Clinical Performance Measures for Adults Hospitalized With Acute Ischemic Stroke

Performance Measures for Healthcare Professionals From the American Heart Association/American Stroke Association

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To work toward the goal of building healthier lives, free of cardiovascular diseases and stroke, the American Heart Association (AHA) and American Stroke Association (ASA) have developed a multifaceted strategy for improving the quality of care for stroke. A key feature of this strategy is the development of professional guidelines for evidence-based stroke care. Recommendations are provided for acute management, primary and secondary prevention, rehabilitation, stroke systems of care, and other domains of stroke care.[1–4] The strength of the evidence supporting these recommendations is given, according to a specified grading system. For many aspects of care, there is widespread consensus that the intervention is beneficial, usually supported by strong scientific evidence including randomized controlled trials.

Professional guidelines improve the delivery of evidence-based care; however, despite these guidelines, gaps between best evidence-based practice and actual practice persist.[5] To close these gaps in quality of care, several organizations have developed systems to allow practitioners and healthcare organizations such as hospitals to quantify the quality of their care through performance measures. A performance measure is defined by the Agency for Healthcare Research and Quality as a "mechanism for assessing the degree to which a provider competently and safely delivers the appropriate clinical services to the patient within the optimal time period."[6] The AHA and American College of Cardiology Foundation have additionally suggested that performance measures should be based on the highest level of supportive evidence and have the greatest impact on health outcomes.[7] Performance measures, in addition to supporting quality improvement activities, are specifically suitable for public reporting, external comparisons, and possibly pay-for-performance programs.

As steward of the professional guidelines for stroke care, with a large group of volunteer expert clinicians with expertise in guideline creation and performance measurement, the AHA/ASA is uniquely positioned to develop high-quality performance measures based on the guidelines. Accordingly, in 2011 the AHA/ASA formed the Stroke Performance Oversight Committee to oversee development of stroke performance measures and quality metrics. Writing committees were commissioned for different domains of stroke care based on the care setting and type of cerebrovascular disease (eg, ischemic stroke versus intracerebral hemorrhage), roughly corresponding to the topics of the highest-impact professional guideline statements.[8] This document provides the results of the writing committee on acute inpatient management of ischemic stroke.

The primary intended purpose of these performance measures is to facilitate improved adherence to guideline-recommended care. The writing committee hopes that healthcare providers, healthcare organizations, and payers, such as the Centers for Medicare and Medicaid Services (CMS), may find these measures useful to measure and improve their quality of care.

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This statement was approved by the American Heart Association Science Advisory and Coordinating Committee on June 18, 2014. A copy of the document is available at http://my.americanheart.org/statements by selecting either the "By Topic" link or the "By Publication Date" link. To purchase additional reprints, call 843-216-2533 or e-mail kelle.ramsay@wolterskluwer.com.

The online-only Data Supplement is available with this article at http://stroke.ahajournals.org/lookup/suppl/doi:10.1161/STR.0000000000000045/-/DC1.

The American Heart Association requests that this document be cited as follows: Smith EE, Saver JL, Alexander DN, Furie KL, Hopkins LN, Katzan IL, Mackey JS, Miller EL, Schwamm LH, Williams LS; on behalf of the AHA/ASA Stroke Performance Oversight Committee. Clinical performance measures for adults hospitalized with acute ischemic stroke: performance measures for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2014;45:3472–3498.

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(*Stroke*. 2014;45:3472-3498.)

***Stroke* is available at http://stroke.ahajournals.org** **DOI: 10.1161/STR.0000000000000045**

Scope of the Problem

Acute ischemic stroke causes ≈691 000 hospitalizations per year.[9] In-hospital mortality is ≈7%.[10] Stroke is the fourth-leading cause of death.[9] Therefore, stroke is one of the leading public health problems in the United States. Improved quality of care can reduce the health burden of stroke. Although age-standardized stroke mortality is falling, the overall burden of stroke is expected to increase because of the aging of the population.[9] Our hope is that the acute ischemic stroke performance measures provided here will facilitate improved quality of care, leading to better outcomes from stroke.

