Stroke Systems of Care:

"The Whole is Greater Than the Sum of the Parts"

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Disclosures

- Research
  - NIH/NINDS — NeuroNext, Study Chair and Core DSMB
    ICECAP Study, Internal Safety Monitor
    SIREN, Chair External Oversight Committee
- Consulting — Senior Consultant, NC Dept. of Health Coverdell Program
  Rapid.AI, Medtronic
- State, National, International Organizations
  - AHA/ASA committees and writing groups
  - Joint Commission technical advisory panels
  - National Quality Foundation Neurology Standing Committee
  - NC Departments of Health Stroke Advisory Committees
  - Middle Eastern / North African Stroke Organization (MENASO)

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Objectives

- Review the current situation surrounding stroke
- Discuss creating regional stroke systems of care to optimize patient care
  - What is the current science driving stroke care?
  - What are the best practices for delivering optimal stroke care?
  - How to put all the pieces together in a system of care?
- Discuss the near future of stroke care and how we will be measured

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Why Should We Care?

- Despite advances, stroke is *not* going away
- Definitive treatments are now available and are effective *if available and delivered in a timely and coordinated manner*
- Current resources and organization may not be ideal
- Despite many obstacles, stroke systems of care can maximize opportunities for optimal outcomes

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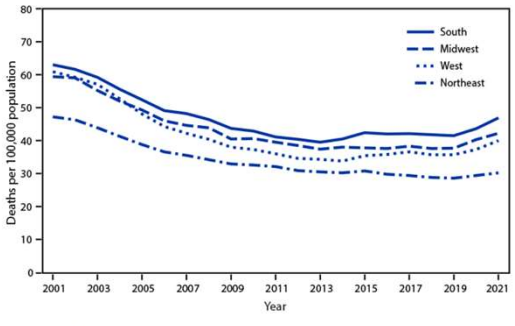
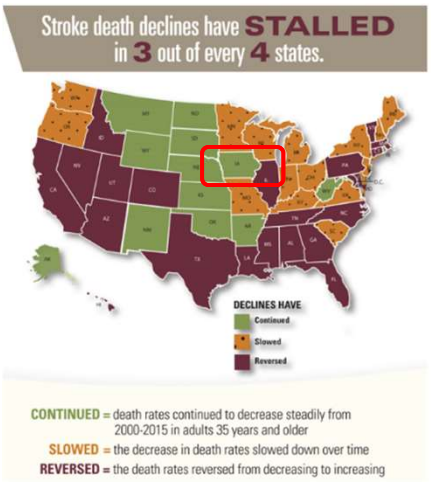
Progress Hard to Maintain



* Age-adjusted rates are based on the 2000 U.S. Census Bureau standard population.



(CDC MMWR, *QuickStats*. 2023;72(40):1099))

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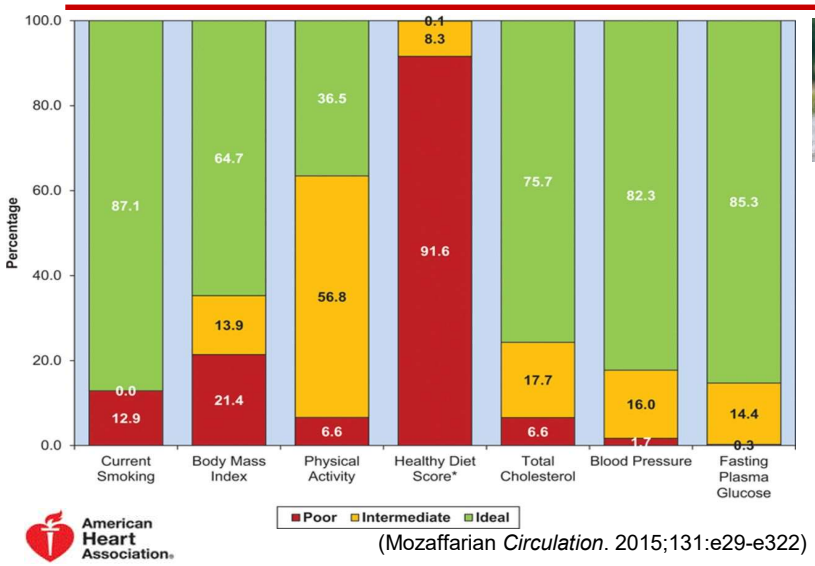
Prevalence (unadjusted) estimates for poor, intermediate, and ideal cardiovascular health for each of the 7 metrics of cardiovascular health in the American Heart Association 2020 goals, US children aged 12 to 19 years, National Health and Nutrition Examination Survey (NHANES) 2011 to 2012. *Healthy diet score data reflects 2009 to 2010 NHANES data.



Zombie Burger
Photo: Orchestrate Hospitality

American Heart Association.

(Mozaffarian *Circulation*. 2015;131:e29-e322)

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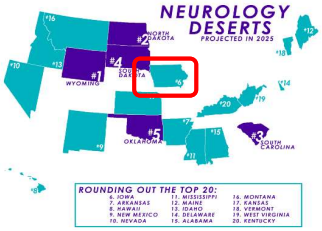
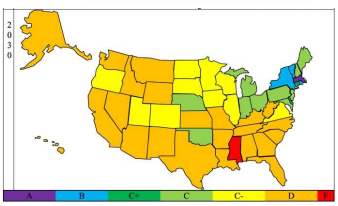
Future Access to Care

Can't Always Count on Local Expertise

- National demand for neurologists to increase from 18,180 in 2012 (11% shortfall) to 21,440 by 2025 (19% shortfall)





Publication | Article | February 17, 2022
NeurologyLive
February 2022 | Volume5 | Issue 1

The "Grave Threat" Posed by the Shortage of Neurologists

- Shortage of MDs in general, especially in rural areas

(Dall, Supply and Demand Analysis of the Current and Future US Neurology Workforce. *Neurology*. 2013:470–478)

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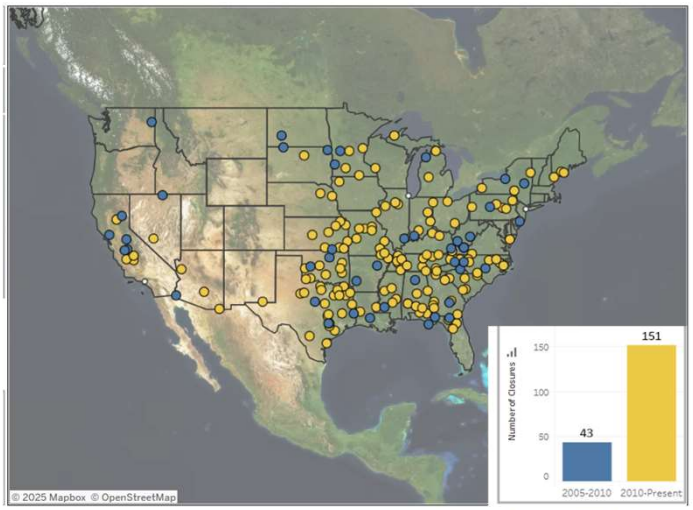
Future Access to Care

Pressures on Rural Hospitals



(UNC Shepp Center)

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Future Access to Care

Pressures on All EMS, Especially Rural Resources

A lack of EMTs in Iowa leads to less stable care for rural residents

Iowa Public Radio | By Kendall Crawford
Published April 6, 2022 at 5:23 PM CDT

HOME / NEWS / HEALTH CARE AND MEDICINE

'Broken system': Iowa's rural ambulance services strained

In some parts of Iowa, 911 callers can't be assured an ambulance will arrive

Recruitment and Retention

Plan to cut EMS positions, hire FFs causes debate among Iowa officials

Sioux City Mayor Bob Scott opposes to going to a firefighter-based EMS model

January 24, 2024 10:20 AM

Why you can trust The Gazette

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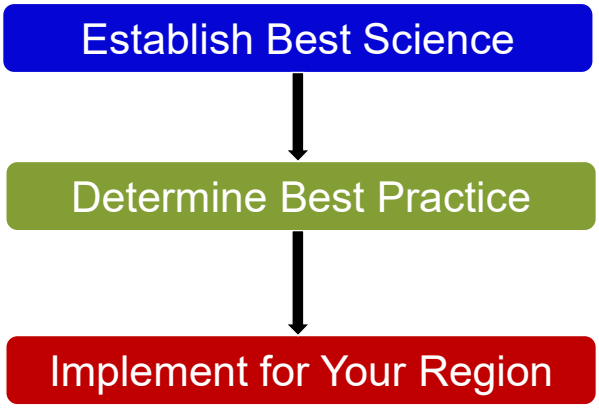
Science Translation: From Bench to Bedside



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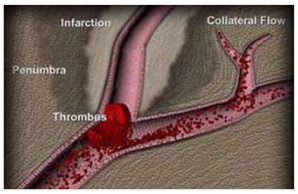
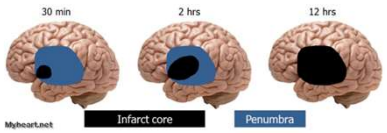
Lessons to Learned Over 20 Years

- Reperfusion critical
  - Minimize delay
  - Maximize penumbral salvageability
- Time to reperfusion
  - Predicts clinical outcomes
  - Significant tolerance-heterogeneity in populations
  - Drives system development
  - *The tissue clock is now cool*





