Implementation strategies for emergency medical services within stroke systems of care: A policy statement from the American Heart Association/American Stroke Association expert panel on emergency medical services systems and the Stroke Council


A Summary Policy Brief

Background
Stroke remains the third leading cause of death and a leading cause of long-term disability among Americans; approximately 700,000 individuals suffer a new or recurrent stroke each year. Advances over the past decade in acute stroke care highlight the important role of emergency medical services (EMS) agencies and emergency medical services systems (EMSS) in optimizing stroke care. EMS refers to the full scope of prehospital services necessary for acute stroke care, including 9-1-1 activation and dispatch, emergency medical response, triage, and stabilization in the field, and transport by ground or air ambulance to a hospital or between facilities. EMSS refers to the delivery systems for EMS that may be organized on a local, regional, statewide, or nationwide basis using public or private resources. The successful integration of one (and often multiple) EMSS is critical to ensuring the effectiveness of a stroke system of care.

Recommended Implementation Strategies
This paper by Acker et al., expands on the four categories of recommendations that were part of the original 2005 Stroke Systems Task Force white paper and defines specific recommendations, resources and measurement parameters for each category. These parameters and policy recommendations can serve as the basis for state-level model legislation. At the federal level, the STOP Stroke Act, if passed and appropriated, would provide resources and leadership to states for implementing many of these recommendations.

The four categories of recommendations are: (1) For activating and dispatching the EMS Response for Stroke Patients, Stroke Systems should Require Appropriate Processes that ensure Rapid access to EMS for Acute Stroke Patients; (2) For EMS responders, EMSS should use protocols, tools and training that meet current AHA/ASA guidelines for stroke care; (3) Prehospital providers, emergency physicians, and stroke experts should collaborate in the development of EMS training, assessment, treatment, and transportation protocols for stroke; and (4) Patients should be transported to the nearest stroke center for evaluation and care if a stroke center is located within a reasonable transport distance and transport time. The determination needs to take into account regional issues such as the availability of stroke centers and geography and whether transportation to a stroke center is possible within the appropriate time for acute therapeutic interventions.

1. For Activating and Dispatching the EMS Response for Stroke Patients, Stroke Systems should Require Appropriate Processes that ensure Rapid access to EMS for Acute Stroke Patients
   a. Locate acute stroke patients rapidly by ensuring that the public has access to enhanced landline and wireless 9-1-1 (W-E911).

Potential Solutions:
   i. Advocate for funding and legislation at the federal, state, and local levels to provide universal availability of W-E911 capabilities.
   ii. Support public policy initiatives and other activities that promote increased quality and appropriate use of 9-1-1 systems.
   iii. Identify political leaders or champions for rural areas in the state and advocate for funding on behalf of 9-1-1 call centers and wireless carriers that serve rural areas.
   iv. Advocate for the adoption of legislation that will require multi-line telephone systems (found in office buildings, hotels, etc.) to provide call centers with sufficient information to locate callers.
   v. Advocate for the FCC to disallow or limit waivers of the rules that require wireless carriers to develop and implement the capabilities necessary to provide caller number and location information to EMS communicators. In addition, advocate for the FCC to enforce compliance
with the existing federal requirements for VoIP providers and to develop requirements for portable VoIP services.

vi. Consider collaborating with in-vehicle services, which locate the caller as well as provide an operator intercept for emergency calls.

**Measurement Parameter:**
Ensure 100% coverage for E911 and W-E911 services for all callers in all geographic areas covered by the stroke system of care.

b. Identify acute stroke patients rapidly and accurately by ensuring EMS communicators recognize stroke signs and symptoms as reported by callers.

**Potential Solutions:**

i. Use stroke educational materials and 1 or more stroke experts (physicians, nurses, EMTs and paramedics) to provide education to EMS communicators about the signs and symptoms of stroke. These educational materials should reflect current published ASA/AHA recommended guidelines for emergency cardiovascular care.

ii. Ensure EMSS emergency medical dispatch guide cards and education resources are stroke-specific.

**Measurement Parameter:**
Ensure that all EMS communicators within a stroke system of care receive written and in-person education on recognizing stroke signs and symptoms as reported by callers. These educational efforts should be conducted periodically, although the frequency should be based on local training requirements and resource availability.

c. Dispatch the highest level of care available to suspected stroke patients in the shortest time possible by ensuring that EMS communicators use emergency medical dispatch guidelines reflecting the current ASA/AHA guidelines.

