Telemedicine Quality and Outcomes in Stroke

A Scientific Statement for Healthcare Professionals from the American Heart Association / American Stroke Association

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Abbreviations

- ACC: American College of Cardiology
- AHA: American Heart Association
- ED: Emergency Department
- ICH: intracranial hemorrhage
- IV tPA (alteplase): intravenous tissue plasminogen activator
- NIHSS: NIH stroke scale
- QI: Quality Improvement

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Objectives

- Review the current status of telestroke
- Review recommendations and proposed measures for ongoing quality and outcome monitoring to improve performance and enhance delivery of care in telestroke

Outline

- Background on Telestroke
- Background on Quality Measures and Reporting
- Methodology
- Telestroke Process Measures
- Telestroke Outcome Measures
- Telestroke Safety Measures
- Patient and Provider Satisfaction
- Technology Quality
- Process of Quality Reporting
- Licensing, Credentialing, and Reporting
- Training
- Documentation
- Summary

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Background: Telestroke

- Telestroke uses telemedicine to bring stroke expertise to remote locations with otherwise insufficient access

- Telestroke enables remote hospitals to effectively treat patients with ischemic stroke with IV tPA (alteplase) on-site, and to identify and triage patients potentially eligible for endovascular treatment or for trials of new or improved therapies

- Supports the stroke system of care, facilitating linkages between providers, especially in rural or neurologically underserved areas

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Background: Telestroke

- Telestroke network models:
  - <u>Distributed model</u> – services are delivered to hospitals from providers at distant sites on a contractual basis; protocols exist for transfer to nearby facilities when appropriate (panel C in next slide)
  - <u>Hub and spoke model</u> – a stroke center provides telestroke services at a distant site to hospitals within its catchment area and the hub receives patients when transfers are necessary (panels A and B in next slide); most common model

