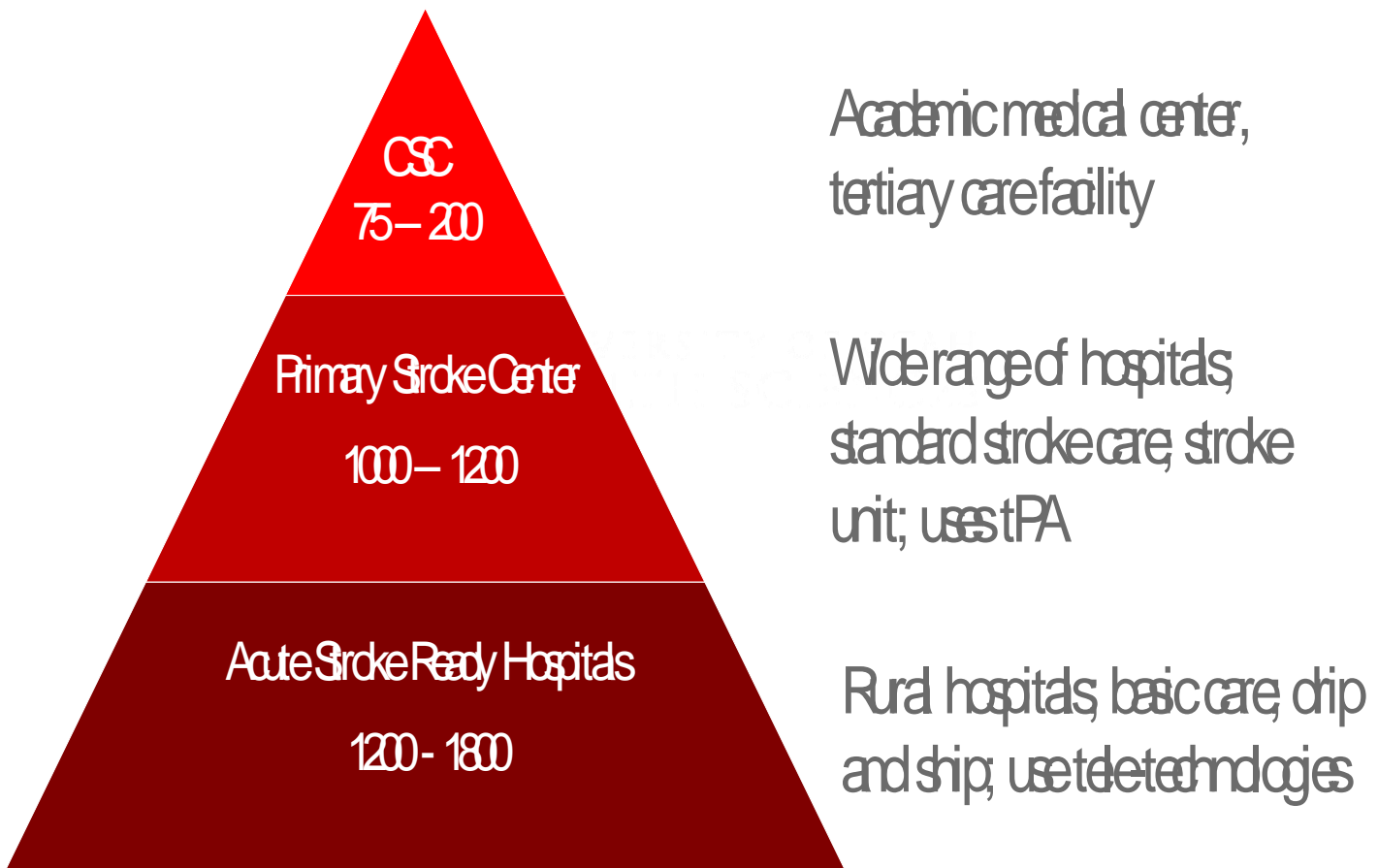
CERTIFICATION

Meets standards for

Acute Stroke Ready Hospital



Models of Stroke Care: Characteristics Of Different Stroke Centers

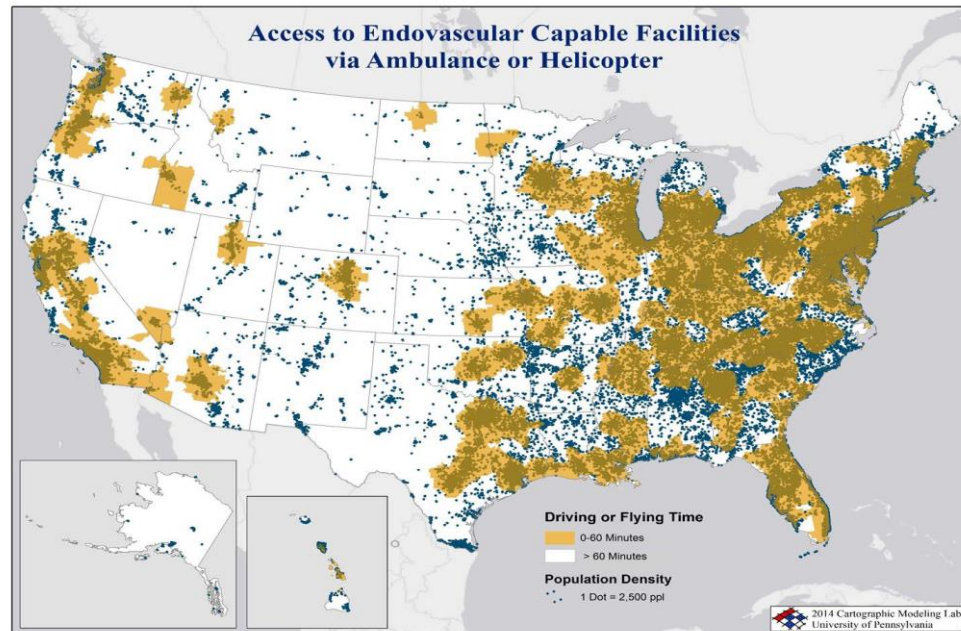
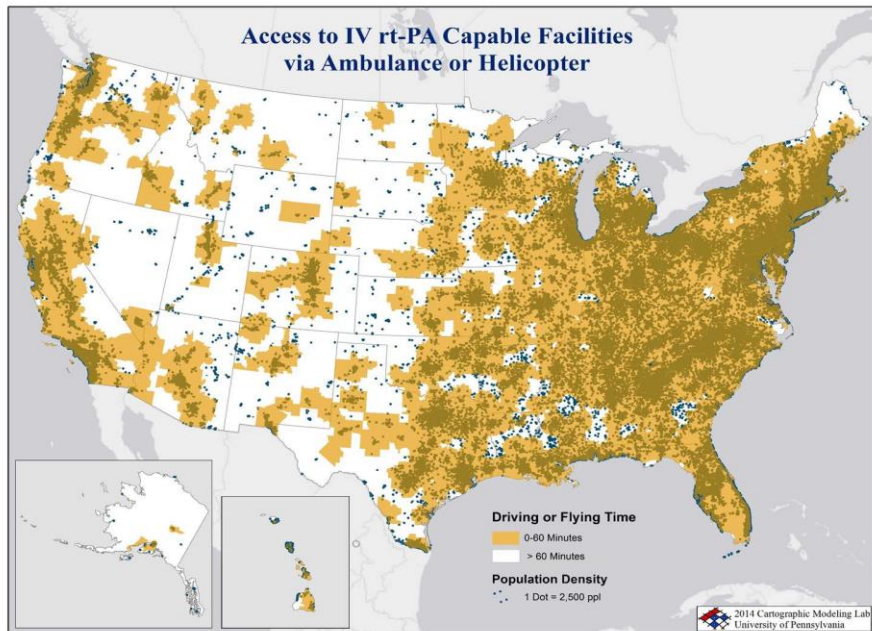


Acute Stroke Ready Hospital (ASRH)

- Joint Commission and American Heart Association Criteria
- A dedicated stroke-focused program.
- Staffing by qualified medical professionals trained in stroke care.
- Collaboration with the local Emergency Management Systems (EMS) that encourages training in field assessment tools