**Potential Solutions:**

i. Review dispatch guidelines used by all 9-1-1 call centers within the stroke system to ensure that the highest-priority response is given to callers with signs and symptoms of stroke. Revise guidelines that are incompatible with this priority response principle.

ii. Promote the use of nationally recognized emergency medical dispatch guidelines reflecting ASA/AHA recommendations for stroke care among the 9-1-1 dispatch agencies. Work with the appropriate federal standards setting organization for emergency medical dispatch protocols – NHTSA and the American Society of Testing and Materials – to ensure that their standards include the appropriate guidelines for identification of and assistance with stroke patients.

iii. Advocate for funding for local 9-1-1 call centers to receive training and to acquire an emergency medical dispatch (EMD) caller interrogation tool to help EMS communicators more effectively identify suspected stroke patients in the field.

iv. Work with the leading commercial providers of emergency medical dispatch protocol interrogation tools to ensure that their products meet ASA/AHA standards and guidelines for identifying and assisting stroke patients.

v. Advocate for state legislation that establishes emergency medical dispatch guidelines consistent with federal guidelines as standards of care.

vi. Establish targets for reducing the time-to-dispatch interval. These targets could be included as a component of certification and proficiency programs for EMS communicators.

vii. Advocate for local, state, federal, and third-party payer funding to ensure the availability of ALS ambulances and paramedics across the stroke system’s catchment area.

viii. Advocate for state and federal rules or standards to require that ALS units be equipped with ECG monitoring devices and other resources necessary to properly care for stroke patients.

ix. Collaborate with organizations that provide services and assistance to non-English-speaking patients and callers to improve the ability of EMS communicators to communicate effectively with contacts who do now speak English as their primary language.
x. Advocate for state and federal policy makers to support EMS personnel in rural areas to ensure the availability and quality of the emergency response system.

**Measurement Parameters:**
Ensure that 100% of 9-1-1 call centers use dispatch guidelines that prioritize patients experiencing stroke as requiring a high-priority EMS response at the highest care level available.

Ensure that the time period between the receipt of the call and the dispatch of the response team is less than 90 seconds for 90% of calls involving stroke. Incoming calls should be answered immediately and there should be rapid determination of the nature of the emergency and event time for onset of stroke.

Ensure that EMS communicators correctly identify a maximum percentage of callers experiencing stroke and dispatch EMS responders at the highest priority for these calls.

2. **For EMS responders, EMSS should use protocols, tools and training that meet current AHA/ASA guidelines for stroke care.**
   a. Identify Acute Stroke Patients Rapidly and Accurately by Ensuring that EMS Responders Use Validated Screening Algorithms Effectively.

**Potential solutions:**

i. Ensure that EMS responders use validated stroke screening tools to aid in the identification of stroke patients.

ii. Advocate for consistent use of a single stroke screening tool at the community, state, or regional level, as appropriate, to improve the identification of stroke patients by EMS responders.

iii. Request that the medical directors of EMSS include a stroke screening tool in the protocols for prehospital stroke assessment and provide education on the use of the screening tool for all EMS personnel.

iv. Include stroke screening tools within the 10 core ACLS cases when teaching both prehospital and hospital personnel.

v. Request that all ED personnel who receive EMS prearrival patient reports obtain copies of the stroke screening tools for all suspected stroke patients.

vi. Implement CQI programs and iteratively improve the accuracy of stroke identifications made by prehospital personnel by comparing completed prehospital stroke screening forms with final hospital discharge diagnoses for stroke patients. Hospitals should report pertinent data back to EMSS, including mortality/morbidity and discharge diagnosis.

vii. Include research on the use of prehospital stroke severity scales or other triage factors as part of prehospital treatment trials that seek to evaluate the direct routing of certain stroke patients by ground or air ambulance to comprehensive stroke centers, or as part of other EMSS activities where the assessment and recognition of the severity of the stroke could be an important component of care.

**Measurement Parameters:**
Ensure that 100% of EMSS use validated prehospital stroke screening tools to identify stroke patients.

Ensure that when EMS responders screen patients for stroke, they err on the side of over-identification. Initially, EMSS should establish a goal of over-triage of 30% for the prehospital assessment of acute stroke.