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Diagram comparing 3 organizational models of a stroke telemedicine model: A, the expert teleconsultant is affiliated with the hub hospital that receives potential postconsultation transfers; B, more detailed schematic diagram of the consult process in a model that the teleconsultant is affiliated with the hub hospital showing the possibility of multipoint acute stroke consult; C, the teleconsultant is an employee of a for-profit telemedicine company unaffiliated with the receiving hub D, the teleconsultant is a private practice neurologist unaffiliated with the receiving hub.
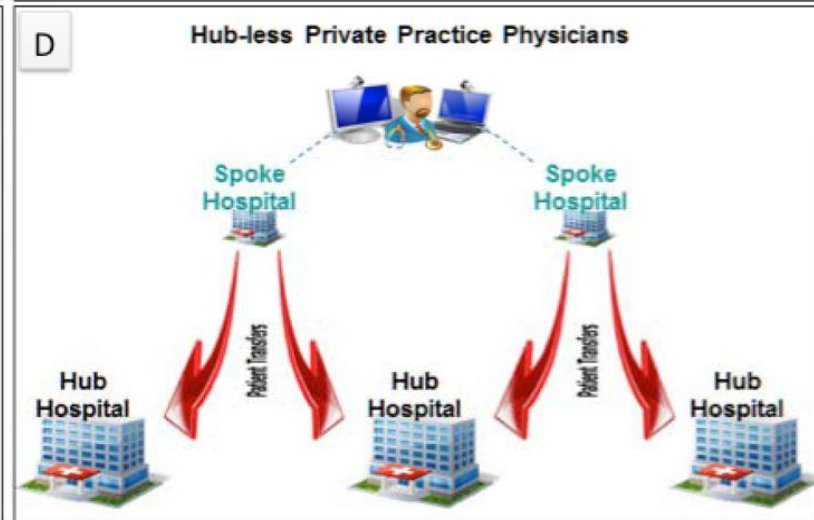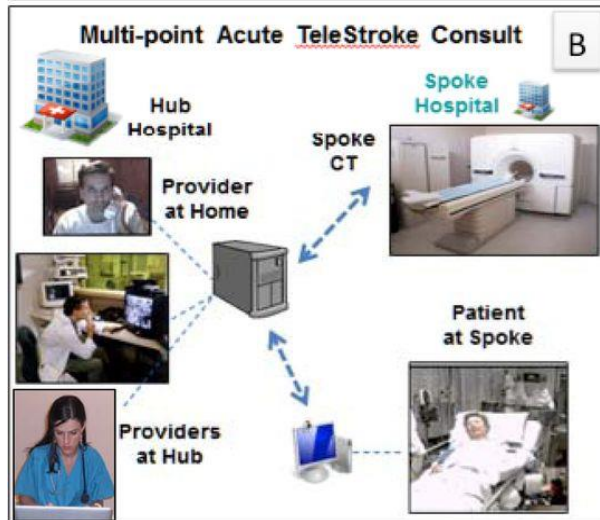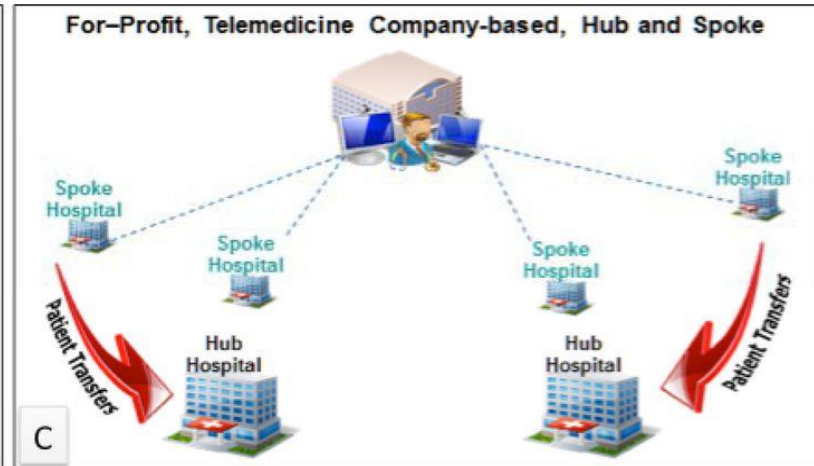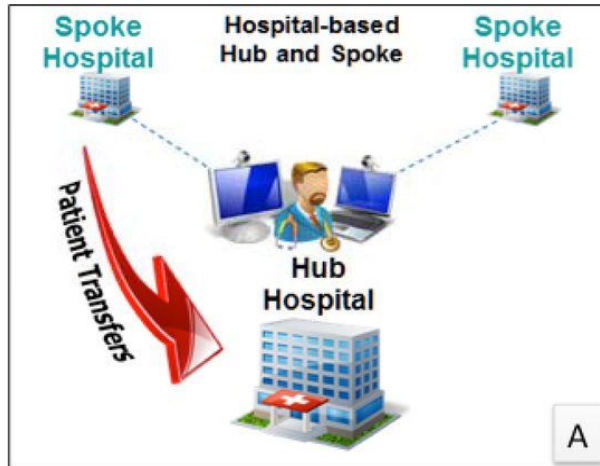
Gisele S. Silva et al. Stroke. 2012;43:2078-2085

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Background: Telestroke

- There is growing evidence for telestroke's advantages
- Ongoing quality monitoring is critical in order to:
  - Assure that patients receive optimal care
  - Provide a vehicle for continuous process improvement
  - Ensure that telestroke does not introduce additional delays in time-critical treatment

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Background: Quality Measurement and Reporting

- Quality measurement is important to ensure that patients may expect to receive care that meets their needs and is based on best evidence

- Types of quality measures
  - Structure: attributes of the healthcare system itself
    - E.g., hospital size, resources available
  - Process: what is done during the care delivery
    - E.g., time-based metrics such as door-to- IV tPA (alteplase) delivery time
  - Outcome: the effects of care on the health status of patients and populations
    - E.g., death, disability, functional status, quality of life

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Background: Quality Measurement and Reporting

- The ACC/AHA Task Force on Performance Measures provides a comprehensive framework for development of quality measures for cardiovascular diseases

- <u>Quality metric</u>: any objective measure that has been developed to support self-assessment and quality improvement at the provider, hospital, and/or health care system level

- <u>Performance measure</u>: any quality metric that has sufficient attributes to allow its use for public reporting, provider profiling, and other QI programs

- The National Quality Forum is a public-private partnership and the final clearing house for quality measure approval