Stroke Quality of Care: Historical Perspective

National hospital-based stroke quality improvement programs have been established previously by The Joint Commission, in collaboration with the AHA/ASA, through their primary stroke center certification program; the Centers for Disease Control and Prevention (CDC) through the Paul Coverdell National Acute Stroke Registry (PCNASR); the AHA/ASA through the Metro Stroke Task Force, Operation Stroke, and Get With The Guidelines (GWTG) program; and the US Department of Veterans Affairs through the Stroke Quality Enhancement Research Initiative.[11] Since 2003, The Joint Commission has certified primary stroke centers based on evidence-based standards, such as presence of a stroke team with written care pathways, verified by on-site review. Certification requires ongoing reporting on 8 ischemic stroke performance measures to The Joint Commission. The CDC established the PCNASR in 2001, with the objectives being to measure, track, and improve the quality of acute stroke care. After a 3-year pilot phase in 8 states, the program expanded nationally in 2004 and has been funded through cooperative agreements with state departments of public health.[12] The AHA launched the GWTG-Stroke program nationally in 2003. The program allows hospitals to enter data on achievement measures and quality metrics and to receive feedback through an Internet-based tool, with benchmarking against other peer hospitals and embedded links to the evidence supporting best care practices.[13] Hospitals that achieve adherence rates >80% on all of the 7 achievement measures among eligible patients are publicly recognized. In 2006, the Healthcare Facilities Accreditation Program initiated a primary stroke certification program, endorsing the GWTG patient management tool and performance measures. Representatives from 3 of these hospital-based programs (The Joint Commission, CDC PCNASR, and GWTG-Stroke) formed the Stroke Performance Measure Consensus Group in 2006 that harmonized to the greatest extent possible the performance measure numerators and denominators for 10 measures reported by all of the programs. In 2008, the National Quality Forum (NQF) endorsed 8 of these 10 measures (Table 1); however, in 2012, the NQF announced that 1 of these 8 measures, stroke education, would no longer be endorsed because of poor reliability and the absence of a strong link between measure adherence, changed patient behavior, and improved health outcomes.[14] The US Department of Veterans Affairs has established similar systems for ischemic stroke quality reporting as part of the Stroke Quality Enhancement Research Initiative program,[15] currently requiring hospital reporting of tissue-type plasminogen activator for eligible patients, dysphagia screening, and performance of the National Institutes of Health Stroke Scale (NIHSS). The American Academy of Neurology has developed a set of stroke performance measures in conjunction with the American Medical Association Physician Consortium for Performance Improvement (AMA PCPI), 5 of which were endorsed by the NQF in 2008 and re-endorsed in 2012. Physicians can select these measures to report to CMS to receive financial incentives as part of the Physician Quality Reporting System. Beginning in 2015, failure to participate in this program will result in financial penalty.

In 2003, CMS began development of the Hospital Inpatient Quality Reporting Program to measure performance for several common hospital diagnoses. As part of this program, hospital reimbursement from CMS now depends in part on reporting on performance measures. Beginning January 2013, 8 stroke performance measures, precisely aligned with their counterpart measures from The Joint Commission, are part of this program (Table 1).

Methods

The process used by the AHA Stroke Council to develop the acute ischemic stroke performance measures is based on the methodology developed by the joint American College of Cardiology Foundation Task Force on Performance Measures[16] and is consistent with principles established by AHA scientific statements.[7,17,18] The committees first selected the definition of stroke and care period, then reviewed the existing AHA/ASA guideline recommendations for suitability for conversion into performance measures, based on the strength of the supporting evidence, feasibility of data collection, reliability for comparisons across sites, and potential to improve patient health outcomes. Next, suitable guideline recommendations were converted into corresponding performance measures with exact specifications of patient inclusion and exclusion criteria and measure numerators and denominators. For guideline recommendations with existing performance measures already endorsed by the NQF or in use by organizations or programs such as The Joint Commission or the AHA GWTG program, the committee either endorsed use of the existing measures or, when deficiencies or limitations were apparent, offered comments and suggestions for improvement. For guideline recommendations without existing performance measures, the committees specified new performance measures. These newly specified measures will require pilot testing in the field before widespread adoption.