and communication with the hospital prior to bringing a patient with a stroke to the hospital.
- 24/7 ability to perform rapid diagnostic and laboratory testing.
- Ability to administer intravenous clot-busting medications to eligible patients.
- Availability of telemedicine technology.
- Use of transfer agreements/protocols with facilities that provide primary or comprehensive stroke services.



Geographical Limitations



By ground:

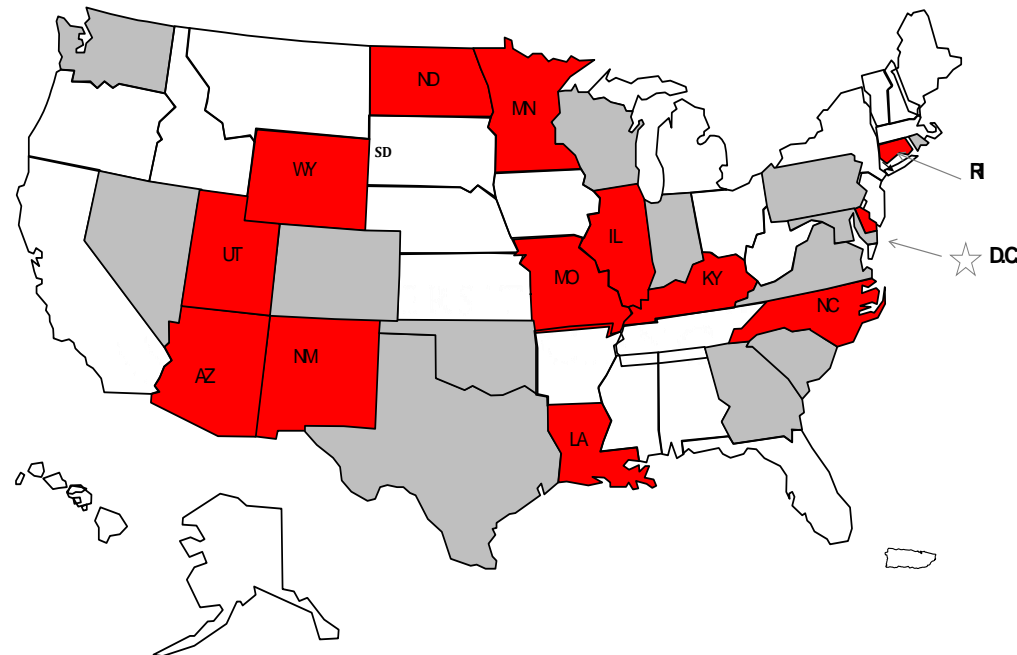
81% of the US population had 60-minute access to IV rt-PA capable hospitals
66% had access to PSCs