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Methodology

- Members of the writing team performed a literature search to examine:
  - The current status of telestroke
  - Relevant quality indicators
- The authors then reviewed quality and outcome measures and provided specific suggestions for metrics in telestroke networks
- Suggestions and drafts were circulated to all committee members prompting further suggestions and revisions
- Consensus was reached by discussion

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Telestroke Process Measures

- 2 main categories and relevant data points to collect:
  - <u>Time based:</u>
    - Patient arrival time
    - CT time
    - Treatment time for IV tPA (alteplase)
    - Consult request time
    - Time of response by consultant
    - Modality of first response (phone, video)
    - Time of video connection if different from first response
    - Duration of consult
  - <u>Transfer related:</u>
    - Whether patient transfers between facilities post-telestroke consult
    - Destination hospital
    - Method of transfer (private vehicle, ground or air ambulance)
    - Distance traveled for transfer
    - Duration of transfer

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Time to Treatment Process Measures

- Should encompass all standard aspects of the chain of care
  - Door-to-imaging time
  - Door-to-needle time for IV tPA (alteplase) administration
- Additionally, should include telestroke specific times
  - Door-to-consult time
  - Time from consult request to initiation of connection (phone or video)
  - Time from consult start to treatment

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Time to Treatment Process Measures: Telestroke Specific Times

- Door-to-consult time
  - Optimal timing of consult request may vary depending on site- and system-specific characteristics
- Time from consult request to initiation of connection (phone or video)
  - Previous definitions have varied
  - Recommendation for uniformity: use time from consult request to initiation of phone or video connection
  - Response times may vary by hour of day
- Time from consult start to treatment

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Time to Treatment Process Measures

- Ideal metrics to focus process improvement:
  - Door-to-needle time (DTN) for tPA treatment
  - Consult-to-needle time for tPA treatment
- Require close collaboration between sites
  - Times are measured at originating site and should be measured in a standardized fashion
  - Data on both phone and audio-video encounters should be included
  - Evidence thus far does not show any shortening of DTN with use of telestroke
  - Reducing door-to-consult times may reduce DTN times
  - With time and practice, DTN times may improve as well

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Transfer Process Measures

- While no specific recommendations are made for transfer process measures, the authors note:

"Tracking transfers between facilities is important for understanding the flow of patients, cost structure, and eventual outcomes. Time of transfer, destination facility, and time of arrival should be recorded for all such cases."

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Telestroke Outcome Measures

- Patient Outcomes
- Stroke Diagnosis and Mimics
- System Outcomes

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Telestroke Patient Outcome Measures

- Outcomes that are important to patients with stroke:
    - Severity of persisting neurological deficits
    - Length of hospital stay
    - Complications
    - Discharge disposition
    - Disability

- <u>Preferred longer term outcome: 90-day functional status</u> (e.g., using Modified Rankin scale)

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Telestroke Patient Outcome Measures: Recommended Data Collection

- Patient characteristics predictive of stroke outcome:
  - Age
  - Sex
  - NIHSS at first presentation
  - Time to treatment
  - NIHSS at arrival after transfer

- Disposition after telestroke consultation:
  - ED discharge
  - Admission to hospital
  - Transfer to another facility (noting which facility)

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- Patient outcomes:
  - NIHSS at first presentation
  - Time of arrival at originating site
  - Time of departure for inter-hospital transfer
  - Time of arrival at receiving hospital
  - Preliminary diagnosis by telestroke consultant
  - Final discharge diagnosis
  - Hospital length of stay
  - In hospital complications
    - Symptomatic and asymptomatic ICH
    - Mortality
  - Residual deficit at hospital discharge (modified Rankin or NIHSS)
  - Discharge destination
  - Ambulatory status at discharge
  - 90 day modified Rankin scale score

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Telestroke Patient Outcome Measures

- <u>It is recommended that telestroke networks collect 90 day follow-up for all tPA-treated patients</u>
- When this is not possible, other functional outcome proxies may be:
  - In-hospital mortality
  - NIHSS at 24 hours
  - Modified Rankin score or NIHSS at discharge
  - Discharge location

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Telestroke Patient Outcome Measures

- A statement of responsibility for collecting outcome information should be explicit at the beginning of an agreement to provide telestroke services

- Since outcomes depend strongly on initial stroke severity, admission NIHSS should always be recorded