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Time to Treatment

STTC and HERMES Collaborations

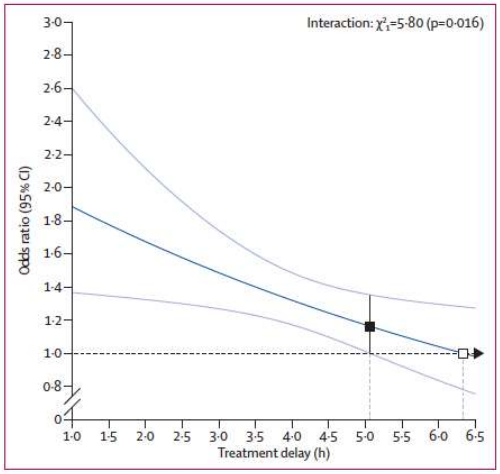
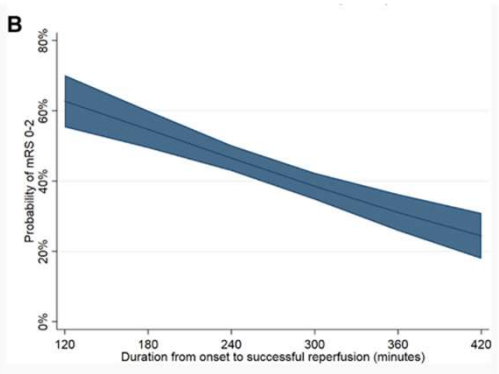


Figure 1: **Effect of timing of alteplase treatment on good stroke outcome (mRS 0–1)**



(Mulder. *Circulation*. 2018;138:232-240)
(Saver. *JAMA*. 2016;316(12):1279-1288)

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Impact of Interventions

Intervention	NNT	Outcome
Fibrinolysis (alteplase)		
0 – 90 mins	3 – 5	mRS 0,1
90 – 180 mins	4 – 9	(NINDS 8 for mRS 0,1)
180 – 270 mins	8 – 14	(ECASS III 14 for mRS 0,1)
Mechanical thrombectomy	2 – 4	Improved disability
	3 – 4	Functional independence (mRS 0,1)
Stroke unit care	10 – 25	Functional independence
	50	Life saved
STEMI – Thrombolytics	43	Life saved if within 6 hrs; 200 from 12-24 hrs

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So, If Time Matters for the Brain

- Focus on what matters, *timely:*
  - Stroke recognition and action
  - EMS activation and transport
  - Initial reperfusion strategies
  - Initiation of secondary prevention strategies
  - Rehabilitation evaluation
  - Prevention of complications
  - Patient and family involvement

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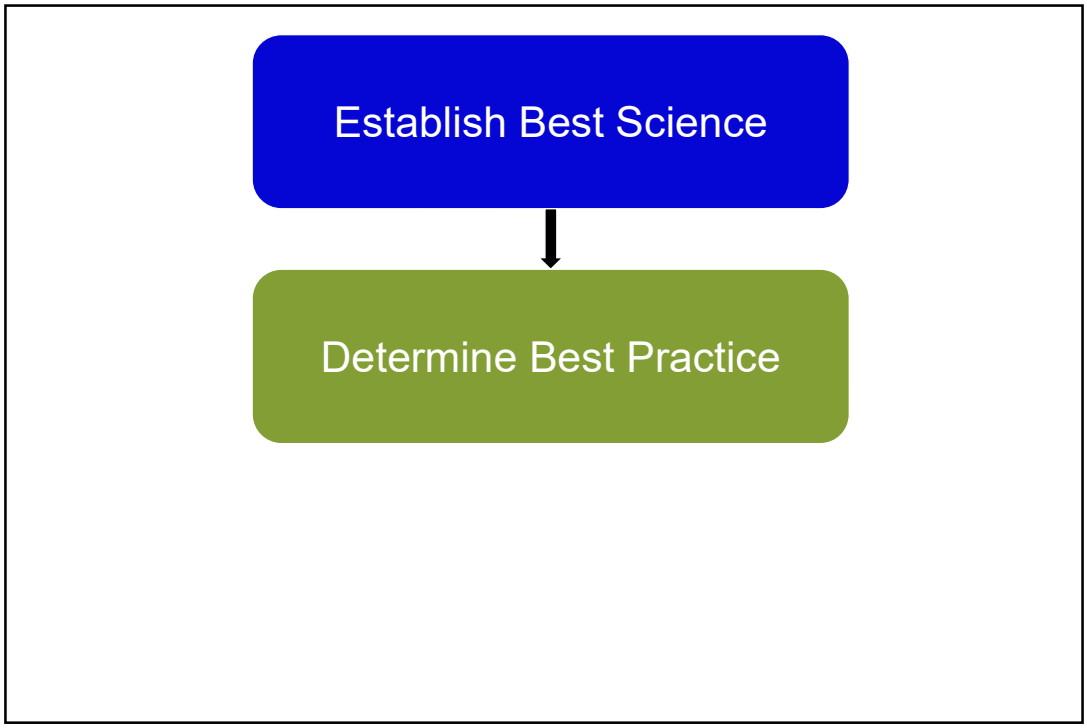

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Stroke Systems of Care
Why Should We Bother?

"A fully functional stroke system of care that reduces stroke-related deaths by just 2%-3% annually would translate to 20,000 fewer deaths in the US alone and 400,000 world-wide"

"As a result, post stroke disability would be reduced, and improve quality of life, increase efficiency use of healthcare resources, and reduce financial burden on patients and families, third party payers and governments"

(Higashida. *Stroke*. 2013; 44;2961-2984)

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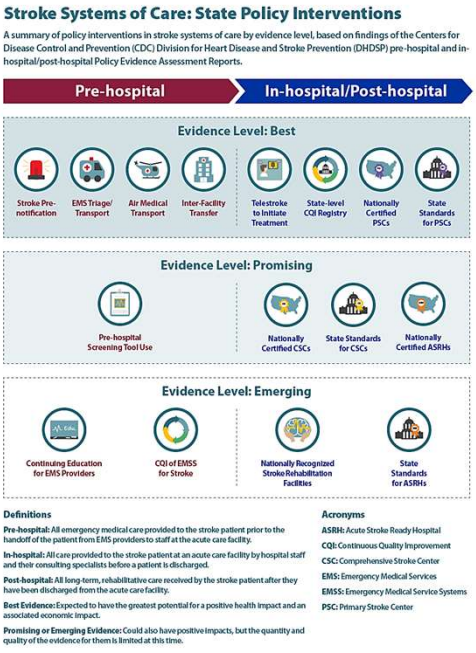
CDC

- A policy evidence assessment report of state policy interventions based typically on SAC addressed in at least one state law.
- Case studies underway



Centers for Disease Control and Prevention. Division for Heart Disease and Stroke Prevention. What is the Evidence for Existing State Laws to Enhance Pre-hospital Stroke Care? Atlanta, GA: Centers for Disease Control and Prevention; 2017.

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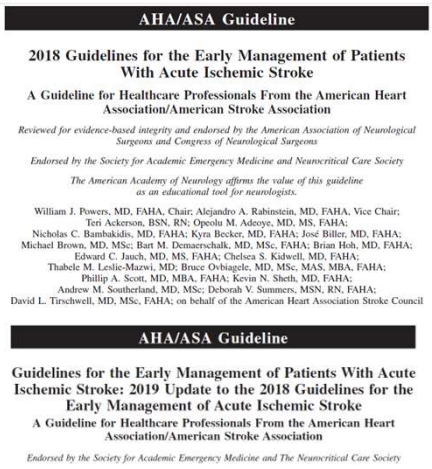
Best Practice Based on Science

Guidelines are Just That

- Guidelines tend to be lagging indicators of SOC but often define SOC.
- Know your local practices which may have "evolved" since the last publication.



(Powers, *Stroke.* 2019;50)

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Stroke Chain of Survival

- Detection: Early recognition
- Dispatch: Early EMS activation
- Delivery: Transport & management
- Door: ED triage
- Data: ED evaluation & management
- Decision: Neurology input, therapy selection
- Drug/Device: Thrombolytic & future agents
- Disposition: Admission or transfer

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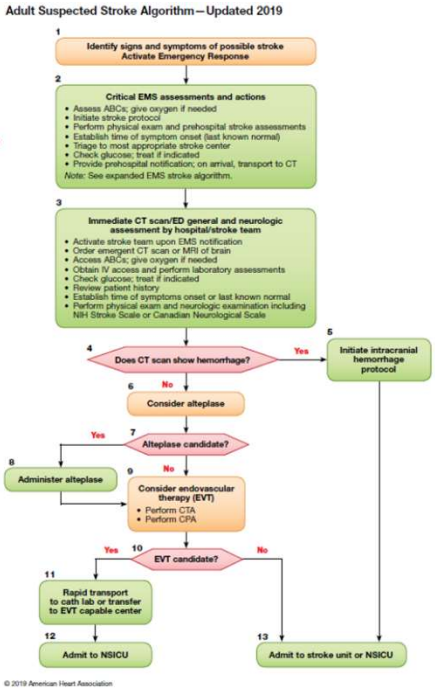
Stroke Pathway