By ground

56% of US population have access to endovascular capable hospital

AHA/ASA: Expanded Systems of Care

12 states and DC have enacted policies around the recognition of stroke facility designations



Large-Vessel Occlusions (LVOs):

- Common: 33% to 40% of all ischemic stroke^{1,2}
- Severe: 5x higher mortality; 3-fold reduction in good outcome
- Respond poorly to intravenous thrombolytic (IV t-PA)
- Successful opening of occlusion by IV t-PA³
 - Distal M1, M2, M3, and M4: 78% to 86%
 - Carotid terminus: ~28%

t-PA, tissue plasminogen activator.

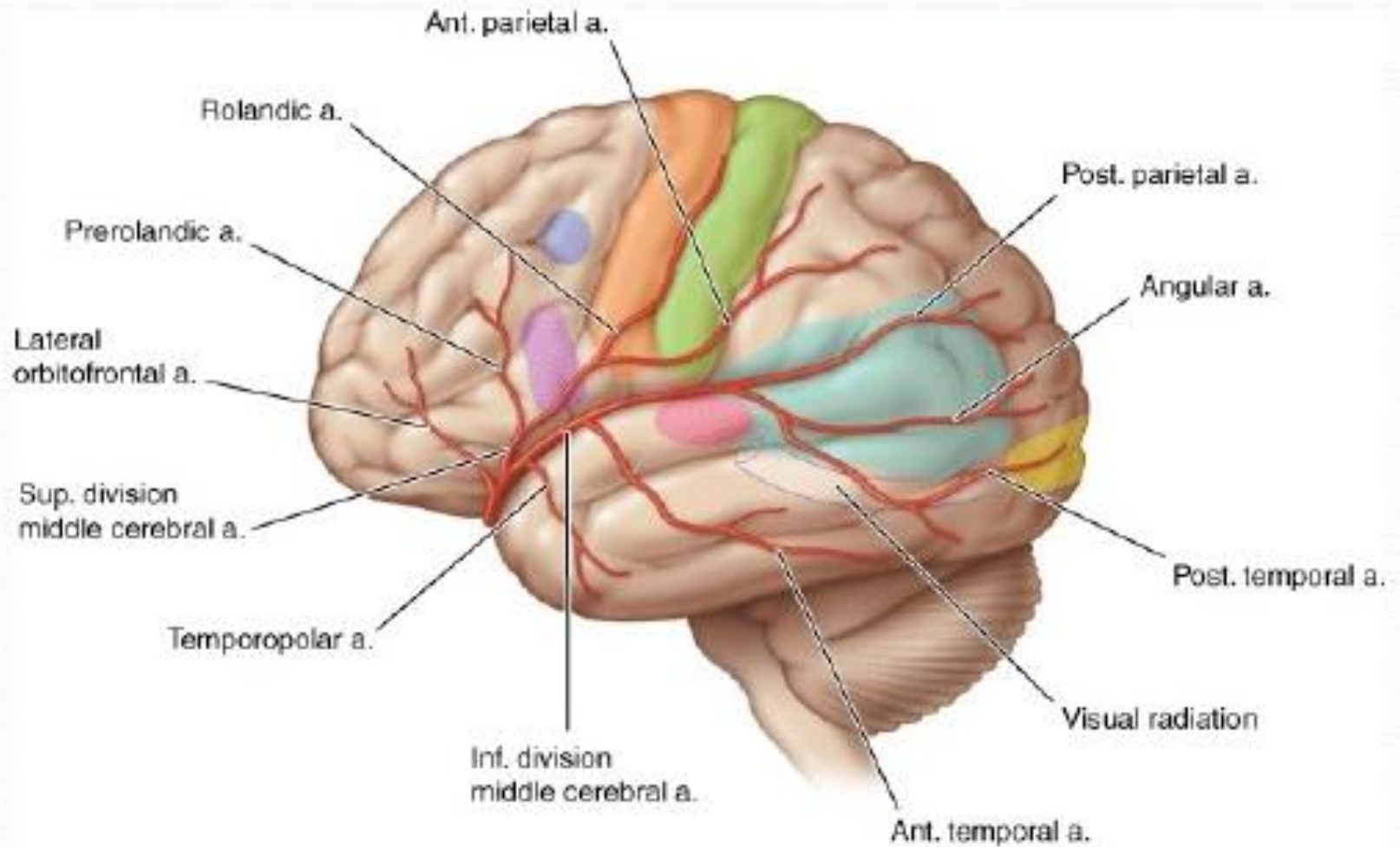
1. Skagen K, et al. *J Stroke Cerebrovasc Dis*. 2015;24(7):1532-1539.