As part of the CQI process, EMS responders’ stroke screening assessment should be compared against final patient diagnoses to identify instances where the initial prehospital screening failed to identify patients who were experiencing a stroke (under-triage). These data should be used to develop and adjust EMS responder training and protocols for the use of stroke screening forms.

b. Establish Goals for the EMSS response time for suspected stroke patients. The EMSS response time comprises the dispatch time, the turnout time, and the travel time.
Potential Solutions:

i. Measure and report the overall EMSS response time and on-scene time for all stroke patients; the time for each component of the response time should be captured.

ii. Measure and report additional response time for every element of the EMSS whenever possible. These include, but are not limited to 9-1-1 call center processing time, basic life support response times, the response times of first responders, and the time spent to reach the patient.

iii. Work with the National EMS Information System (NEMSIS) project to recommend that states collect and submit all necessary data elements for stroke for inclusion in the national EMS dataset.

iv. For data elements absent from the NHTSA’s national dataset, work with state EMS offices to ensure the appropriate stroke elements are nonetheless captured in state datasets.

v. Encourage EMSS to collect NHTSA-defined stroke data elements and use these data for CQI activities.

Measurement Parameters:

Ensure that EMSS response time is less than 9 minutes at least 90% of the time for suspected acute stroke patients. The EMSS response time reflects the amount of time elapsed from the receipt of the call by the dispatch entity to the arrival on the scene of a properly equipped and staffed ambulance.

Ensure that dispatch time is less than 1 minute, turnout time is less than 1 minute, and travel time is equivalent to trauma or acute myocardial infarction calls.

Ensure that the on-scene time is less than 15 minutes (unless there are extenuating circumstances or extrication difficulties).

Report all times using the fractile method (eg, 90th percentile). For accurate data collection, all clocks capturing these times in the EMSS should be synchronized.

3. Prehospital providers, emergency physicians, and stroke experts should collaborate in the development of EMS training, assessment, treatment, and transportation protocols for stroke.

   a. Promote ongoing collaboration among prehospital and hospital providers in the acute treatment of stroke patients.

Potential Solutions:

i. Integrate EMS within ED stroke care and ongoing CQI activities for stroke.

ii. Provide ongoing feedback to EMS providers who care for and transport stroke patients.

iii. Incorporate into EMSS protocol algorithms and checklists for the prearrival notification of the destination hospital for suspected stroke patients and include prearrival notification as a component of EMS training and continuing education courses for stroke. In addition, review of the use of prearrival notification for suspected stroke patients as a part of CQI activities within stroke systems of care.

iv. Incorporate mechanisms to garner participants’ enthusiasm in collaborative activities.

v. Create or work within an existing broad-based state, regional, or local coalition of healthcare providers, experts, and regulators to develop improved EMSS processes and protocol enhancements.

vi. Urge stroke centers and EMS personnel to collaborate in stroke system research projects.

Measurement Parameter:

Ensure prearrival notification of hospitals is provided for all suspected stroke patients.

b. Develop and implement stroke education activities collaboratively with prehospital and hospital providers that meet current AHA/ASA guidelines for stroke care.

Potential Solutions:

i. Encourage prehospital providers, ED physicians, and stroke experts to collaborate in evaluating the evidence for quality stroke care, writing stroke guidelines, and developing stroke training materials and programs.
ii. Encourage stroke system leaders to determine and facilitate the education needed by EMS personnel to provide optimal care for patients with stroke. EMS medical directors should proactively define the frequency of stroke reeducation so that skill sets are maintained over time.

iii. Work with agencies that oversee EMS to ensure that the regulations include adequate requirements for evidence-based stroke training.

iv. Advocate for funding of professional education training for prehospital providers.

v. Advocate for a stroke training requirement for the renewal of EMS responders’ licensure.

vi. Collaborate with professional organizations, such as nursing associations, to provide stroke training and educational opportunities at conferences.

vii. Ensure that stroke experts are available to help teach the 10 core ACLS cases and to promote the use among providers of computer- and video-based self-directed learning and other training resources.