The Acute Ischemic Stroke Performance Measures Writing Committee was charged with developing performance measures related to emergency department and inpatient care of adults (>18 years of age) hospitalized with acute ischemic stroke. These performance measures are relevant to care provided in the inpatient setting, including acute diagnosis, reperfusion therapy including thrombolysis, secondary prevention to prevent early recurrence, prevention of common medical complications, assessment for rehabilitation, and stroke education. They do not apply to inpatient management of intracerebral or subarachnoid hemorrhage, which will be the subject of future performance measures recommendations.

Table 1. Current Harmonized Stroke Performance Measures Used by the CDC PCNASR, AHA GWTG-Stroke Program, and The Joint Commission

Performance Measure	NQF Endorsed	PCNSAR/ GWTG	TJC/CMS HIQRP
1. Venous thromboembolism prophylaxis	✓	✓	✓
2. Discharged on antithrombotic therapy	✓	✓	✓
3. Anticoagulation therapy for atrial fibrillation/flutter	✓	✓	✓
4. Thrombolytic therapy administered	✓	✓	✓
5. Antithrombotic therapy by end of hospital day 2	✓	✓	✓
6. Discharged on statin medication	✓	✓	✓
7. Dysphagia screening		✓	
8. Stroke education		✓	✓
9. Tobacco use counseling		✓	
10. Assessed for rehabilitation	✓	✓	✓

The stroke education measure was previously endorsed by NQF, but was not re-endorsed in 2012. The ischemic stroke tobacco use cessation measure is not endorsed by NQF or used by The Joint Commission; however, The Joint Commission offers a similar global tobacco cessation measure that is applicable to all hospitalized patients, including ischemic stroke patients. The dysphagia screening measure used by CDC PCNASR, AHA/American Stroke Association GWTG-Stroke and The Joint Commission has been proposed to NQF but was never endorsed because of concerns regarding the strength of the evidence linking the measure to improved patient outcomes. Measures 1, 8, 10 are applicable to hospitalized hemorrhagic stroke patients too (intracerebral hemorrhage and subarachnoid hemorrhage), and such patients are included in the denominators of the NQF-endorsed and The Joint Commission/CMS measures.

AHA indicates American Heart Association/American Stroke Association; CDC, Centers for Disease Control and Prevention; CMS, Centers for Medicare and Medicaid Services; GWTG, Get With The Guidelines; HIQRP, Hospital Inpatient Quality Reporting Program; NQF, National Quality Forum; PCNASR, Paul Coverdell National Acute Stroke Registry; and TJC, The Joint Commission.

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Structure and Membership of the Committee

Writing committee invitees were determined by the AHA/ASA Stroke Performance Oversight Committee. The committee roster was designed to include experienced clinicians with expertise in the methods of performance measurement and to ensure diversity of specialists representative of most of the disciplines involved in the inpatient management of stroke. Disciplines included vascular neurology, neurocritical care, neuroendovascular care, neurosurgery, physical medicine and rehabilitation, and nursing.

Disclosure of Relationships With Industry

This work was supported solely by the AHA without other financial support. Committee members volunteered their time, without financial compensation. Meetings of the writing committee were confidential and attended only by committee members and staff. Writing committee members were required to disclose in writing all financial relationships with industry relevant to this topic according to standard AHA reporting policies.

Definition of Acute Ischemic Stroke

The committee used definitions of ischemic stroke and transient ischemic attack (TIA) based on scientific statements from the AHA[19,20] and definitions for key data elements for cardiovascular disease recommended by the AHA and ACC.[21] Ischemic stroke was defined as an episode of neurological dysfunction caused by focal infarction of the brain, spinal cord, or retina, in which central nervous system infarction was defined by pathological, imaging, or other objective evidence of ischemic injury in a defined vascular distribution or by symptoms that persisted ≥24 hours or until death with other (nonstroke) causes excluded.[19] TIA was defined as a transient episode of neurological dysfunction caused by focal brain, spinal cord, or retinal ischemia, without evidence of infarction.[20]