2. Turc G, et al. *Stroke*. 2016;47:1466-1472.

3. Demchuck AM, et al. *Neuroradiol*. 2014;273(1): 202-210.



Middle Cerebral Artery



KEY

Broca's area	Sensory cortex	Auditory area	Motor cortex
Contraversive eye center	Wernicke's aphasia area	Visual cortex	

Stroke Systems Of Care- EMS Transport Protocol

- Challenges

- What role can EMS play in rapidly identifying patients with LVAO?
- Which stroke severity screen should be utilized?
- What role do PSC and ASRH play in an Endovascular world?
- When should patients be transported straight to a CSC?
- Should PSCs and ASRHs be bypassed in favor of CSCs?
- How can we fully utilize the ENTIRE Stroke System of Care?
- Drip and Ship or straight to the Mother Ship?

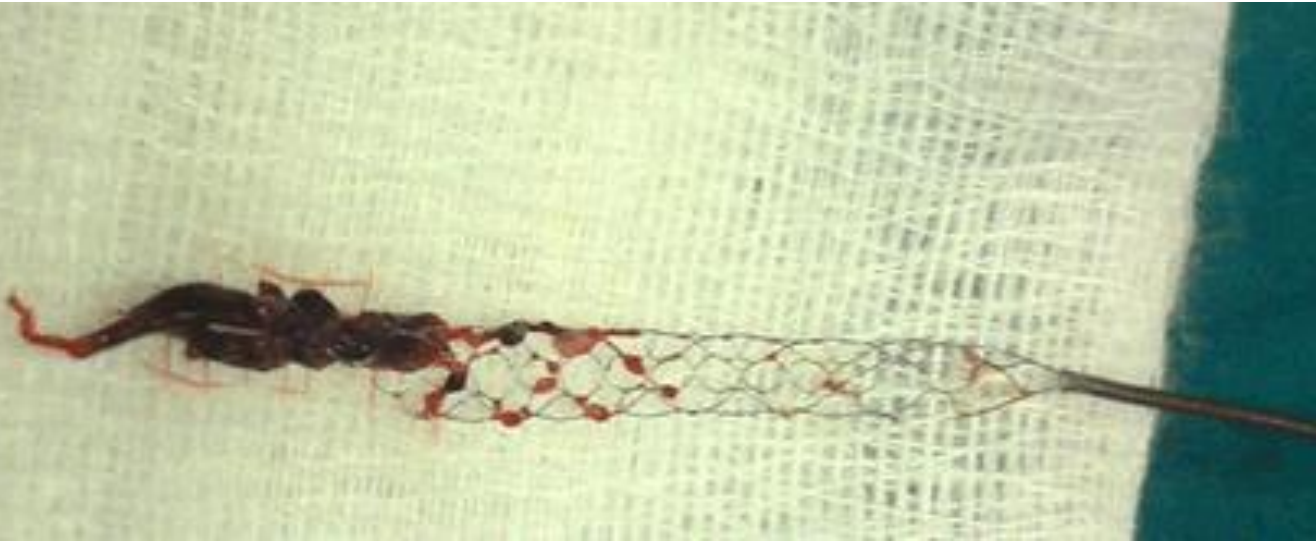
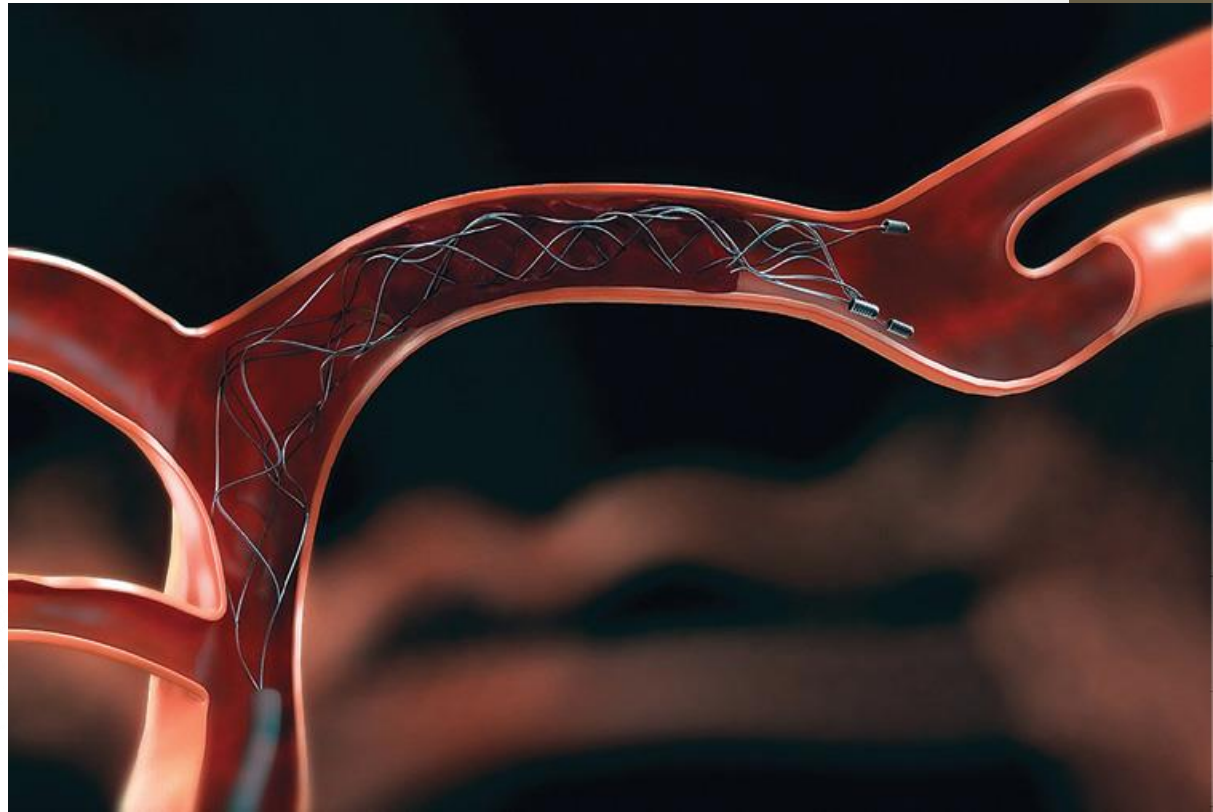
Acute Ischemic Stroke: Treatment Options

