

ARTICLE REVIEW

Stroke

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

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**KANSAS INITIATIVE
FOR STROKE SURVIVAL
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Background

2019: AHA published update to policy statement from 2005

- Addressed prehospital stroke screening and severity scales and preferential triage of selected patients with suspected severe stroke due to LVO to the nearest EVT capable stroke center
- Mission Lifeline Stroke Guidelines were released that recommended triaging patients with suspected LVO to EVT capable center only when this added no more than 15 minutes of travel time
 - The need to vary this for urban vs. rural areas was needed after this was released

COVID-19 Pandemic emphasized the need for flexible adaptation of prehospital triage and transport due to local and regional factors

- Routing LVO patients to thrombectomy centers may be of greater importance when delays are amplified because of the pandemic

Goals of this Article

#1. Develop SSOC

Regions should all develop a region-specific stroke system of care by all local stakeholders with consideration and integration of all regional stroke resources

Stroke advisory committee should include:

- Regional EMS (including Air)
- EMS medical directors
- Hospitals of all certification levels
- Patient advocacy groups
- Professional/Medical Societies
- Local/State Govt & policymakers

Group should:

- Develop and implement feasible local prehospital destination plans for EMS, interhospital collaborations and discussions tailored to geography and local resources
- Require data collection and reporting of evidence based measures with benchmarks and performance feedback (see next slide)
- Prehospital records should be incorporated into stroke registries to enhance total system performance assessment
- Incorporate new national quality measures when they are released
- Participate in public education about stroke

Example of Quality Improvement Projects to Assess the SSOC

Table 2. Examples of Consensus-Based Quality Improvement or Performance Measures for Assessment of the Acute Phase of Stroke Systems of Care

1	911 dispatcher use of suspected stroke algorithms: percentage of confirmed stroke patients transported to a hospital by EMS and in whom stroke dispatch algorithm was used.
2	Identification of suspected strokes: percentage of confirmed stroke patients transported to a hospital by EMS and identified as suspected strokes.
3	Documentation of last known well and symptom discovery times: percentage of confirmed stroke patients transported to a hospital by EMS for whom a last-known-well time or time of discovery of stroke symptoms was documented.
4	Evaluation of blood glucose: percentage of confirmed stroke patients transported to a hospital by EMS for whom blood glucose was evaluated by EMS.
5	Stroke screen performed and reported: percentage of confirmed stroke patients transported to a hospital by EMS for whom a validated regional or national stroke screen tool was used with documentation of the result.
6	Stroke severity score performed and reported: percentage of confirmed stroke patients transported to a hospital by EMS for whom a validated regional or national stroke severity tool was used to identify suspected LVO with documentation of the result.
7	Advanced notification with triage findings: percentage of stroke transports in whom EMS provided a stroke alert prenotification to the receiving hospital and provided additional information about a patient's status.
8	EMS use of regional destination protocol: percentage of stroke transports in whom EMS triaged the patient according to their approved regional triage protocol.

9	On-scene times for suspected stroke: distribution of times for suspected stroke patients transported to a hospital by EMS with a goal for on-scene time ≤ 15 min.
10	DIDO at the first hospital before transfer: distribution of times for confirmed stroke patients transported to a hospital by EMS who were transferred to a higher level stroke center for time-critical therapy, with a goal for DIDO ≤ 60 min.
11	Time from EMS first medical contact to stroke alert notification: distribution of times for confirmed stroke patients transported to a hospital by EMS from the time from first medical contact to initiation of stroke alert notification to the receiving hospital.
12	Time from EMS first medical contact to brain imaging: distribution of times for confirmed stroke patients transported to a hospital by EMS from the time from first medical contact to start of first brain imaging.
13	Time from first medical contact to EVT: distribution of times for confirmed stroke patients transported to a hospital by EMS from the time from first medical contact to the first pass of endovascular thrombectomy device.

DIDO indicates door-in door-out; EMS, emergency medical services; EVT, endovascular therapy; and LVO, large vessel occlusion.

Definitions of the Levels and Capabilities of Hospital Stroke 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.