- Incorporate
  - Target Stroke I, II, III
  - Mission Lifeline: Stroke
  - 2018 Guidelines
  - 2019 SSOC
  - 2020 ACLS
  - 2021 Consensus Statement



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Dispatch: 911
Delivery: Transport & Management
Door: Triage

- 911 dispatch / EMD for stroke
- EMS prehospital interventions
  - Neurologic evaluation
  - Stroke screens and scores
  - Time of onset / LKNW
  - Glucose
  - Early prehospital notification
  - Means of transport (air medical?)
- Triage to *appropriate* stroke center by local protocol

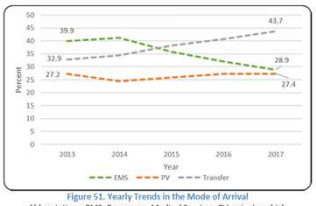

Figure 51. Yearly Trends in the Mode of Arrival
Abbreviations: EMS=Emergency Medical Services, PV=private vehicle

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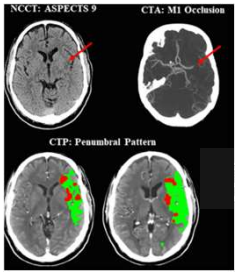
Door: Emergent Triage
Data: Emergent Evaluation



(Wannamaker, *Stroke*. 2018;49(6))

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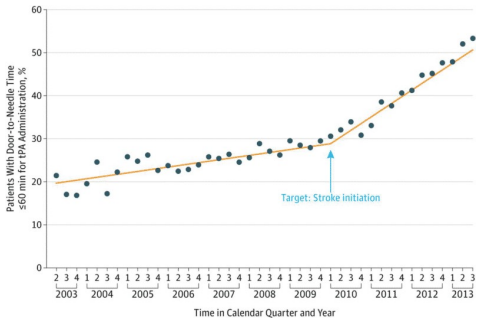
The Process and Practice

- ED Interventions proven to work

EMS prehospital notification
Stroke tools and tool kits
Rapid triage protocol and stroke team notification
Single call activation system
Direct transfer to CT scanner
Rapid CT and interpretation
Rapid laboratory testing / POC
Mix rtPA ahead of time
Rapid access & rtPA initiation
Team-based approach
Prompt data feedback



(Fonarow, *JAMA*. 2014;311:1632-1640)

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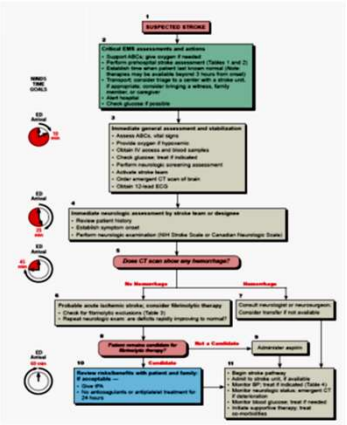
NINDS and ACLS Recommendations

Time Goal	2010	2020
Door to MD	~~10~~	0
Door to Stroke Team	~~15~~	0
Door to CT	~~25~~	0
Door to Drug	~~60~~	45
Door to Device		60
Door in Door out		60
Door to Admission	~~180~~	90



(Jauch, ACLS Stroke 2010)
(NINDS National Symposium on Acute Stroke, 2003)

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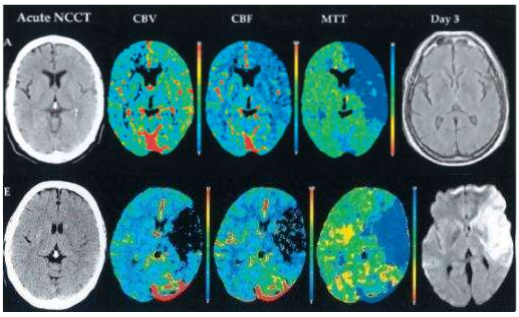
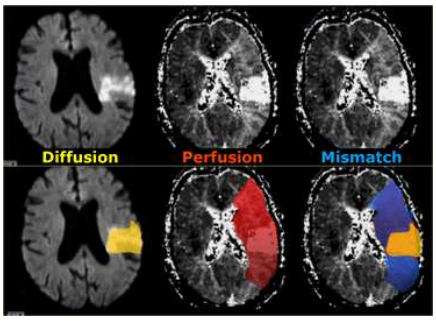
Imaging Selection for Reperfusion





A ↑CBV ↑MTT with recanalization → small stroke

E ↓CBV ↑MTT → big stroke

(Majda Thurnher, Medical University of Vienna)
(Parsons *Neurology* 2007;68:730–736)

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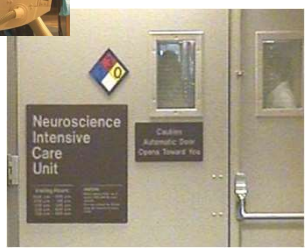
Decision: Team Approach
Drug: Drug, Device, Other



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Recanalization Strategies

- FDA cleared/reviewed interventions:
  - IV alteplase (0-3 hrs) Approved 1996
  - Thrombectomy devices Cleared for clot removal 2004
  - IV alteplase (3-4.5 hrs) Request denied 2012
  - Second generation EVT New guidelines in 2015, 2019
  - IV tenecteplase (0-3 hrs) FDA approved 2025

Time Window	0-3 hrs	3-4.5 hrs	4.5-6 hrs	6-24 hrs / Wakeup
Therapeutic Options	• Drug • Device	• Drug • Device	• Drug* • Device ("LVO")	• Drug* • Device*

* With "penumbral" selection

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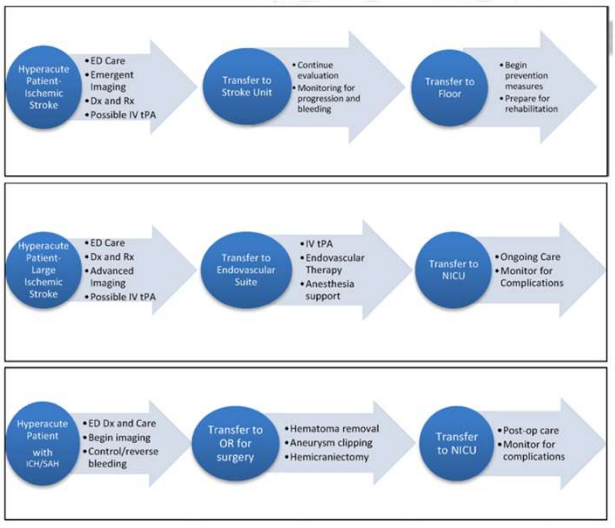
Disposition (Care Transition)



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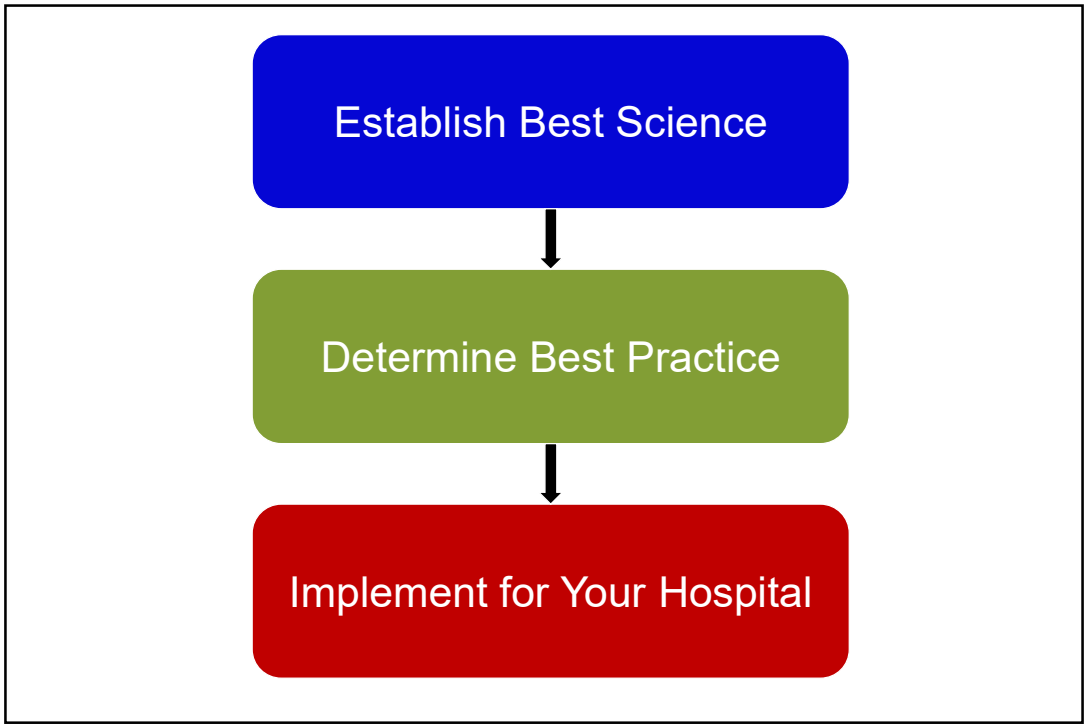

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Stroke Care in 2025

- It is simple
  - Build an *expert team*, not a team experts
- How to perform locally?
  - Do it based on data
  - Do it fast but safely
  - Do it as a team
  - Drive change through QI
  - Again share credit and publicize!