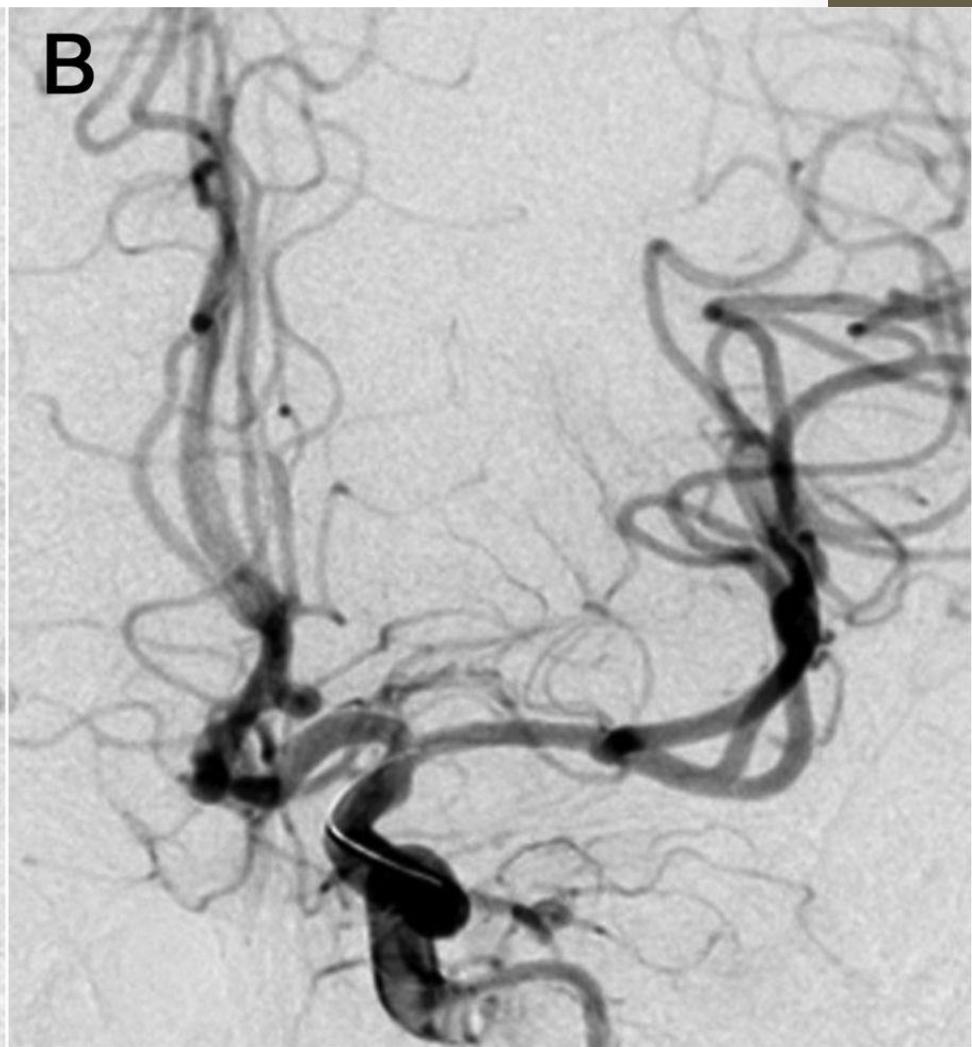