Methods

- Committee created 3 working groups to focus on AIS care, based on community characteristics. They met in person and then electronically to develop their guidelines. These groups were defined as:
 - Rural
 - RUCA code 4-10; <50,000 residents; limited health care resources; few nearly ASRHs or PSCs and often no CSCs/TSCs within 60 minutes ground transport
 - Suburban
 - RUCA code 2-3; pop'l density closer to urban core threshold; have access to CSC/TSC within 30-60 min ground transport
 - Urban
 - RUCA code 1; >50,000 residents and abundant health care resources; CSCs/TSCs within a 30 minute transport time by ground EMS
- Once the individual guidelines were written with consensus, they were joined together and submitted to participating organizations for review and consideration for endorsement

Best Practices/Recommendations Featured in this Article

Best Practices for
911 Stroke
Screenings

Best Practices for
EMS

Best Practices for
EMS Transport to
Stroke Centers

Time Frames for
Stroke Destination

Challenges &
Recommendations
for Rural SSOC

Challenges &
Recommendations
for Suburban
SSOC

Challenges &
Recommendations
for Urban SSOC

Best Practices for 911 Stroke Screening

- Call centers should utilize specific screening protocols for potential stroke patients
- Groups should utilize QI processes to review screening and dispatch and review the final clinical hospital diagnosis
- Dispatchers should have annual stroke education training requirements to maintain knowledge and proficiency

Best Practices for EMS

Region should harmonize & adopt consistent stroke management **protocols**, evidence-based **stroke screening tools** and **severity scales** for identifying possible LVO

Stroke Management education (in conjunction with hospital partners and local EMS) should be done every year and integrated as a core care competency and should include information about interfacility transport (including of drip and ship patients)

EMS agencies should develop and utilize **stroke destination plans** based on hospital locations & capabilities, transport times, and patient acuity

EMS should develop uniform **prehospital stroke notification protocols** with receiving stroke hospitals and direct CT transport should be encouraged

Proposed times are meant to serve as starting points for local discussion and these should be determined in the future by specific performance data from stroke centers within the SSOC