Dimensions of Care

The management of ischemic stroke involves multiple dimensions of care (including acute treatment, prevention of recurrence, prevention and treatment of common medical complications, rehabilitation, and patient education and counseling) that cut across multiple healthcare disciplines (eg, physicians, nurses, therapists, and others) and across multiple healthcare settings (eg, outpatient, acute care hospital, and inpatient rehabilitation). Therefore, the committee carefully deliberated the appropriate dimensions of care for the set of proposed measures. The result was a decision to provide a set of measures applicable to all dimensions of care in the acute care hospital setting. The acute hospital setting was chosen because it is an easily defined care period for which there is good evidence for multiple processes of care that improve patient outcomes. The choice of an initial set of measures ready to be applied or studied in this specific setting, rather than a larger global set of measures that would have to be modified for use in the acute hospital, should facilitate adoption of these measures by hospitals. There is a strong precedent for hospital-based ischemic stroke performance measurement, including The Joint Commission's primary stroke center certification program, the CDC's PCNASR, the AHA's GWTG-Stroke program, and various state-specific initiatives.

The committee considered including outcome measures but declined to do so because the evidence that differences in outcome measures reflect differences in quality of care is uncertain and still evolving.[18,22] Additionally, outcome measures require risk adjustment to account for hospital differences in patient case mix, and the single most important prognostic variable for stroke outcome, stroke severity, is not routinely recorded in a standardized fashion in routine clinical practice.[23] The committee encourages policies to promote documentation of presenting stroke severity, including creation of a stroke severity documentation performance measure, so that this crucial prognostic variable will be more widely available for use for risk adjustment for potential future outcome measures.

Literature Review

The primary source used to derive the measures was the 2007 AHA/ASA "Guidelines for the early management of adults with ischemic stroke."[24] These guideline statements were also reviewed to identify additional recommendations suitable for measure development: "Recommendations for the

Establishment of Stroke Systems of Care,"[1] "Guidelines for the Prevention of Stroke in Patients with Stroke and Transient Ischemic Attack,"[2] and "Comprehensive Overview of Nursing and Interdisciplinary Care of the Acute Ischemic Stroke Patient."[3] In 2013, while the measure development process was ongoing, the AHA/ASA released an updated, new version of the "Guidelines for the Early Management of Patients With Acute Ischemic Stroke"[4]; therefore, the committee reviewed the measures in development to ensure that they remained relevant and appropriate in light of the new 2013 guidelines. Additionally, the co-chair of this committee was the vice chair of the writing committee for the 2013 "Guidelines for the Early Management of Adults With Acute Ischemic Stroke" and helped ensure harmony with the updated guidelines.

Definition and Selection of Measures

To ensure that performance measures would be based on the strongest consensus regarding best quality of care, only Class I (high consensus for benefit) and Class III (high consensus for harm) recommendations were considered candidates for development into performance measures. The committee met by teleconference and reviewed all Class I and III recommendations suitable for creation and/or endorsement of an accompanying performance measure. Standardized criteria for suitability for performance measurement, based on principles previously used by the AHA and ACC,[7] were reviewed and agreed upon. These criteria were as follows: (1) Likelihood that measure adherence would result in improved patient outcomes; (2) interpretability; (3) actionability; (4) precise numerator and denominator could be defined; (5) reliability; (6) validity; and (7) feasibility for implementation. After the teleconference, each committee member voted on each Class I or III recommendation by ballot. The ballots were collected, and the vote results were discussed at a subsequent teleconference, followed by discussion and selection of the final recommendations for translation into performance measures.

First, committee members identified whether a relevant NQF-endorsed measure already existed for the guideline recommendation in question and, if one did exist, whether the measure was appropriate. The committee adopted the principle of giving priority to alignment with NQF-endorsed measures whenever possible, because the NQF endorsement is widely accepted by other programs and organizations. Next, committee members created performance measures by specifying numerators and denominators for each measure, either by adopting or modifying existing quality measures or by drafting new measures. Each committee member individually drafted 1 or 2 measures. In addition to the measure numerators and denominators, committee members proposed the period of assessment, sources of data, method of reporting, brief rationale for the measure, and potential challenges to implementation.