- Attribution to originating versus distant site depends upon:
  - Where the patient is hospitalized
  - Capabilities of both sites

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Telestroke Outcome Measures: Stroke Diagnosis and Mimics

- Diagnostic accuracy is a critical measure of telestroke consultation quality
  - e.g., a comparison of initial and final diagnosis may help better understand diagnosis and treatment of stroke mimics

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Telestroke Outcome Measures: IV tPA (alteplase) Utilization

- IV tPA (alteplase) treatment rates relative to total telestroke consults
  - Should include percent of all patients seen in the ED with the initial diagnosis of stroke and percent of all patients discharged with a stroke diagnosis
  - Should include percent of patients with stroke arriving within the 3 and 4.5 hour time windows and the percent of all patients within these windows who are eligible for IV tPA (alteplase) no documented reason for not treating with IV tPA)
- IV tPA (alteplase) protocol adherence

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Telestroke Safety Measures

- Given the risks associated with IV tPA (alteplase), it is essential to monitor complications and safety outcomes

- Suggested measures
  - Intracranial hemorrhage
  - Mortality
    - In-hospital
    - Up to 90-day

- May also consider less common complications such as angioedema and systemic hemorrhage

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Telestroke Safety Measures: Intracranial hemorrhage

- Definitions of symptomatic hemorrhage have varied between studies but rates of symptomatic intracranial hemorrhage should be monitored and reported using a standard definition

- Asymptomatic hemorrhage should also be monitored and reported

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Telestroke Safety Measures: Mortality

- For assessment of treatment safety
  - Ideal: 7-day mortality
  - Pragmatic: survival to discharge from acute care
- 90-day mortality

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Patient Satisfaction

- Patient satisfaction has grown as a recent focus and is a high priority for most healthcare systems
- Should be an integral component of a telestroke quality monitoring program
- Surveys should assess:
  - Satisfaction with the provider, staff, technology, interactions, audio and video components
  - Overall experience
- There is need for standardization of a metric for reporting patients' perception of their experience with telestroke services

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Provider Feedback

- Provider satisfaction is a critical factor in predicting network success, includes acceptance, utilization, effectiveness, and efficiency

- Feedback from providers
  - On adequacy of the network operation and on patient care
  - Important to identify problems, facilitate system-wide improvements to improve patient care

- Feedback from providers (issues)
  - Amount of on call, call reimbursement, overall quality of life, perceived quality of care provided

- The ideal vehicle for tracking this parameter requires further study

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Telestroke Technology Quality

- Continuous monitoring of technical failures and limitations during consults
  - Recorded by both the originating and provider sites
  - Notes on specific problems, frequency of problems, and how frequently issues resulted in limitations, delays, or inability to perform a telestroke consult
  - The number of failed and compromised calls should be expressed as a percent of all telemedicine interactions
- A backup system should be available
- Any potential harm due to failed or inadequate connections should be recorded and reported

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Telestroke Technology Quality: Prehospital

- In a system utilizing telestroke in a prehospital setting, technical measures should be recorded in addition to any specific limitations related to mobile communication in an air or ground ambulance setting

- Systems must provide bandwidth sufficient for meaningful decision-making relative to the channel being used (e.g., phone, video or imaging)

- There should be backup alternatives to address connection failures or delays

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Telestroke Technology Quality: Data Security

- Safeguards are necessary to ensure compliance with local and federal privacy and security regulations

- Any telestroke interactions in which a violation of security or protected health information policies is suspected due to technical problems should be recorded, investigated, and corrected

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Telestroke Technology Quality: Image Quality

- Quality monitoring of CT image quality, technical failures, operational failures, or workflow issues should be recorded and regularly reviewed along with other technology quality measures

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Process of Quality Reporting

- Collection within a telestroke system:
  - Should be standardized
  - Measures should be shared across a network
- Who's responsible?
  - Collecting quality data should be a component of the agreement between telestroke sites and either a coordinating stroke center or distributed partner
- A program budget should include the cost associated with quality reporting

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Process of Quality Reporting

- Certification
  - By an independent, external organization with no financial or other ties to the network hospitals
  - May be integrated into existing hospital certification programs
  - Process should include a review of performance metrics, processes and outcomes involving telemedicine and should be integrated into existing certifications mechanisms
  - Distributed networks that are not based inside a stroke system of care should be included in a certification mechanism to ensure uniform quality