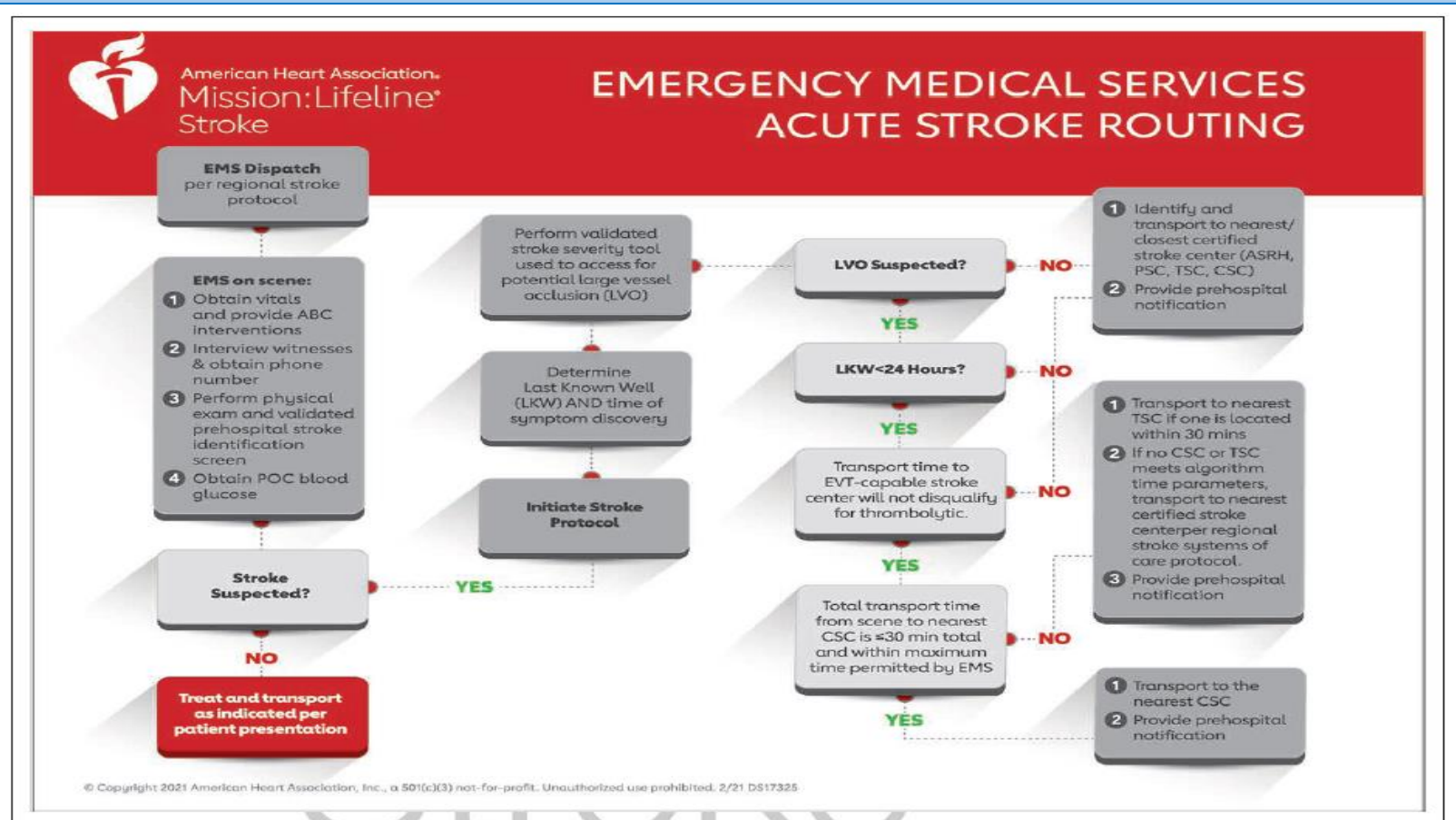


Figure 1. Mission: Lifeline Stroke Emergency Medical Services (EMS) Acute Stroke Routing Algorithm.

ABC indicates airway, breathing and circulation; ASRH, acute stroke-ready hospital; CSC, comprehensive stroke center; EVT, endovascular therapy; LKW, last known well; LVO, large vessel occlusion; POC, point of care; PSC, primary stroke center; and TSC, thrombectomy-capable stroke center. Reprinted from the American Heart Association with permission. Copyright ©2021.

Rural Destination Challenges (EMS & Health Care Facilities)

EMS

- Recruitment and retainment of EMS medical directors and personnel
- Less likely to implement QI programs or provide continuing education
- Encounter stroke patients less frequently, making skills and protocols harder to remember
 - States should mandate stroke education continuing education requirements yearly bc of this
- Longer Scene-to-hospital transport times
 - Remote access to stroke expertise should be explored in the vehicle via telehealth or artificial intelligence
- EMS vehicles and personnel may be outside their designated service area and unable to respond to other emergencies if on interfacility transports

Health Care Facilities

- Low annual volumes of stroke patients, necessitating efficient & reliable protocols
- Financial and personnel shortages
- Institutional support of a stroke coordinator, including advancing their education
- Access to neurological expertise
- Lack of dedicated inpatient stroke unit
- Inability to provide advanced stroke imaging

Recommendations for Rural SSOC

RUCA code 4-10; <50,000 residents; limited health care resources; few nearby ASRHs or PSCs and often no CSCs/TSCs within 60 minutes ground transport

1. Area stakeholders should work together to develop prehospital response and destination plans with consideration of long transport times
 - Efforts should **prioritize ensuring tPA within 4.5 hours of LKW and transport to CSC/TSC if suspected LVO**
2. **Patients with suspected LVO should be routed directly to CSC if transport time past TSC does not exceed 30 minutes and max total transport time from scene does not exceed 60 min.**
 - *If no CSC within 60 min, EMS should go directly to TSC if additional transport time beyond PSC/ASRH does not exceed 30 min (and max time from scene → TSC does not exceed 60 min)*
 - **If no CSC/TSC within 60 min, EMS should go to nearest ASRH or PSC**
3. **Air transport** should be included if no CSC or TSC is available within 60 min ground transport time
 - Efforts should be made to implement advanced imaging in community hospitals in order to help identify EVT-eligible candidates and decrease overtriage (and reduce unnecessary transport times)
4. EMS destination plans should prioritize rural hospitals that have **formal agreements** with regional CSCs or TSCs
5. If >1 destination exists, EMS should transport patient to **facility that has stroke protocols in place, clear destination plans and partnerships with TSCs/CSCs in region**