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What the System Needs From You

As an individual and a system:

- Availability
- Affability
- Ability
- Affordability
- Accountability

(photo by W. Eugene Smith)

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Learn From Industry – Toyota Value Stream Analysis

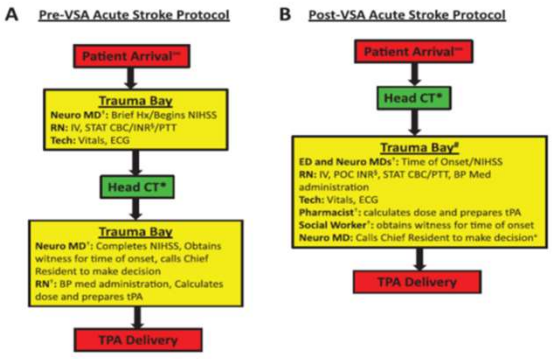

Table 2. Protocol Metrics and Outcomes Pre- and Post-VSA

	Pre-VSA January 1, 2009, to February 28, 2011 (N=132)	Post-VSA March 1, 2011, to March 1, 2012 (N=87)	*P* Value
Door-to-needle time, min*	60 [46–73]	39 [28–56]	<0.0001
Percent patients with DNT ≤60 min	52%	78%	<0.0001
Onset-to-needle time, min*	131 [105–165]	111 [80–158]	0.016
Door-to-CT time,†, min*	16 [10–22]	1 [0–4]	<0.0001
Door-to-CBC time,† min*	22 [16–29]	24 [17–34]	0.13
Door-to-PTT time,† min*	34 [29–42]	40 [31–47]	0.14
Symptomatic ICH	3.0%	3.4%	1.0
Favorable discharge location‡	76%	83%	0.24
90-d mRS 0 to 2§	49%	43%	0.34
Length of hospital stay, d*	4 [3–7]	3 [2–6]	0.056
Stroke mimic	6.8%	11.5%	0.33

(Ford *Stroke*. 2012;43:3395-3398)

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Target: Stroke - Strategies

- National QI to increase rates of DTN < 60 mins
  - 1030 GWTG-Stroke Hospitals
  - Pre 2003-2009 / Post 2010-2013
- Interventions

EMS prehospital notification
Stroke tools and tool kits
Rapid triage protocol and stroke team notification
Single call activation system
Direct transfer to CT scanner
Rapid CT and interpretation
Rapid laboratory testing / POC
Mix alteplase ahead of time
Rapid access & rtPA initiation
Team-based approach
Prompt data feedback

(Fonarow, *JAMA*. 2014;311:1632-1640)

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Target: Stroke

	Study Period		Adjusted Odds Ratio (95% CI)	*P* Value
	Preintervention (n = 27 319)	Postintervention (n = 43 850)		
tPA DTN time, median (IQR), min	77 (60-98)	67 (51-87)		< .001
tPA DTN time ≤ 60 min, % (95% CI)	26.5 (26.0-27.1)	41.3 (40.8-41.7)		< .001
End of each period	29.6 (27.8-31.5)	53.3 (51.5-55.2)		< .001
Improvement in tPA DTN time ≤ 60 min, % per year (95% CI)	1.36 (1.04-1.67)	6.20 (5.58-6.78)		< .001
In-hospital all-cause mortality, %	9.93	8.25	0.89 (0.83-0.94)	< .001
Discharge to home, %	37.6	42.7	1.14 (1.09-1.19)	< .001
Independent ambulatory status, %	42.2	45.4	1.03 (0.97-1.10)	.31
Symptomatic intracranial hemorrhage within 36 h, %	5.68	4.68	0.83 (0.76-0.91)	< .001

(Fonarow, *JAMA*. 2014;311:1632-1640)

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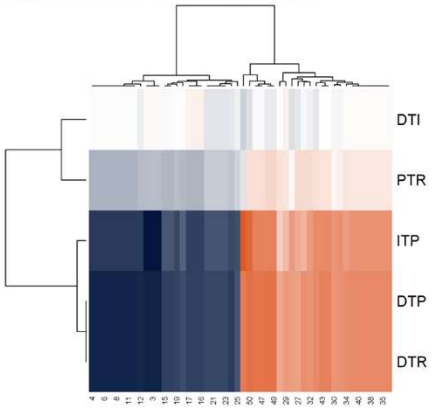
Look for System Best Practices

Hospital-bAsed Protocol to Standardize ThrombEctomy (HASTE)

Number	MT Protocol Component
1	Are blood labs run?: No, Never
2	What intra-arterial lytics are used at your facility for mechanical thrombectomy? Please select all that apply.: Tenecteplase (TNK)
3	Are there any clinical care components related to mechanical thrombectomy that were altered due to COVID-19 in 2020 that continued in 2021 and are projected to continue beyond the pandemic?: Yes
4	What prompt or activity is required for the Neurointerventional Physician to be called on-site during normal business hours?: Part of General Stroke Alert
5	What prompt or activity is triggered for the Neurointerventional Physician to be called on-site during off-hours?: Part of General Stroke Alert
6	What prompt or activity is triggered for the Neurointerventional Physician to be called on-site during weekends?: Neurointerventional Physician Already On-Site
7	What roles are included in the responding stroke team during normal hours? (select all that apply): Research Tech
8	What brand(s) of retriever are available at your facility? Select all that apply.: Seronovus
9	How many dedicated NI rooms are available to receive patients for stroke assessment at your facility?: 5
10	When are intra-arterial thrombolytics prepared?: Prior to Procedure (pre-ordered) Only if Indicated
11	Do you insert a Foley catheter prior to the procedure if there is not one already in place?: No, Never
12	If Tenecteplase is used by your facility, how is it administered? (select all that apply): Both (sequential) in same patient
13	What is the composition of the stroke kit?: Drapes
14	What is the next step after encode/intake? (select all that apply): Code Stroke Activated
15	How does the neurointervential physician communicate the treatment plan to the stroke team based on imaging studies?: In person
16	What is included in the initial assessment? (select all that apply): Creatinine
17	Who on the clinical team is involved in the support of potential stroke patient cases during off-hours while in the ED (in addition to ED staff)?: Neuro-Dedicated Personnel
18	Who on the clinical team is involved in the support of potential stroke patient cases during weekend hours while in the ED (in addition to ED staff)?: Neuro-Dedicated Personnel
19	Do you currently use cardiac monitoring during imaging?: Yes
20	In general, what criteria are used for activating the Code Stroke or stroke team? (select all that apply): EMS Positive Screen

Figure 3. Heatmap for Door-to-Reperfusion Top 50 Protocol Component Winners and Losers Across all Endpoints for Direct Admit Patients



Door to Imaging (DTI), Puncture to Reperfusion (DTR), Imaging to Puncture (ITP), Door to Puncture (DTP), and Door to Reperfusion (DTR)
Blue, reduced/improved time vs. **Orange**, increased/worse time

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Who to Transfer?

- It depends on
  - The patient / family
    - Acute issues (stroke severity)
    - Comorbidities
  - The geographic location
  - The referring hospital's capabilities (imaging, resources)
  - The receiving hospital's capabilities
  - Hopefully by a well articulated existing protocol

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Optimizing Processes for Transfer

- The nuts and bolts - plan ahead!
  - Know who, how, and when
  - Train on post-alteplase protocol
    - BP, HT, angioedema
    - Follow the neuro exam
    - Ensure communication en route
  - Track Door-in Door-out
  - Like EMS, *provide feedback*

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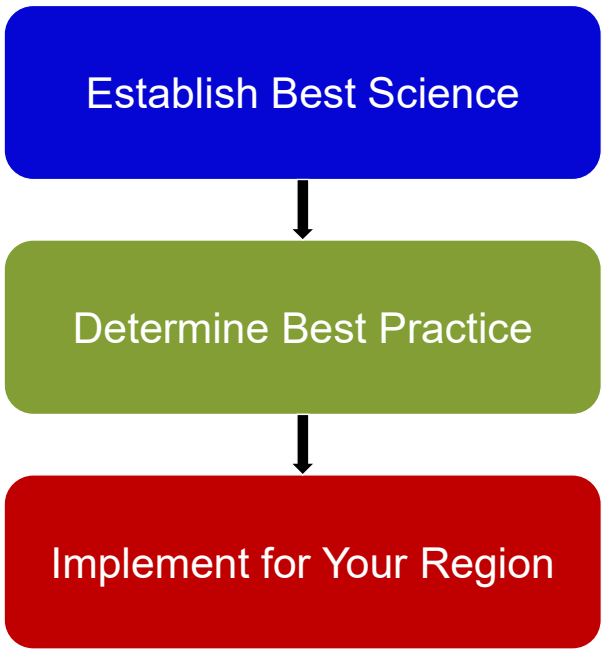

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What is a System of Care?

- A system of care is an organized, coordinated effort in a defined geographic area that delivers the full range of care to all patients and is integrated with the local public health system.
- The true value of a system of care is derived from the seamless transition between each phase of care, integrating existing resources to achieve improved patient outcomes. Success of a system of care is largely determined by the degree to which it is supported by public policy.

(https://www.heart.org/en/professional/quality-improvement/mission-lifeline)

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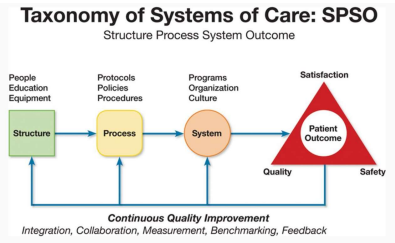
What is a System of Care?