- Standardization of telestroke quality data across networks is desirable and could be achieved by certifying organizations uniformly adopting the suggestions in this document

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Licensing, Credentialing and Training Requirements

- While medical licensure and hospital credentialing are identified as barriers to telemedicine implementation, they are crucial to ensuring high quality of care delivery to patients in a telestroke network

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Licensing

- US Federation of State Medical Boards developed a policy to provide guidance to state medical boards on telemedicine regulation
  - A physician must be licensed in the state where the patient is located
  - The Interstate Medical Licensure Compact may alleviate some of this burden
- Further efforts to mitigate the administrative burden of maintaining individual state licenses are warranted

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Credentialing

- CMS and the Joint Commission allow credentialing and privileging by proxy at small and critical access hospitals
  - Not all state boards of registration have been revised accordingly
- Future efforts should be directed toward mitigating the administrative burden created by credentialing requirements for telestroke services in both rural and urban clinical environments
- Privileges for telestroke providers and ancillary staff should incorporate completion of training standards appropriate to their level of care

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Training

- Training programs at the originating and distant sites
  - Educate providers
  - Support personnel to keep clinical skills updated
  - Assure appropriate use of technology
- No uniformly agreed upon training requirements
- Essentials:
  - Support and buy-in of hospital administrators, information technology personnel, and legal and financial personnel
  - A physician champion to facilitate navigation through administrative, technological, legal and financial issues, and to cultivate enthusiasm on site and build relationships between sites (may be the Medical Director for telestroke)

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Training

- Distinct training goals for
    - Medical Director
    - Consultant vascular neurologists/stroke experts at the stroke center
    - Emergency physicians at a telestroke facility
    - ED nurses at a telestroke facility
    - Other hospital providers
    - Program manager

Training

- <u>Medical Director</u> should have at least 2 of the following:
  - Vascular neurology fellowship training
  - Attend ≥ 2 professional meetings or courses over 2 years concentrating on cerebrovascular disease or telemedicine
  - 4 or more CME credits per year in cerebrovascular disease and 4 or more CME credits in telemedicine
  - Other criteria demonstrating competence in these areas as agreed upon by local and national standards
- Medical director should be trained in and familiar with:
  - Shared clinical protocols
  - The selected technology platform, and troubleshooting
  - Local transfer and referral arrangements

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Training

- Training for <u>vascular neurologists/stroke experts</u> at the stroke center to optimize clinical care:
  - Use of technology platform
  - Troubleshooting technological difficulties with IT assistance
  - Back-up plans for providing clinical care if technical problems are insurmountable
  - Local hospitals' clinical goals and transfer needs/requirements
- New training for all when new hardware is introduced
- Re-credentialing at regular intervals including
  - Continuing education specific to stroke and telemedicine
  - Any adverse events
  - Outcomes
  - Peer review of one or more telestroke interaction

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Training

- Training for <u>emergency physicians at a telestroke facility</u>
  - Processes for initiating a telestroke consult in a timely and efficient manner
  - Use of the selected technology platform for communicating with the consulting partner
  - The clinical protocol for stroke evaluation established by the telestroke champions
- These physicians should have input into the development of the clinical protocol early in the process

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Training

- Training for <u>ED nurses</u> at the telestroke site should include:
  - Quick recognition and triage, evaluation, and treatment of acute stroke patients
  - Stroke recognition
  - The importance of rapid evaluation and treatment for stroke outcomes
  - NIH stroke scale or Emergency Neurologic Life Support training

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Training for other hospital providers

- <u>EMS personnel:</u> training to triage possible stroke patients to hospitals with telestroke capability over those without

- <u>Advanced practice providers</u>:
  - Similar to emergency physicians if practicing in the ED
  - As telestroke champions regardless of primary practice
  - In quality monitoring and chart review

- <u>Hospitalists, Intensivists, other non-ED physicians:</u>
  - Post-management aspects of clinical protocol
  - Use of technology (depending on involvement of stroke center in post-ED care)