The draft measures were reviewed by the committee by teleconference and revised on the basis of the committee feedback. As a final step, each measure was voted on for inclusion or exclusion using standardized ballot forms. The ballots allowed measures to be rated on these dimensions: evidenced-based, interpretable, actionable, design of numerator and denominator, reliability, validity, and feasibility for implementation.[18] For each of these dimensions, the ballot respondent indicated a score on a Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree). As well, an overall recommendation for inclusion, ranging from 1 (do not include) to 5 (must include), was provided. The ballot results were collated and discussed by teleconference. Measures with high mean scores for inclusion (4 or 5) were selected for a final vote for inclusion in the final measure set. The final vote was conducted by email after the teleconference.

Review and Endorsement

In May 2013, the performance measures document underwent a 30-day public comment period, during which AHA members and other healthcare professionals had an opportunity to review and comment on the text in advance of its final approval and publication. Relevant healthcare organizations and professional societies were alerted to the publication of the document and encouraged to comment. The official peer review/content review of the document was conducted simultaneously with the 30-day public comment period, with 6 peer reviewers selected by the AHA. Additional comments were sought from clinical content experts and performance measurement experts. After refinement based on public and peer review comments, the AHA/ASA clinical performance measures for adults hospitalized with acute ischemic stroke were adopted by the respective governing bodies of the AHA/ASA in October 2013. These measures will be updated comprehensively once every 3 years, with interim focused updates as needed. They should be considered valid until either updated or rescinded by the AHA/ASA Stroke Performance Oversight Committee.

Performance Measures for Adults Hospitalized With Acute Ischemic Stroke

Patient Population and Care Period

The patient population is ischemic stroke, as defined in Definition of Acute Ischemic Stroke in the Methods section, and the care period is the acute hospitalization for diagnosis and management of new ischemic stroke, from emergency department arrival at an acute care hospital to discharge. The performance measures were not designed for use for elective admissions (eg, for elective carotid endarterectomy or stenting) or for inpatient ischemic stroke, in which the stroke occurred after hospital admission. Accordingly, these admission types are excluded from the measure denominators, as they are for the current NQF-endorsed ischemic stroke measures. The committee agreed it is reasonable to exclude admissions with length of stay >120 days, as is done in the NQF-endorsed ischemic stroke measures, to avoid double counting patients when generating quarterly reports.

Ischemic stroke admissions may be identified by discharge *International Classification of Diseases* (*ICD*) codes (as required by The Joint Commission), prospective or retrospective surveillance of admission logs by the hospital team, or a combination (as allowed by AHA/ASA GWTG-Stroke). *ICD-9* (*ICD, 9th Revision*) and *ICD-10* (*ICD, 10th Revision*) codes for acute ischemic stroke are shown in Table 2. These codes have moderately good sensitivity and specificity for ischemic stroke.[25,26] The choice of method of case ascertainment and diagnosis—administrative billing codes versus chart review—may depend on many registry-specific factors, including

Table 2. *ICD-9* and *ICD-10* Codes for Ischemic Stroke for Use for Performance Measurement

ICD-9 Codes
433.01, 433.10, 433.11, 433.21, 433.31, 433.81, 433.91, 434.00, 434.01, 434.11, 434.91, 436
ICD-10 Codes
I63.00, I63.01x, I63.02, I63.03x, I63.09, I63.10, I63.11x, I63.12, I63.13x, I63.19, I63.20, I63.21x, I63.22, I63.23x, I63.29, I63.30, I63.31x, I63.32x, I63.33x, I63.34x, I63.39, I63.40, I63.41x, I63.42x, I63.43x, I63.44x, I63.49, I63.50, I63.51x, I63.52x, I63.53x, I63.54x, I63.59, I63.6, I63.8, I63.9

Code 436 is included in the definition of ischemic stroke used by The Joint Commission and Centers for Medicare and Medicaid Services but not included in the definition of stroke used for American Medical Association Physician Consortium for Performance Improvement measures.

ICD-9 indicates *International Classification of Diseases, 9th Revision*; *ICD-10*, *International Classification of Diseases, 10th Revision*.

available resources, and the implications for validity and reliability of performance measurement are not yet known; therefore, the committee endorses either method as a valid means of case ascertainment.