- Optimal healthcare delivery requires
  - Structure (people, equipment, education, prospective registry data collection)
  - Process (policies, protocols, procedures)
  - System (programs, organizations)
  - Outcomes (patient safety, quality, satisfaction).
- An effective system of care comprises all of these elements—structure, process, system, and patient outcomes—in a framework of continuous quality improvement.



(Kronick. *Circulation*. 2015;132:S397-S413)

42

Definitions

- Accreditation
  - 3rd party attestation of organizational performance standards and quality
- Certification
  - 3rd party attestation of disease specific capabilities and performance
- Designation
  - System/governmental recognition of destination facilities by disease
- Legislation
  - Law which has been promulgated by a legislature or other governing body

Approved Medicare Accreditation Programs by AO
FY 2016

AO	Hospital	Psych Hospital	CAH	HHA	Hospice	ASC	OPT	RHC	Total
AAAASF						X	X	X	3
AAAHC						X			1
ACHC				X	X				2
AOA/HFAP	X		X			X			3
CHAP				X	X				2
CIHQ	X								1
DNV GL	X		X						2
IMQ						X			1
TCT								X	1
TJC	X	X	X	X	X	X			6
Total	4	1	3	3	3	5	1	2	22

GENERAL ASSEMBLY OF NORTH CAROLINA
SESSION 2021

S 1

SENATE BILL 683

Short Title:	Prehospital Stroke Protocols/EMS Personnel.	(Public)
Sponsors:	Senator Perry (Primary Sponsor).	
Referred to:	Rules and Operations of the Senate	

April 8, 2021

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Establish Regional Capabilities
Stroke Center Certifications

Table 1. Levels and Capabilities of Hospital Stroke Certifications

Characteristics	ASRH	PSC	TSC	CSC
Location	Typically rural	Often urban/sub-urban	Often urban/sub-urban	Typically urban
Stroke team accessible/available 24/7	Yes	Yes	Yes	Yes
Noncontrast CT available 24/7	Yes	Yes	Yes	Yes
Advanced imaging available 24/7 (eg, CTA/CTP/MRI/MRA/MRP)	No	Possibly	Yes	Yes
Intravenous thrombolysis capable 24/7	Yes	Yes	Yes	Yes
Thrombectomy capable 24/7	No	Possibly	Yes	Yes
Diagnose stroke etiology and manage poststroke complications	Unlikely	Yes, routine	Yes, complex	Yes, complex
Admit hemorrhagic stroke	No	Possibly	Possibly	Yes
Clip/coil ruptured intracranial aneurysms	No	Unlikely	Possibly	Yes
Dedicated stroke unit	No	Yes	Yes	Yes
Neurocritical care unit and expertise	No	Possibly	Possibly*	Yes
Clinical stroke research performed	Unlikely	Possibly	Possibly	Yes

Source: American Heart Association, Inc.[5] ASRH indicates acute stroke-ready hospital; CSC, comprehensive stroke center; CT, computed tomography; CTA, computed tomography angiography; CTP, computed tomography perfusion; MRA, magnetic resonance angiography; MRI, magnetic resonance imaging; MRP, magnetic resonance perfusion; PSC, primary stroke center; and TSC, thrombectomy-capable stroke center.
*Access to neurocritical care expertise required and may be provided by telemedicine.

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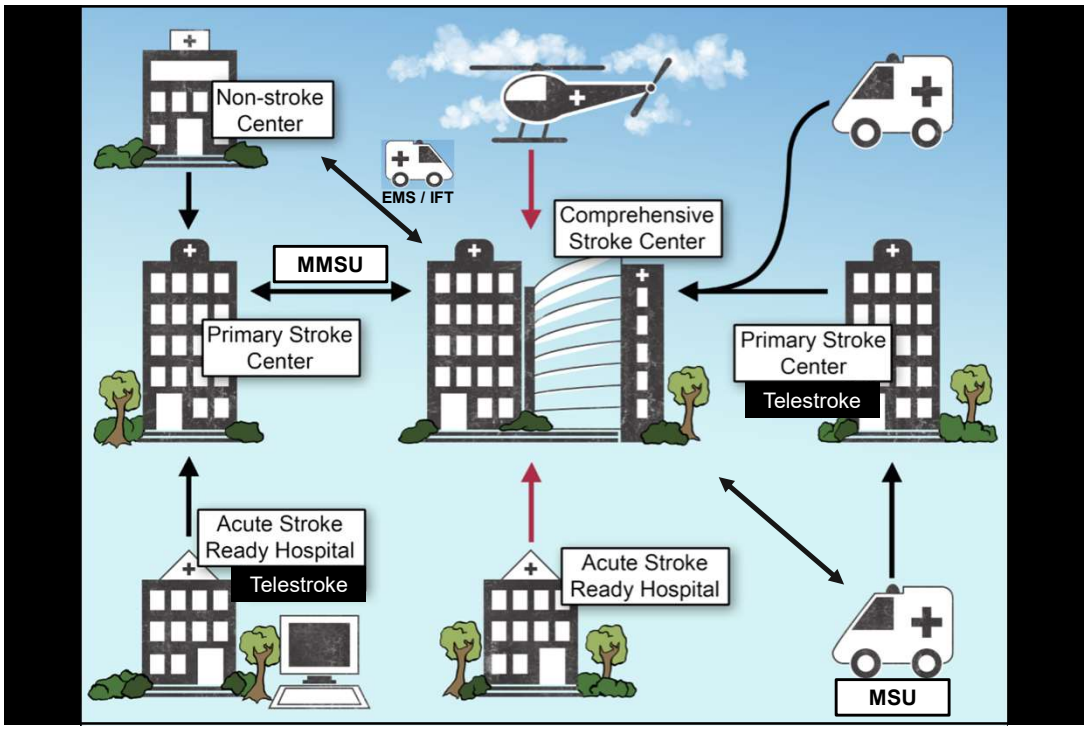
New York

Harmonize Criteria to Avoid Race to Bottom

45



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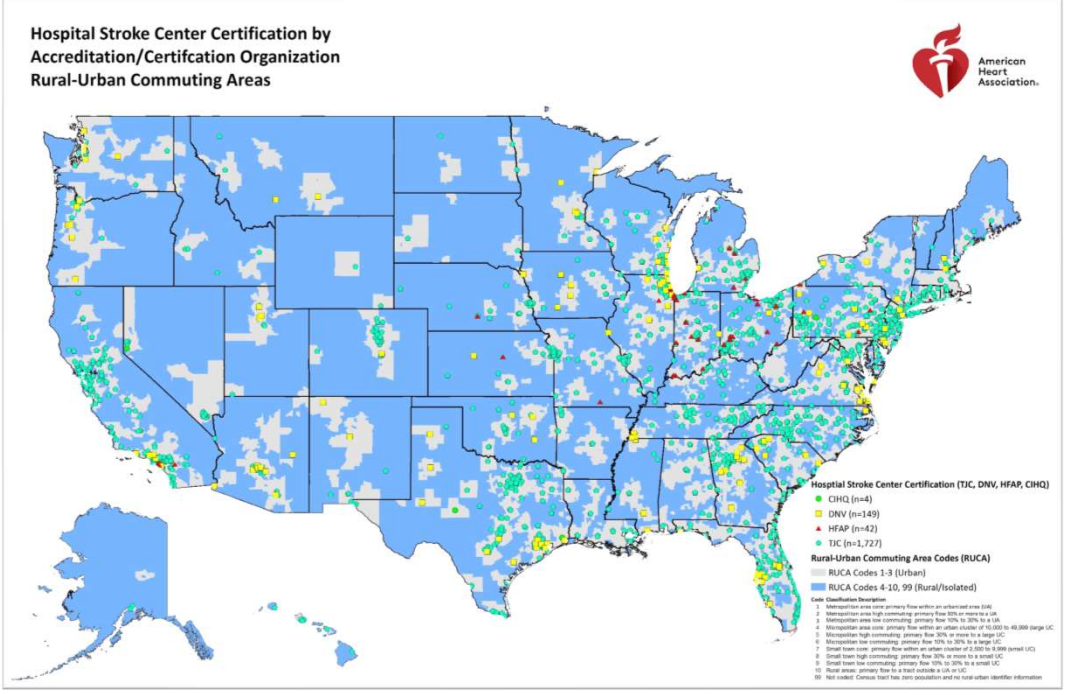
Hospital Stroke Center Certification by
Accreditation/Certifcation Organization
Rural-Urban Commuting Areas
American Heart Association.
Hospital Stroke Center Certification (TJC, DNV, HFAP, CIHQ)
CIHQ (n=4)
DNV (n=149)
HFAP (n=42)
TJC (n=1,727)
Rural-Urban Commuting Area Codes (RUCA)
RUCA Codes 1-3 (Urban)
RUCA Codes 4-10, 99 (Rural/Isolated)