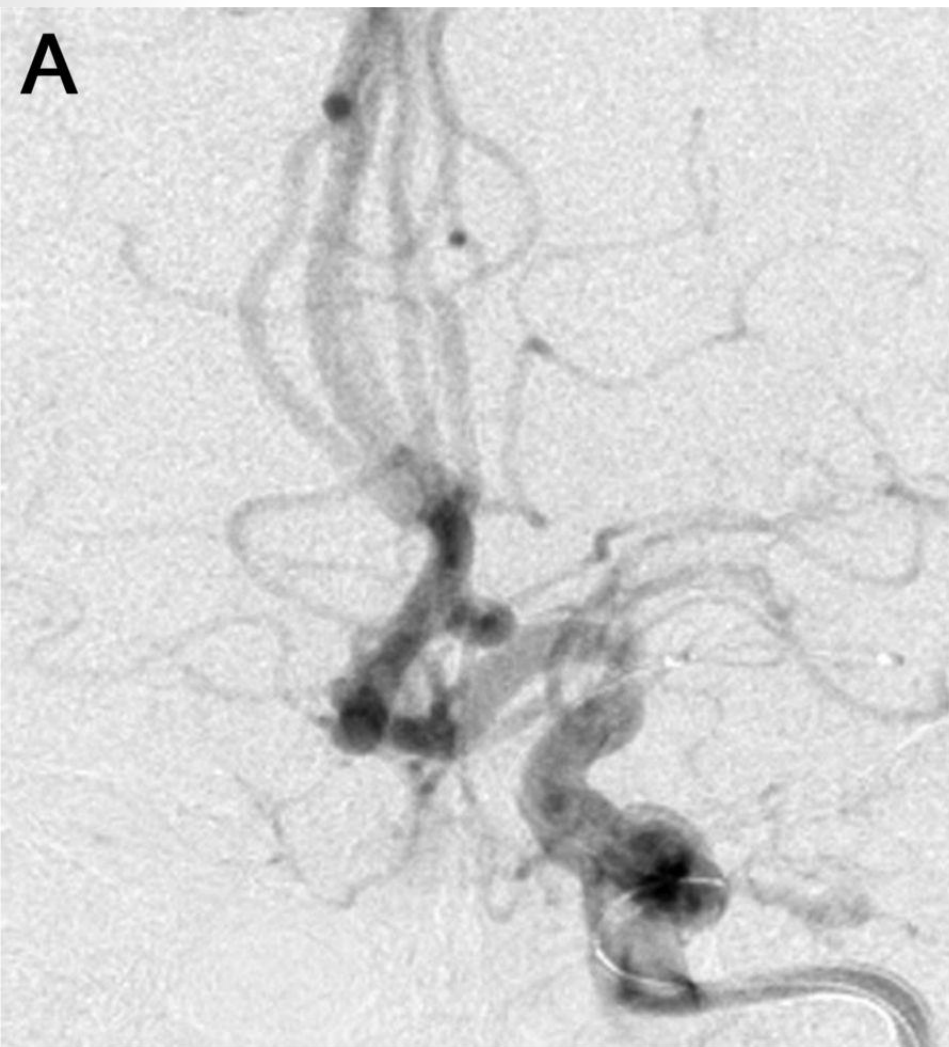
Medical Management