Although measures were developed with the intent that they would be applied in the patient population and care setting described above, the writing committee recognizes that many of the measures may be applicable to other settings and patient populations, including patients with TIA, inpatient strokes, and hemorrhagic strokes. The committee cannot endorse the use of measures outside the setting in which they were designed; however, the committee acknowledges that measures could be piloted in these additional settings and eventually reconsidered for formal endorsement. Measures that are potentially applicable to TIA or hemorrhagic stroke are listed in the legend to Table 3. Organizations could consider using these measures for performance measurement for TIA or hemorrhagic stroke, or adapting the existing measures for use for inpatient stroke, at their discretion. Currently, the performance measures used in AHA/ASA GWTG-Stroke, The Joint Commission, and the CMS Hospital Inpatient Quality Reporting Program do not include TIA patients, possibly because of concerns regarding the accurate identification of TIA using administrative billing data, whereas PCNASR includes TIA patients and reports performance in TIA separately. When *ICD* codes are used to identify TIA patients, code 435.xx should be used, which has moderate accuracy for TIA compared with chart review. Patients with intracerebral hemorrhage or subarachnoid hemorrhage are included in 3 measures that are used by The Joint Commission and CMS, including 2 endorsed by NQF that were reviewed and also endorsed by this committee: venous thromboembolism prophylaxis, stroke education, and assessment for rehabilitation (Table 1). Subsequent AHA/ASA Stroke Performance Oversight Committee writing committees will be tasked with comprehensive measure development for hemorrhagic stroke.

Brief Summary of the Measurement Set

Table 3 shows the AHA/ASA performance measure set for adults hospitalized with acute ischemic stroke. The set consists

Table 3. AHA/ASA Performance Measure Set for Hospitalized Patients With Ischemic Stroke

Number	Performance Measure	NQF Endorsed	CDC PCNASR/ AHA GWTG	TJC/CMS HIQRP Measure	Revised Measure	New Measure
1	Venous thromboembolism prophylaxis	✓	✓	✓		
2	Discharged on antithrombotic therapy	✓	✓	✓		
3	Anticoagulation therapy for atrial fibrillation/flutter	✓	✓	✓		
4	Thrombolytic therapy	✓	✓	✓		
5	Antithrombotic therapy by end of hospital day 2	✓	✓	✓		
6	Discharged on statin medication	✓	✓			
7	Stroke education		✓	✓		
8	Tobacco use counseling		✓	✓		
9	Assessed for rehabilitation	✓	✓	✓		
10	Time to intravenous thrombolytic therapy	✓	✓			
11	Dysphagia screen: assessment				✓	
12	Dysphagia screen: management				✓	
13	NIHSS assessment		✓			
14	Cardiac monitoring					✓
15	Early carotid imaging					✓

The revised and new measures should be considered pilot measures and will require field testing for validity and feasibility. Measures 2, 3, 5, 6, 7, 8, and 15 are potentially relevant to urgent management of TIA as well and could be adapted for that purpose. The Joint Commission versions of measures 1, 7, and 9 and the NQF versions of measures 1 and 9 include patients with intracerebral hemorrhage and subarachnoid hemorrhage, as well as ischemic stroke, in the measure denominator. The newly proposed dysphagia measures (11 and 12) could also be adapted for use in patients with intracerebral hemorrhage or subarachnoid hemorrhage.

AHA/ASA indicates American Heart Association,/American Stroke Association; CDC, Centers for Disease Control and Prevention; CMS, Centers for Medicare and Medicaid Services; GWTG, Get With The Guidelines; HIQRP, Hospital Inpatient Quality Reporting Program; NIHSS, National Institutes of Health Stroke Scale; NQF, National Quality Forum; PCNASR, Paul Coverdell National Acute Stroke Registry; TIA, transient ischemic attack; and TJC, The Joint Commission.

of 15 measures. Eight are currently already endorsed by the NQF; 2 are not endorsed by the NQF but are endorsed by the Stroke Performance Measure Consensus Group of the PCNASR, AHA/ASA GWTG, and The Joint Commission; 2 are new measures designed to improve the current dysphagia measure endorsed by the Stroke Performance Measure Consensus Group; and 3 are new measures. Please see the Discussion for additional comments on the measures, including discussion of the limitations of some of the current measures, opportunities for improvement, and recommendations for implementation and field testing. The Appendix at the end of this statement provides full specifications for each measure.