**Measurement parameter:**
Ensure that 100% of EMS providers complete a minimum of 2 hours of instruction on stroke assessment and care as part of their required continuing medical education for certification and re-licensure.

c. Develop stroke system transport protocols collaboratively with prehospital and hospital providers, as well as with other stakeholders.

i. Obtain support for updated stroke transport protocols from key EMSS, medical, and clinical leaders in the community. Collaborate with state, regional, and community agencies to modify transport policies for stroke treatment and transport.

ii. Establish a hospital identification system that provides a transparent list of hospitals that meet standard criteria for primary stroke centers within the stroke system of care. Comprehensive stroke centers are not yet certified by any national organization, and therefore it may be too early to add these to the list.

iii. Create or work within an existing state, regional or local broad-based coalition of healthcare providers, experts, and regulators to develop improved EMSS point-of-entry (transport destination) plans.

iv. Partner with professional organizations to communicate more effectively with prehospital and hospital providers the evidence supporting current treatment recommendations. Form alliances with professional organizations and advocate for the statewide adoption of transport protocols for stroke.

v. Ensure that all available EMS transportation resources are considered for suspected stroke patients to minimize transport time to the appropriate hospital.

vi. Recognize air transport in the collaborative development of stroke transport protocols.

vii. Develop relationships with CCT and ALS interfacility transfer resources to provide for the rapid transfer of patients to more appropriate hospitals, when indicated.

viii. Standardize equipment and/or cross-train transport personnel in CCT and ALS interfacility transfer procedures to increase available resources for the rapid transfer of patients to more appropriate hospitals when indicated.

ix. Educate providers to treat the transfer of stroke patients for stroke interventions as a true emergency and eliminate the mindset of characterizing CCT and ALS interfacility transfers as non-emergency transports.

x. Develop and measure response time parameters for CCT and ALS interfacility transfers in a manner similar to the measurement of traditional emergency response times.

xi. Use helicopter transport in cases where resource constraints would adversely affect EMS ground availability.

xii. Work with state EMS medical director associations, the state chapter of the American College of Emergency Physicians the ASA, and other relevant organizations to come to a consensus on common stroke training, triage, and transport protocols.

**Measurement Parameters:**
Ensure the total EMSS contact time (from the receipt of the 9-1-1 call or presentation at a non-stroke center hospital to arrival at a stroke center) is measured for 100% of stroke patients. EMSS should consistently strive to decrease this time.
Ensure the amount of time spent with the patient before the start of transport is less than 15 minutes, unless there are extenuating circumstances. This on-scene time should also apply to emergent interfacility transportation of stroke patients. EMSS and hospitals should develop policies and procedures to streamline paperwork and equipment issues.

Ensure that the EMS response time to reach a stroke patient for emergent interfacility transfer is the same as the time from dispatch to transport (less than 9 minutes at least 90% of the time or as determined appropriate by the local EMSS). Similarly the time spent with the patient before starting emergency interfacility transport should be the same as the on-scene time (less than 15 minutes 100% of the time).

d. Engage collaboratively with prehospital and hospital programs in continuous quality improvement processes for stroke patient care while complying with protections for the privacy of personal health information.

**Potential Solutions:**
1. Ensure active participation by prehospital and hospital providers in the development and ongoing implementation of CQI activities. Include stroke experts in reviewing the prehospital care received by every stroke patient as part of CQI activities.
2. Provide education about HIPAA to stroke system providers, including EMS providers and hospitals.
3. Develop model CQI agreements that address HIPAA concerns for EMSS, hospitals, and other providers within stroke systems.

**Measurement Parameters:**
Ensure that 100% of stroke patients are included in CQI activities. Ensure that EMSS feedback is received from the hospital on 100% of stroke patients and that all suspected stroke patients are transported to that hospital for which EMS provided prearrival hospital notification of a suspected stroke.

Implement the development and continuous monitoring of standard measures as part of the CQI process including: stroke history obtained when indicated, stroke assessment performed using validated screening tools when indicated, stroke history checklists that document eligibility for acute therapies properly completed, whether on-scene time was appropriate, and whether the hospital transport destination decision was appropriate.

4. Patients should be transported to the nearest stroke center for evaluation and care if a stroke center is located within a reasonable transport distance and transport time. The determination needs to take into account regional issues such as the availability of stroke centers and geography and whether transportation to a stroke center is possible within the appropriate time for acute therapeutic interventions.

a. Assess stroke patient eligibility for acute stroke therapies using a stroke history checklist or algorithm designed for prehospital personnel consistent with AHA/ASA guidelines.

**Potential Solutions:**
1. Develop and ensure the use of stroke triage and transport protocols that reflect current recommendations for assessing stroke patients for eligibility for acute stroke therapies, including thrombolytic therapy.
2. Ensure that EMS responders have adequate education and training to screen patients accurately for acute therapies.