- IV t-PA is the thrombolytic drug used in stroke patients
- Patients must be within the time window of 0 to 3 hours from symptom onset
- There are other contraindications associated with use of the drug as well

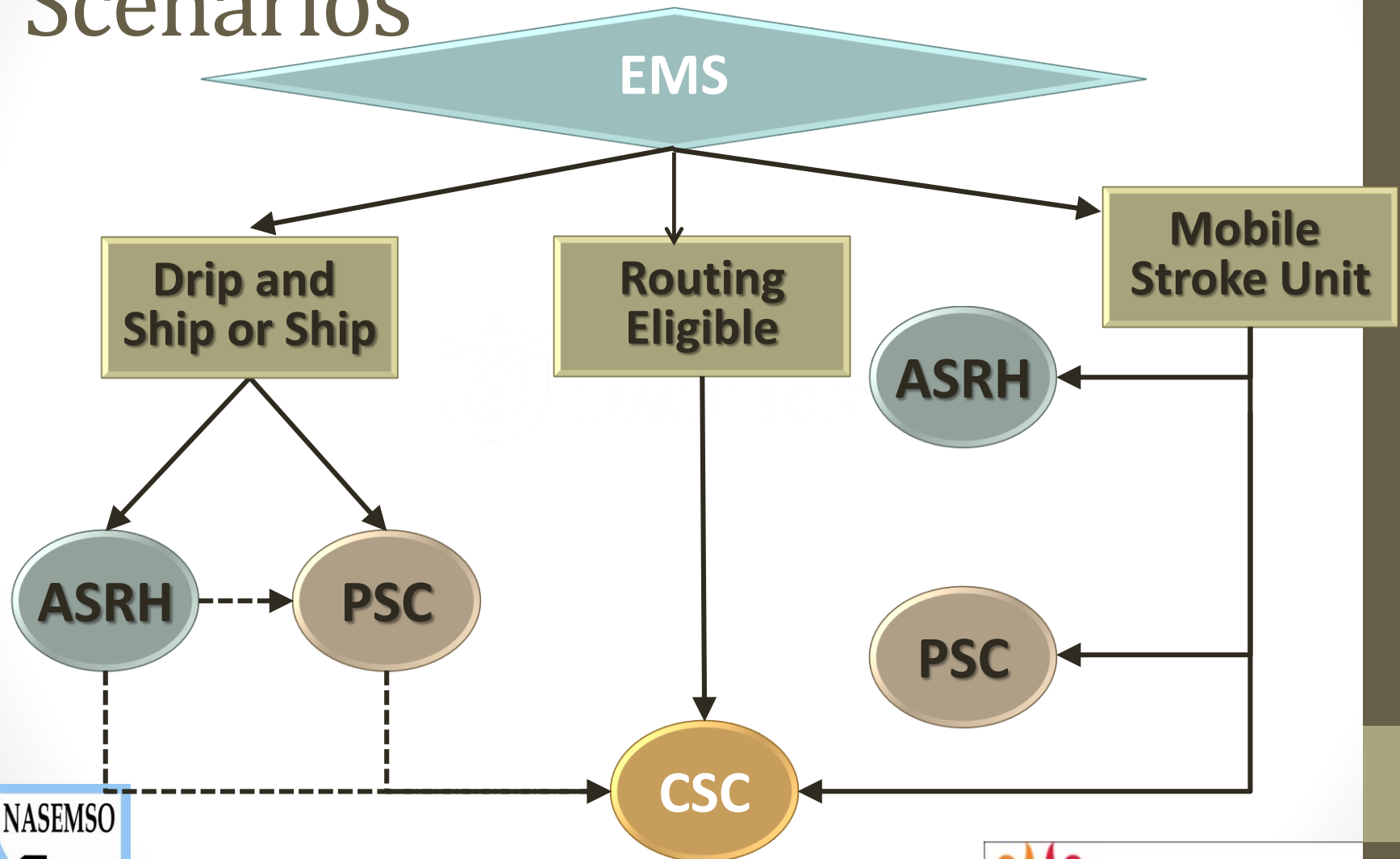
Mechanical Thrombectomy

- This procedure uses a stent retriever that is placed in the occluded vessel through a catheter placed in the groin
- The time window for mechanical thrombectomy is up to 6 hours from symptom onset
- If the patient fails IV t-PA or is ineligible for IV t-PA, he/she may be eligible for mechanical thrombectomy





Stroke Triage and Destination Scenarios



Stroke Severity Scales

Score Scale	Strengths	Weaknesses
Los Angeles Motor Scale (LAMS)	<ul style="list-style-type: none"> ▪ Pure motor: easy to teach and perform ▪ High interrater reliability ▪ Fast: 20 to 30 seconds to perform ▪ Predicts LVO ▪ Correlated to NIHSS scores ($r=0.75$) ▪ Performed by prehospital providers 	<ul style="list-style-type: none"> ▪ Not validated ▪ Facial droop interrater reliability ▪ Caveat (present or absent)
3-Item Stroke Scale (3ISS)	<ul style="list-style-type: none"> ▪ Prospective (171 patients) ▪ Fast: 20 to 30 seconds ▪ Easy to perform ▪ Reproducible; intraclass correlation coefficient (ICC): 0.947 ▪ Performed by stroke doctors ▪ Correlation with NIHSS: 0.954 ▪ Only on 20 patients 	<ul style="list-style-type: none"> ▪ Moderate sensitivity for LVO ▪ Not validated ▪ Low derivation population ▪ Not evaluated by EMS or in the prehospital setting
Rapid Arterial Occlusion Evaluation (RACE)	<ul style="list-style-type: none"> ▪ Derivation population: 654 ▪ Validated in prehospital setting ▪ 357 patients ▪ Weights both hemispheres equally ▪ Most similar to NIHSS ▪ High sensitivity 	<ul style="list-style-type: none"> ▪ Weakness both arms ▪ Longest scale ▪ Only LVO
Cincinnati Stroke Triage Assessment Tool (C-STAT)	<ul style="list-style-type: none"> ▪ Largest derivation/validation cohort ▪ Weighted scale: gaze getting 2 points ▪ Classification and regression tree (CART) analysis and neuroanatomy ▪ "Present" or "Absent" questions ▪ Not a graded analysis ▪ Fast: <1 minute ▪ High sensitivity ▪ Ongoing, prospective EMS study 	<ul style="list-style-type: none"> ▪ Moderate specificity of LVO