Data Collection

The quality of the data used to implement performance measures is a crucial aspect of quality assessment. How the data are collected influences data quality, cost of assessment, and ultimately the ways that the data can be used. The importance of feasibility of data collection, and thus data collection methods, has been underscored by inclusion of this attribute in formal evaluation criteria of existing and proposed performance measures.[7,18] To maximize the reliability of data capture, a prospectively designed report form should be used. Increasingly, hospitals and healthcare systems are moving toward electronic health records, which can be used to automatically capture data elements. Often, some data elements (eg, laboratory results or medications dispensed) have highly structured implementation in electronic health records, which facilitates automatic data abstraction, whereas other data elements (eg, last known well time or performance of a swallowing screen) are captured in less structured or only unstructured formats, which precludes their automatic export. In the absence of a structured data collection process embedded in the usual flow of care, capturing these elements and other crucial clinical data (eg, a contraindication to a process or a measure of disease severity) may still require manual chart review and abstraction. Regardless of how the data are collected, the reliability of data abstraction methods used in performance measure assessment should be validated by independent review of a subset of cases, consisting of manual chart review (in the case of electronically derived performance data) and/or independent abstracter review (in the case of chart review–based performance data). To avoid bias, data should be collected on all consecutive patients or a sufficiently large random sample, rather than a convenience sample.

Discussion

The writing committee hopes that these clinical performance measures for adults hospitalized with acute ischemic stroke will be useful for physicians, hospitals, and health organizations to measure their quality of care for ischemic stroke, thereby facilitating the objective assessment of quality improvement initiatives. These performance measures are closely based on AHA/ASA guidelines for stroke management and were developed using prespecified methods based on best practices for performance measure development. The measures were developed with the principal goal of measuring quality of care in the inpatient acute care hospital setting.

These performance measures were designed to be implemented within stroke systems of care within the United States but may be useful to inform measure development in other countries too. Some countries have already developed stroke measures, for example, the Canadian Stroke Strategy and the United Kingdom National Institute for Health and Care Excellence.[27,28] When considering adoption of our measures for use outside the United States, the applicability of the measure should be considered and the measure should be modified as needed to fit the local context.

This measure set is intended to complement similar existing efforts, including the performance measure sets implemented as part of primary stroke center certification by The Joint Commission, the AHA/ASA GWTG-Stroke Program, the CDC PCNASR, and the AMA PCPI program. Where there were existing measures, including those endorsed by the NQF, the writing committee adopted the principle of harmonizing its measures with existing measures unless review of the evidence suggested that the existing measures were no longer applicable to current guideline-recommended practice. On the basis of these evidence reviews, the committee endorsed the continued use of the 8 NQF-endorsed measures as consistent with current guideline-recommended stroke care. Additionally, the committee endorses the measures harmonized by the Stroke Performance Measure Consensus Group for use by The Joint Commission, AHA/ASA GWTG-Stroke, and the CDC PCNASR, with the single exception that a revised version of the dysphagia screening measure is offered for pilot testing and potential implementation. Notwithstanding the fact that all existing measures were based on good evidence, in some cases the evidence review identified concerns with feasibility, interpretability, actionability, and the link between measure adherence and the likelihood of better patient outcomes that suggested opportunities for improvement in the measure construction.

Below, we discuss the specific measures, with a focus first on measures already endorsed by the NQF, then on the stroke education measure that recently was not re-endorsed by the NQF, and finally on new measures.