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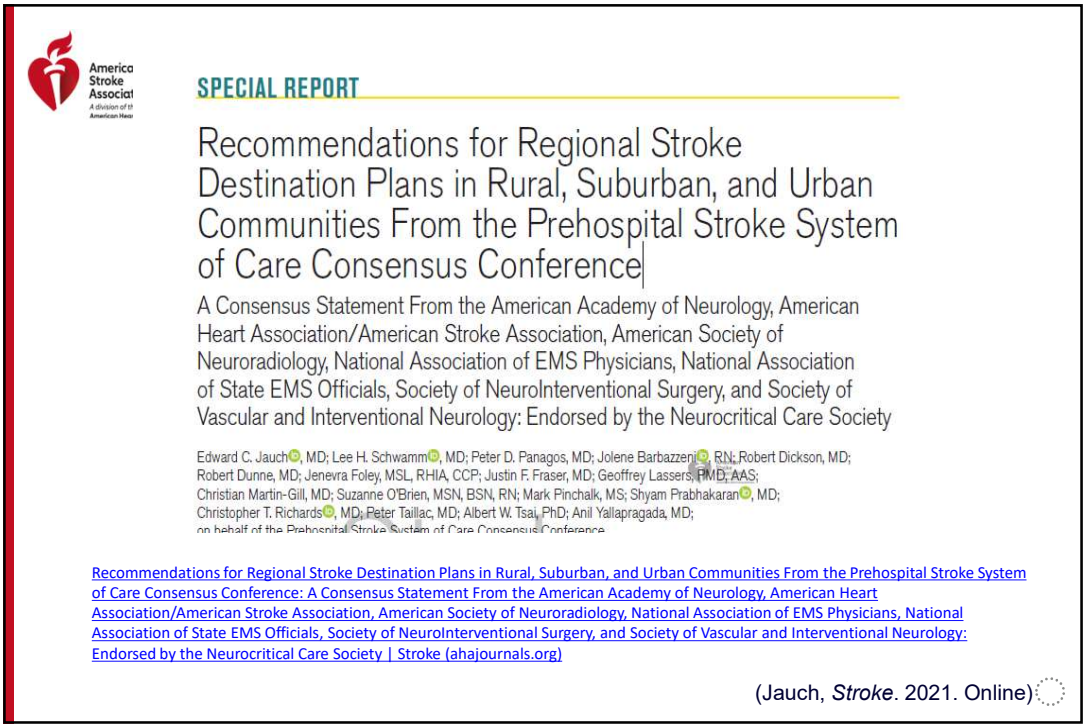
SPECIAL REPORT
Recommendations for Regional Stroke Destination Plans in Rural, Suburban, and Urban Communities From the Prehospital Stroke System of Care Consensus Conference
A Consensus Statement From the American Academy of Neurology, American Heart Association/American Stroke Association, American Society of Neuroradiology, National Association of EMS Physicians, National Association of State EMS Officials, Society of NeuroInterventional Surgery, and Society of Vascular and Interventional Neurology: Endorsed by the Neurocritical Care Society
Edward C. Jauch, MD; Lee H. Schwamm, MD; Peter D. Panagos, MD; Jolene Barbazzeni, RN; Robert Dickson, MD; Robert Dunne, MD; Jenevra Foley, MSL, RHIA, CCP; Justin F. Fraser, MD; Geoffrey Lassers, PMD, AAS; Christian Martin-Gill, MD; Suzanne O'Brien, MSN, BSN, RN; Mark Pinchalk, MS; Shyam Prabhakaran, MD; Christopher T. Richards, MD; Peter Taillac, MD; Albert W. Tsai, PhD; Anil Yallapragada, MD;
Recommendations for Regional Stroke Destination Plans in Rural, Suburban, and Urban Communities From the Prehospital Stroke System of Care Consensus Conference: A Consensus Statement From the American Academy of Neurology, American Heart Association/American Stroke Association, American Society of Neuroradiology, National Association of EMS Physicians, National Association of State EMS Officials, Society of NeuroInterventional Surgery, and Society of Vascular and Interventional Neurology: Endorsed by the Neurocritical Care Society | Stroke (ahajournals.org)
(Jauch, *Stroke*. 2021. Online)

48

The Challenge

- Goal: right place for the right patient the first time
  - Not every patient needs a CSC/TSC nor are they always available
  - CSC for SAH, ICH, severe AIS
  - "TSC" for regions without CSC
  - PSC for AIS stroke/stroke unit care
  - ASRH for AIS and timely transfer
  - Ensuring appropriate interactions and feedback between system members to benefit our patients

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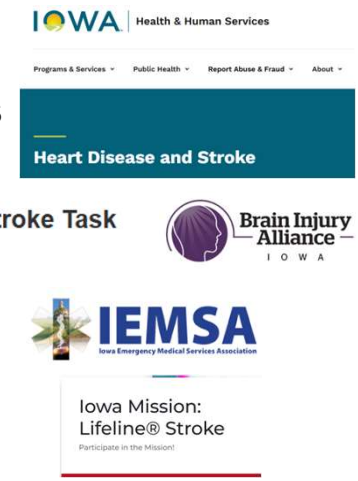
How Do You Start?

Build a Team of Engaged/Empowered Stakeholders

- Departments of Health
- Hospitals / healthcare settings
- EMS / AMT services
- Physicians / groups
- Proximate state partners
- Patient advocacy groups
- Legislative representatives?



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Stroke
Volume 50, Issue 7, July 2019;, Pages e187-e210
https://doi.org/10.1161/STR.0000000000000173

ASA POLICY STATEMENT

Recommendations for the Establishment of Stroke Systems of Care: A 2019 Update

A Policy Statement From the American Stroke Association

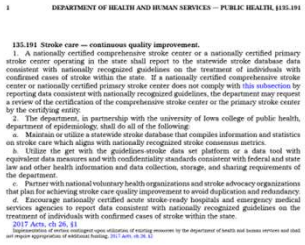
Opeolu Adeoye, MD, MS, FAHA, Chair, Karin V. Nyström, RN, MSN, FAHA, Dileep R. Yavagal, MD, Jean Luciano, CRNP, Raul G. Nogueira, MD, Richard D. Zorowitz, MD, Alexander A. Khalessi, MD, MS, FAHA, Cheryl Bushnell, MD, MHS, FAHA, William G. Barsan, MD, Peter Panagos, MD, Mark J. Alberts, MD, FAHA, A. Colby Tiner, MA, Lee H. Schwamm, MD, FAHA, and Edward C. Jauch, MD, MS, FAHA

(Adeoye, *Stroke*. 2019; 50:7)

51

Build a Plan and Measure

- Design after engagement and consensus
- Start modest
  - Look for low-hanging fruit
  - Look to prior success (STEMI)
  - Publicize and share credit widely
- Collect *and* publish data!
- Advocate for resources
- Wash, rinse, repeat



1 DEPARTMENT OF HEALTH AND HUMAN SERVICES — PUBLIC HEALTH, §135.191

135.191 Stroke care — continuous quality improvement.

1. A nationally certified comprehensive stroke center or a nationally certified primary stroke center operating in the state shall report to the statewide stroke database data consistent with nationally recognized guidelines on the treatment of individuals with confirmed cases of stroke within the state. If a nationally certified comprehensive stroke center or nationally certified primary stroke center does not comply with this subsection by reporting data consistent with nationally recognized guidelines, the department may request a review of the certification of the comprehensive stroke center or the primary stroke center by the certifying entity.

2. The department, in partnership with the university of Iowa college of public health, department of epidemiology, shall do all of the following:

a. Maintain or utilize a statewide stroke database that compiles information and statistics on stroke care which aligns with nationally recognized stroke consensus metrics.

b. Utilize the get with the guidelines-stroke data set platform or a data tool with equivalent data measures and with confidentiality standards consistent with federal and state law and other health information and data collection, storage, and sharing requirements of the department.

c. Partner with national voluntary health organizations and stroke advocacy organizations that plan for achieving stroke care quality improvement to avoid duplication and redundancy.

d. Encourage nationally certified acute stroke-ready hospitals and emergency medical services agencies to report data consistent with nationally recognized guidelines on the treatment of individuals with confirmed cases of stroke within the state.

2017 Acts, ch 26, §1

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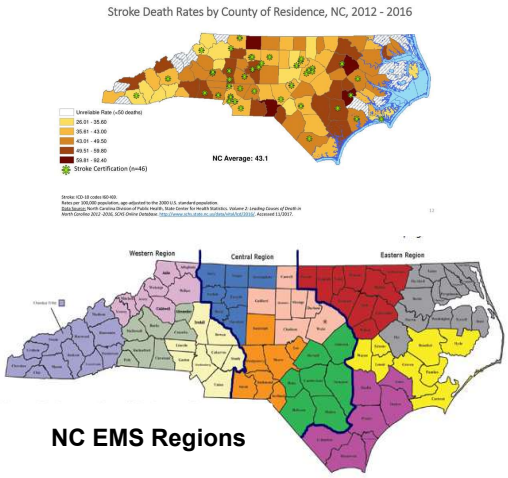
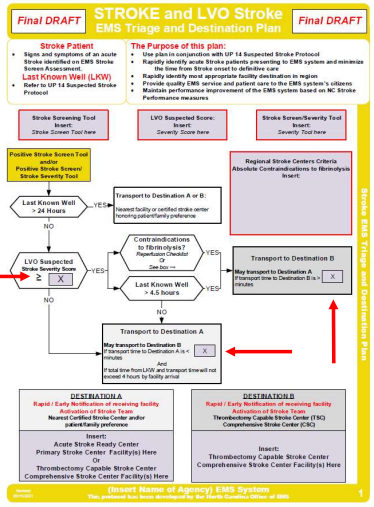
Created at the State Level Implemented in the Region





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So Where Does This Patient Go?