Nazliel B, et al. *Stroke*. 2008;39:2264-2267; Llanes J, et al. *Prehosp Emerg Care*. 2004;8(1):46-50; Singer O, et al. *Stroke*. 2005;36:773-776; Perez de la Ossa, et al. *Stroke*. 2014;45(1):87-91; Katz BS. *Stroke*. 2015;46:1508-1512.

Lessons Learned from Utah's Stroke System Development

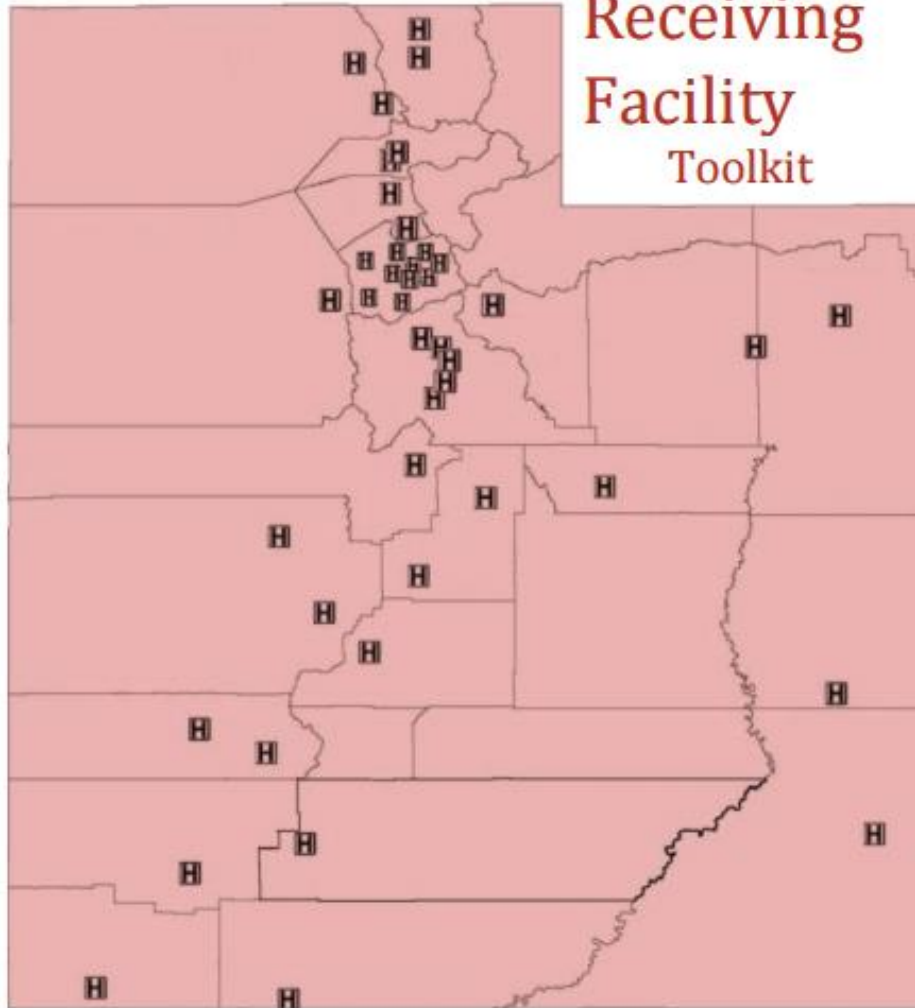
- Inclusive system
- Avoid bypass, especially in rural areas: raise the level of care in all hospitals
 - Only 50% of strokes arrive by EMS
- Voluntary
- Criteria for Utah Stroke Receiving Facility very similar to AHA/JC ASRH
- Partner with hospital association
- Keep knocking on the doors of uncertified hospitals
 - “How can we help you meet the criteria?”
- Toolkit



Utah SRF Toolkit

www.health.utah.gov/ems/stroke

Stroke
Receiving
Facility
Toolkit



Utah State Stroke System



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Questions?