Suburban Destination Challenges (EMS & Health Care Facilities)

Multiple EMS agencies and
hospital destinations

Distance, traffic and county/state
boundaries & rapid residential
growth

Admit a greater number of stroke
patients

May have greater ability for
advanced imaging but may have
delays in obtaining imaging timely
due to more patients needing
imaging

If performing EVT, may lack 24/7
EVT capability

- Sites should strive for 24/7 capability and CSC/TSC certification or at minimum, states should require noncertified centers performing EVT adhere to common standards for EVT performance, data collection & reporting/QI programs

Recommendations for Suburban SSOC

RUCA code 2-3; pop'l density closer to urban core threshold; have access to CSC/TSC within 30-60 min ground transport

1. **Establish SSOC** to maximize treatment opportunities for patients needing reperfusion
2. **Communities with >1 destination option, suspected LVOs should be routed directly to CSC if transport time past nearest TSC does not exceed 30 min and max transport time from scene to CSC does not exceed 45 min**
 - *No CSC within 45 min, EMS should go directly to TSC if additional transport time past nearest PSC/ASRH does not exceed 30 min and max transport time does not exceed 45 min*
 - **If no TSC/CSC exist within 45 min of total travel time, EMS should go to nearest ASRH or PSC**
 - **If medically unstable, local protocols should contain information about diversion to closest facility**
3. **Protocols** should be in place to rapidly and efficiently care for stroke patients
4. If suburban hospital is PSC, it is appropriate for most stroke patients to be admitted for post stroke care with protocols for rapid transport to higher level of care, if needed
5. **Recurring stroke education** should be provided for staff and **QI program developed** to focus on DIDO
6. All hospitals should have an **identified regional partner** for advanced stroke care
7. Destination protocols should **prioritize hospitals that participate in regional QI program and feedback should be provided to EMS and hospitals**

Urban Destination Challenges (for EMS and Health Care Facilities)

Large, diverse ethnic populations with language and cultural barriers that interfere with timely use of 911 services and early recognition

Traffic congestion and crowded housing environments

Emergence of mobile stroke units that are owned by private health systems vs. EMS agencies

Geographic oversaturation of low complexity stroke patients at CSCs can create overcrowding, increased cost and decreased access for complex cases that require CSC admissions

Recommendations for Urban SSOC

RUCA code 1; >50,000 residents and abundant health care resources;
CSCs/TSCs within a 30 minute transport time by ground EMS

1. EMS agencies should implement **simplified and actionable destination plans** that prioritize CSCs over other nearby centers for LVO within 24 hours LKW
2. **Areas with >1 destination option, LVO patients should be triaged directly to CSC if total transport time from scene to CSC does not exceed 30 minutes**
 - *No CSC within 30 min transport time, EMS should go directly to TSC if total transport time from scene → TSC doesn't exceed 30 min*
 - **If no TSC/CSC exist within a 30 min travel time, EMS should go to nearest PSC or ASRH**
3. Urban communities with no CSCs/TSCs within 45 min, should adopt the recommendations for Suburban communities
4. All EMS agencies in a urban area should be integrated into a cohesive stroke system of care and **destination plans should be patient-centric**
5. Tertiary care facilities should serve as a source for **exporting best practices, assisting referring hospitals with transfer protocols and providing continuing education**
6. **Patient specific and systems level feedback** should be provided to all referral sites
7. **Stroke experts** from these areas should be included in **local/state departments of health and govt organizational efforts** to create legislative or regulatory priorities for stroke care
8. **Clinical trials** should be provided at facilities in urban areas

Conclusion

SSOCs play a pivotal role in maximizing the opportunities for patients with AIS to receive optimal care

Stakeholders in each region/state should work together to develop local SSOC that integrates various health care resources into the most effective system of care possible

Singular purpose: Maximizing stroke outcomes for our patients

These documents should be continued to be updated based on newest literature/research

Full article can be viewed at:
<https://www.ahajournals.org/doi/epub/10.1161/STROKEAHA.120.033228>

Kansas Initiative for Stroke Survival (KISS)

Website Resources



<http://www.kissnetwork.us/>

Questions?



Next Month, 8/3, topic will be:

“Large vessel occlusion (LVO) screening tools”