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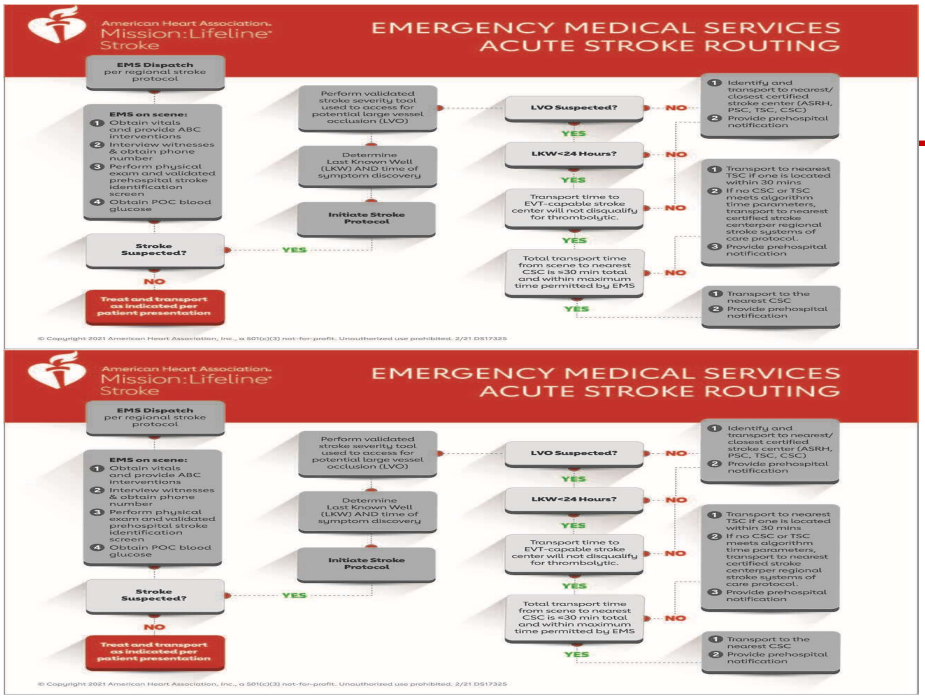

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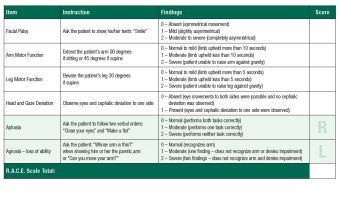
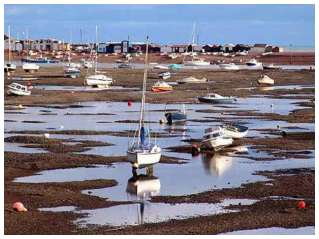
It Depends and It Matters

- EMS
  - Issue of training
  - Accuracy of LVO tools
  - Longer transports, especially for rural agencies, reduce services
- Hospitals
  - Receiving hospital over-crowding
  - Impedes local evolution to highest level possible



Item	Instruction	Findings	Score
Facial Palsy	Ask the patient to show his/her teeth "Smile"	0 – Absent (symmetrical movement) 1 – Mild (slightly asymmetrical) 2 – Moderate to severe (completely asymmetrical)	
Arm Motor Function	Extend the patient's arm 90 degrees if sitting or 45 degrees if supine	0 – Normal (no drift-upheld more than 10 seconds) 1 – Moderate (limb upheld less than 10 seconds) 2 – Severe (patient unable to raise arm against gravity)	
Leg Motor Function	Elevate the patient's leg 30 degrees if supine	0 – Normal (no drift-upheld more than 5 seconds) 1 – Moderate (limb upheld less than 5 seconds) 2 – Severe (patient unable to raise leg against gravity)	
Head and Gaze Deviation	Observe eyes and cephalic deviation to one side	0 – Absent (eye movements to both sides were possible and no cephalic deviation was observed) 1 – Present (eyes and cephalic deviation to one side were observed)	
Aphasia	Ask the patient to follow two verbal orders: "Close your eyes" and "Make a fist"	0 – Normal (performs both tasks correctly) 1 – Moderate (performs one task correctly) 2 – Severe (performs neither task correctly)	R
Agnosia – loss of ability	Ask the patient: "Whose arm is this?" when showing him or her the paretic arm or "Can you move your arm?"	0 – Normal (recognizes arm) 1 – Moderate (one finding – does not recognize arm or denies impairment) 2 – Severe (two findings – does not recognize arm and denies impairment)	L
R.A.C.E. Scale Total:			



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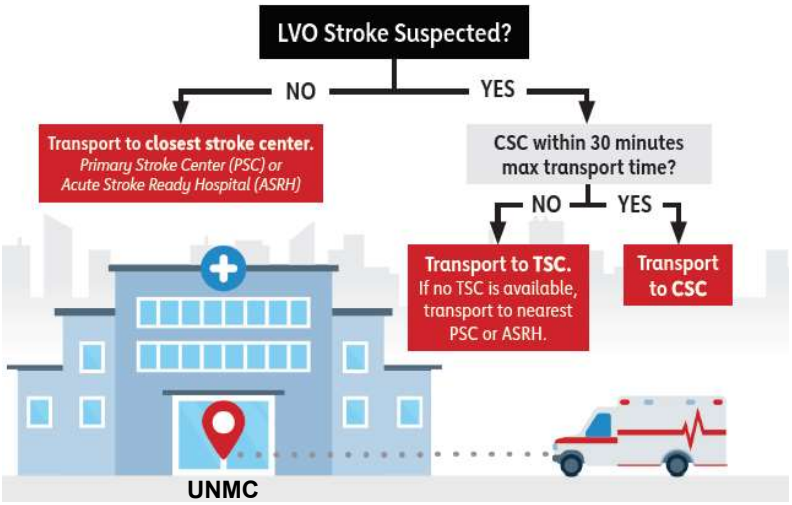
American Stroke Association.
A division of the American Heart Association.

Urban Transport Recommendations



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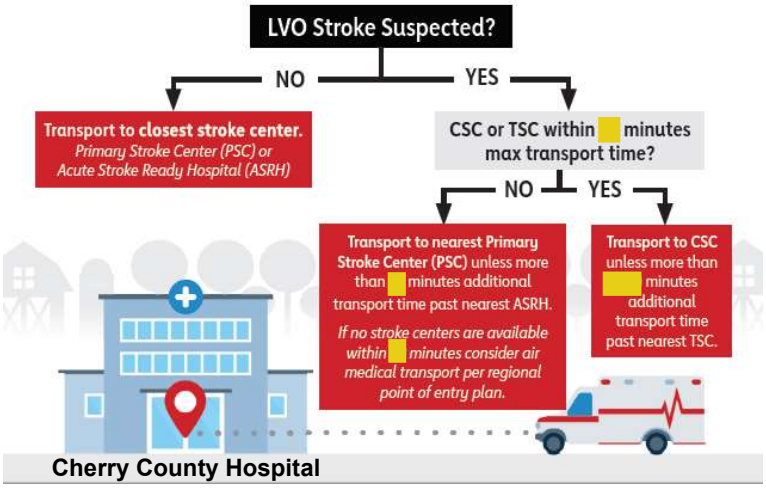
57

American Stroke Association.
A division of the American Heart Association.

Rural Transport Recommendations



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Specific Help for Our Rural Partners

AHA SCIENTIFIC STATEMENT

Identifying Best Practices for Improving the Evaluation and Management of Stroke in Rural Lower-Resourced Settings: A Scientific Statement From the American Heart Association

The American Academy of Neurology affirms the value of this statement as an educational tool for neurologists.

Kori S. Zachrison, MD, MSc, Chair; Kaiz S. Asif, MD, Vice Chair; Sherita Chapman, MD; Karen E. Joynt Maddox, MD, MPH; Enrique C. Leira, MD, MS; Susan Maynard, DNP, MS; Christa O'Hana S. Nobleza, MD, MSCI; Charles R. Wira, MD; on behalf of the American Heart Association Emergency Neurovascular Care and Telestroke Committee of the Stroke Council; Council on Cardiovascular and Stroke Nursing; and Council on Cardiovascular Radiology and Intervention

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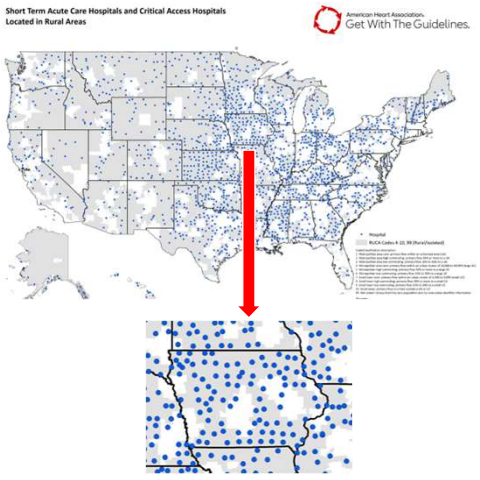
AHA Commitment to Rural Health