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Training

- Training for <u>program manager</u> to enable this person:
  - To interface with medical staff office, IT and legal offices at the stroke center and supported hospitals
  - Ensure contracts are in place, licensure and credentialing are current
  - Schedule training and education of personnel at all hospitals within the network
  - Ensure quality measures are in place and followed
  - Provide oversight for telestroke program

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Training

- Professional societies of vascular neurology, emergency medicine nursing, and telemedicine should partner to develop a curriculum, and make available a series of CME offerings that would meet the needs of telestroke medical directors and their teams

- Telestroke programs should assist in educational program development or implementation in their covered regions, in partnership with properly accredited CME organizations

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Documentation

- Critical for all telestroke encounters
- Consistent with documentation that would be provided with an in-person consultation
  - History
  - Exam – including NIHSS
  - IV tPA (alteplase): assessment of the appropriateness, decision process, consent documentation as appropriate, time of administration
  - Final telestroke diagnosis
- Provided expediently to originating site to support any verbal recommendations
- Complying with privacy and security regulations

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Telestroke measures overlapping with other stroke quality measure recommendations

Telestroke Quality Measure	AHA/GWTG	BAC Papers	Hospital Accrediting Bodies*
Patient characteristics upon arrival after transfer	Yes	Yes	Yes
CT scan completion time	Yes	Yes	Yes
tPA treatment (eligibility; door-to-needle; protocol adherence)	Yes	Yes	Yes
The percent of tPA in: patients seen in ED with the initial diagnosis of stroke, arriving in the ED within the 3 and 4.5 hour time windows, eligible for tPA	Yes	No	Yes
Patient disposition after telestroke consultation	Yes	Yes	Yes
Short-term patient outcomes (length of stay, symptomatic and asymptomatic ICH, in-hospital or 7 day mortality)	Yes	Yes	Yes
Functional outcome at discharge	Yes	No	No
Longer term outcomes (90 day mRS) for patients treated with thrombolysis	Yes	No	Yes
Quality performance should be collected in a standardized fashion and	Yes	Yes	Yes

AHA indicates American Heart Association; BAC, Brain Attack Coalition; CT, computed tomography; ED, emergency department; GWTG, Get With The Guidelines; ICH, intracranial hemorrhage; mRS, modified Rankin Scale; and tPA (alteplase), tissue-type plasminogen activator.
*The Joint Commission, DNV Healthcare, Healthcare Facilities Accreditation Program, and Center for Improvement in Healthcare Quality

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New telestroke quality measures without overlap in existing stroke quality recommendations

Telestroke Quality Measure	Comments
Telestroke Workflow Times (consult notification, phone response, video-consult initiation, consult completion)	BAC suggests telemedicine link be established within 20 minutes of consult request
Quality metrics on phone and audiovisual consults	
Tracking transfers between facilities (time of arrival and departure at originating site and arrival at receiving facility)	AHA/ASA policy, ASRF, HFAP only recommend tracking median facility to facility transfer times
Telestroke consultant preliminary diagnosis and final discharge diagnosis	GWTG only tracks patients with discharge diagnosis of stroke. This recommendation extends collection of diagnosis to all patients seen as a telestroke consult, whether stroke or not.
Patient satisfaction with the telestroke consult	
Provider feedback on network operation	
Monitoring of technical failures/limitations during consults including the frequency that technical issues affect patient care (for both ED-based and EMS-based systems)	Though this is new, as it applies solely to telestroke systems, it is in the spirit of general hospital quality monitoring
Investigation of any telestroke security breaches	Though this is new, as it applies solely to telestroke systems, it is in the spirit of general hospital quality monitoring

AHA indicates American Heart Association; ASA, American Stroke Association; BAC, Brain Attack Coalition; CT, computed tomography; ED, emergency department; EMS, emergency medical services; GWTG, Get With The Guidelines; and HFAP, Healthcare Facilities Accreditation Program.

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Summary

- Ongoing data collection and quality monitoring is critical
    - Ensure optimal clinical care to patients
    - Enable process improvement
- Specifically, systems must
    - Ensure that telestroke does not introduce delays in time-critical treatment
    - Monitor traditional stroke outcomes (disability scales)
    - Monitor patient-centered outcomes (satisfaction, experience)
    - Monitor adverse outcomes (ICH, mortality)
- New goals may include
    - Screening for endovascular eligibility and identifying patients appropriate to transfer for this therapy

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