**Measurement Parameters:**
Ensure that stroke history checklists are completed for at least 90% of all suspected stroke patients.

Ensure that the amount of time EMS responders spend collecting the clinical history at the scene is no longer than 10 minutes. Total on-scene time should not exceed 15 minutes.
b. Establish EMSS transport destination protocols that reflect optimal patient care with transport to a certified stroke center.

**Potential Solutions**

i. Amend EMS transport destination protocols to place a greater priority on transporting patients to recognized certified stroke centers.

ii. Transport suspected stroke patients to the nearest stroke center that provides definitive treatment if such a hospital is within a reasonable transport time, taking into account regional issues such as availability of stroke centers and geography, and whether transportation to a certified stroke center is possible within the appropriate time for acute therapeutic interventions. Alternatively, patients should be transported to the hospital considered to be best prepared to treat stroke patients on an emergency basis.

iii. Advocate for a statewide plan for EMS protocols to ensure stroke patients receive high-priority care at recognized certified stroke centers. Advocate for the development of a public statewide hospital identification system identifying hospitals that meet the criteria for primary or comprehensive stroke centers.

iv. Involve all affected hospital systems and EMS providers in the development of prehospital transport and triage protocols.

v. Include stroke survivors and family members of stroke survivors on committees that develop stroke transport protocols to help mitigate the likelihood that patient destination may be manipulated for economic reasons.

vi. Advocate for local, state, and federal legislation to facilitate and reimburse for the care and transportation of stroke patients to certified stroke centers.

vii. Promote The Joint Commission certification as well as other recognition programs that use similar quality-based outcome measurements.

viii. Encourage rural hospitals to enter into collaborative relationships with stroke centers to access expertise needed to initiate acute therapy before transporting patients to a certified stroke center.

ix. Advise to the development of an interfacility transport component of EMS agencies.

x. Advocate for the creation of model legislation to remove unnecessary legal and regulatory barriers to interfacility transfers.

c. Establish protocols for the transfer of stroke patients from nonstroke center hospitals to certified stroke centers.

**Potential Solutions**

i. Adopt goals for stroke patient arrival detailing initial evaluation and subsequent transfer with treatment at rural nonstroke center hospitals.

ii. Create community-wide guidelines for the interfacility transfer of stroke patients who are candidates for short-term therapies or who have conditions requiring more complex care.

iii. Provide stroke-specific education to assist providers in using system-wide interfacility transport protocols and in making medical decisions about when the benefits of transporting patients outweigh the risks in the context of stroke care and compliance with EMTALA requirements.

iv. Use the trauma system as a model for stroke system development of transport and interfacility transfers.

v. Develop model preestablished referral processes and interfacility transport agreements that reflect EMTALA requirements and any other state and local requirements. Create easy-to-complete forms that address such requirements that physicians can complete before patient transport.

vi. Advocate for the development of an interfacility transport component of EMS agencies.

vii. Advocate for the creation of model legislation to remove unnecessary legal and regulatory barriers to interfacility transfers.
viii. Develop for interfacility transfers a reverse transfer agreement, which returns the stroke patient after the receipt of acute care to the community hospital for subacute care and rehabilitation, as appropriate.

d. Transport stroke patients to stroke-ready hospitals regardless of the patients’ geopolitical location.

**Potential Solutions**

i. Educate state EMS office personnel and regional and local EMS officials regarding EMSS efforts and goals for the development for stroke systems of care.

ii. Identify key stakeholders involved in the development of state and regional trauma systems and discuss their experiences and “lessons learned” that are applicable to the development of stroke systems of care.

iii. Form or work within an existing coalition to address the development of policies and regulations that are specific to patient destination with regard to the stroke patient. This coalition should include representatives of key stakeholder organizations, such as state EMS offices, regional and local EMS offices, the state legislature, the state chapter of the American College of Emergency Physicians, the state chapter of the Emergency Nurses Association, hospitals, and hospital associations.

**Measurement Parameters:**

Establish or work within an existing coalition with participation from representatives of the emergency medicine, political, and prehospital communities.

Establish model policies and regulations for patient transportation protocols that are consistent with AHA/ASA guidelines and can be adopted at the state, regional, and local levels.

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1 American Heart Association. *Heart Disease and Stroke Statistics–2006 Update*. Dallas, TX: American Heart Association; 2006. Available at: http://circ.ahajournals.org/cgi/content/abstract/CIRCULATIONAHA.105.171600