Rural Health Care Outcomes Accelerator

- Closing the urban / rural gap
  - GWTG for rural hospitals
  - Rural community network
  - Educational tool kits
  - Rural hospital awards program



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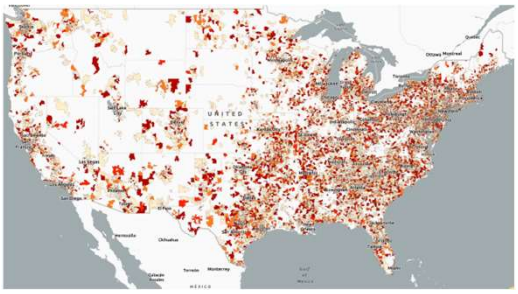
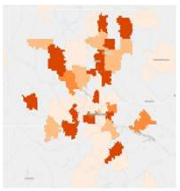
Delays to Hospital Arrival

Target Areas of Vulnerability

- Opportunity for improvement
  - 50% still present > 2º
  - At-risk populations
    - Women, older, Black
    - Higher SVI
    - Rural location
  - This was only for patients utilizing EMS





Des Moines
Peach < 3 hrs
Orange 3-6 hrs
Red > 6 hrs

https://www.arcgis.com/apps/webappviewer/index.html?id=08f6e885c71b457f83cefc71013bcaa7
(Dhand, *Stroke* 2024;55(6))

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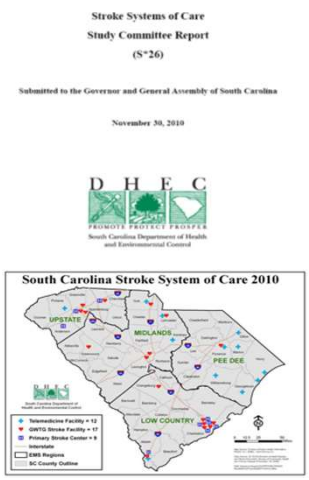
An Example from South Carolina Stroke Systems of Care Act


Stroke Systems of Care
Study Committee Report
(S*26)

Submitted to the Governor and General Assembly of South Carolina

November 30, 2010

D H E C

South Carolina Department of Health and Environmental Control

South Carolina Stroke System of Care 2010


State of South Carolina
Office of the Governor

Ratified	6/08/2011
Vetoed by the Governor	6/14/2011
Veto overridden by Senate	6/21/2011
Veto overridden by House	6/21/2011
Ed's happy dance	6/22/2011

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An Example from South Carolina Stroke Systems of Care Act

- Victory was sweet but brief – bill defunded
- It took 5 years to finally get funding
  - – New director of health took on stroke with a passion
  - – Hired dedicated FTE in Dept of Health
  - – Created SC Stroke Advisory Committee
    - All stakeholders
    - Create guidance for Director
    - Created triage algorithm
    - Funding for state-wide stroke registry of *all* hospitals

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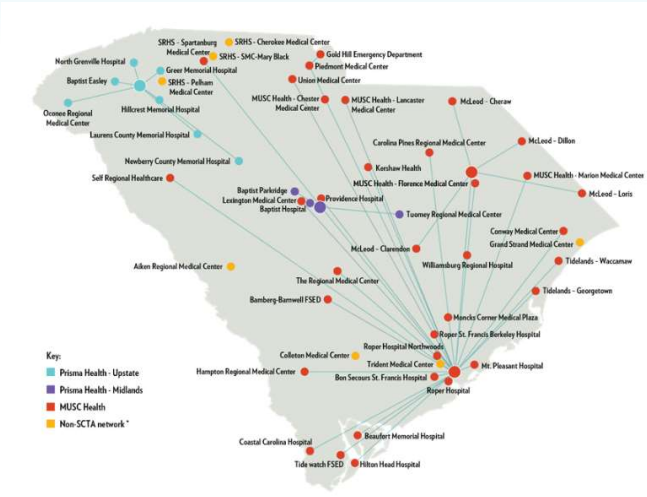
SC Telestroke Alliance



Rough estimate
- $120M over past decade
- $18M recurring
- Original bolus $12M

ROI
- Backbone for state
- Decrease in disability (stroke, preterm delivery, behavioral health, now COVID)
- EMS pilot
- 1000 alteplase recommendations / yr
- 2,000,000 interactions in 2020

SOUTH CAROLINA Telehealth ALLIANCE
MUSC Health Medical University of South Carolina

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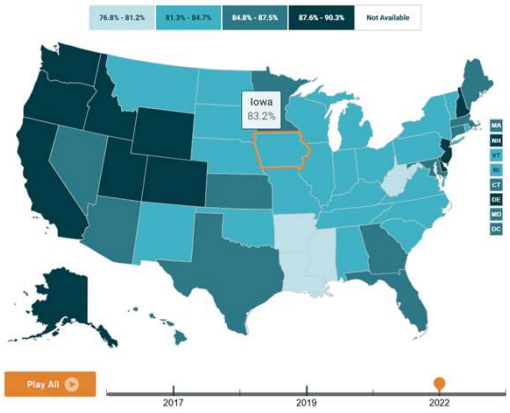
Access to Broadband

Ensure Access to Vulnerable Populations



SHADAC analysis of the American Community Survey (ACS) Public Use Microdata Sample

- In Iowa
  - 83.2% with disability
  - 92.1% without disability
- Practice settings
  - Telespecialists
  - TeleICU
  - Diagnostics
- Patient homes
  - Telehealth / Telemental health / Teleopiod use disorder
  - Telerehab
  - Remote monitoring
- Other environments
  - Prisons
  - Worksites

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Feedback

To Every Link in the Chain

- Never underestimate the critical role of feedback
  - Show how *"they"* contributed to the patient's outcome
  - Do it quickly – it is a teachable moment,
  - Bring special patients back to the ED and invite EMS crew
  - Improve the system in real-time
- Get it out to the public

Dr. Jim Edwards, right, jokes with neurointerventionalist Dr. Emrin Chaudry, left, and Comprehensive Stroke Program's Dr. Ed Jauch during his April 14 visit to MUSC Hospital.

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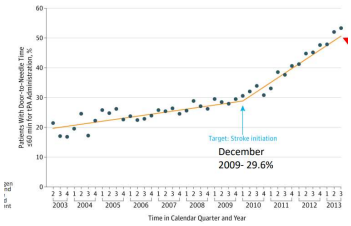
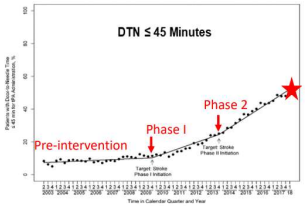
Continuous Quality Improvement

Once You Build It, Measure It

- Collect system performance data to drive improvement across all domains.
- GWTG- Stroke provides discrete measures of improvement and opportunity.

	Target: Stroke Phase II	Target: Stroke Phase III
Honor Roll	Time to thrombolytic therapy within **60 minutes** in **50%** or more of acute ischemic stroke patients treated with IV thrombolytic	DTN times within **60 minutes** for at least **75%** of applicable patients are required.
Honor Roll Elite	Time to thrombolytic therapy within **60 minutes** in **75%** or more of acute ischemic stroke patients treated with IV thrombolytic	DTN times within **60 minutes** for at least **85%** of applicable patients are required.
Honor Roll Elite Plus	Time to thrombolytic therapy within **60 minutes** in **75%** or more of acute ischemic stroke patients treated with IV thrombolytic AND time to thrombolytic therapy within **45 minutes** in **50%** of acute ischemic stroke patients treated with IV thrombolytic	DTN times within **45 minutes** for at least **75%** of applicable patients and DTN times within **30 minutes** for at least **50%** of applicable patients.
Honor Roll Advanced Therapy		DTD times in at least **50%** of applicable patients within **90 minutes** for direct arriving and within **60 minutes** for transfers





(Fonarow, *JAMA*. 2014.311:1632-1640)

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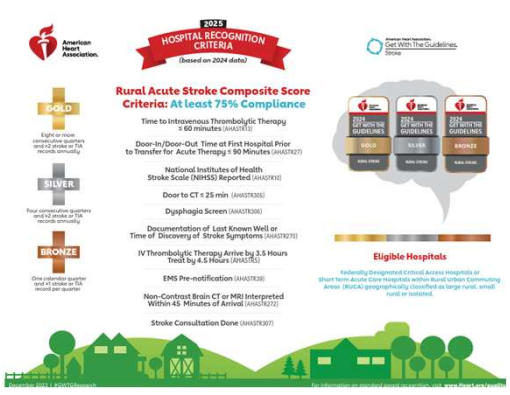
Feedback

Share and Reward Success as a Team



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Sustainability

Avoid the “One and Done”

- It is critical to codify the system and progress
  - Thoughtful legislative statutes
  - Recurring funding and support
  - Active and empowered stroke advisory committee at the state level engaged with DoH and legislators
  - Require data collection and transparent reporting
    - Statewide
    - Systems of care
    - Hospitals / Healthcare facilities

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Conclusion

- No matter where you practice you will see stroke
- Acute treatments’ *efficacies* are nearly asymptotic
- Now the goal is to maximize their *effectiveness*
  - Build a resourced and supported ***SSOC and team***
  - Implement best practices at each location in the system and across the system
  - Measure success by outcomes not check boxes
- Recognize the importance of sustained public education, secondary prevention, and rehabilitation

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