The 8 NQF-endorsed measures were reviewed by the writing committee and endorsed, based on the committee's assessment that they met AHA/ACC criteria for a useful performance measure (Table 3). The most recent NQF-endorsed measure, time to intravenous thrombolytic therapy, is based on a Class I, Level A guideline recommendation,[4] with strong evidence from a pooled analysis of the tissue-type plasminogen activator trials that more rapid treatment leads to better patient outcomes. The benchmark time of 60 minutes from arrival to initiation of intravenous tissue-type plasminogen activator is based on recommendations from the Brain Attack Coalition.[29] Recent evidence shows that fewer than 27% of patients are treated within 60 minutes,[30] which indicates that there is ample opportunity to improve care. The proposed measure is harmonized with the same measure in GWTG-Stroke that has recently been endorsed by the NQF and has also been used in the AHA Target: Stroke quality improvement initiative.[31]

The committee expressed concern based on emerging data that the NQF's "assessed for rehabilitation" measure has very high adherence, with little room for improvement, and an uncertain link between measure adherence and actually receiving the appropriate intensity and duration of rehabilitation that

would improve stroke outcomes. In a study of 1532 hospitals that contributed 616982 stroke admissions (mostly for ischemic stroke) in GWTG-Stroke, 89.5% of eligible patients had documentation of an assessment for rehabilitation, and assessed patients were more likely to be discharged to an inpatient rehabilitation facility or skilled nursing facility.[32] Although the high measure adherence could be seen as a sign of good quality of care, it is not certain whether each assessed patient was provided appropriate care, including therapy with the appropriate intensity and duration. Therefore, although the writing committee endorses the continued use of the NQF-endorsed measure, it also recommends further research and development of measures that take into account whether appropriate therapy was actually provided, recognizing that measure construction will be challenging because rehabilitation is highly individualized and is impacted by reimbursement policies of CMS and other insurers.

The measure for stroke education was discussed at length, in light of its recent lack of re-endorsement by the Neurology Steering Committee of the NQF. The NQF cited a lack of assessment of whether education changes patient behavior or improves patient outcomes and a lack of direction regarding literacy and language requirements as shortcomings of the current measure. Nonetheless, national consensus guidelines recognize that a central aspect of good quality care for the stroke patient is to educate the patient regarding stroke signs and symptoms, risk factors, treatment-seeking behaviors (ie, to call 9-1-1), and the importance of taking medications as prescribed and participating in consistent care follow-up activities. Therefore, the writing committee proceeded with endorsing a measure for stroke education currently used in The Joint Commission, AHA GWTG-Stroke, and CDC PCNASR. However, acknowledging its limitations as pointed out by the NQF, the writing group also strongly recommends further research to develop a successor stroke education measure that that differs from the current version by requiring assessment of what learning has actually occurred in terms of knowledge and self-efficacy. This performance measure should also incorporate stroke education that is appropriate and customized to patient literacy and potential hearing, vision, language, and memory changes that may affect understanding, learning, and retaining information. More research on the feasibility, validity, and reliability of measuring the relationship between stroke education and behavioral changes (eg, stating what was actually learned and how it can apply to the patient's circumstances, as well as medication regimen adherence) is needed before such a measure can be proposed for nationwide use.

The writing committee specified 5 new measures for consideration for implementation that were not already endorsed by the NQF, which will be discussed subsequently. Quality improvement organizations should consider implementing and pilot testing these new measures to determine their reliability and feasibility. If pilot testing determines that these new measures are feasible, valid, and reliable, they could eventually be brought forward for consideration of endorsement by the NQF. We caution against using these new measures to compare quality of care between institutions, or within the same institution over time, until pilot testing demonstrates that they are reliable and accurate.

There was considerable discussion of the dysphagia screening measure used by AHA/ASA GWTG-Stroke and the CDC PCNASR. This hospital-based measure was submitted to NQF but was not endorsed, even though a very similar provider-level AMA PCPI–sponsored measure has been endorsed. However, there is strong consensus that dysphagia screening (to identify patients at risk for aspiration so that the risk can be mitigated by dietary modifications) represents best practice. Challenges with implementing performance measurement for dysphagia screening include (1) a lack of controlled trials of strategies for dysphagia management, (2) challenges in interpreting observational studies of dysphagia screening because of confounding by indication (ie, because screening is often performed only in patients at higher risk of aspiration pneumonia because of high stroke severity, the [presumed] relationship between screening and reduced risk of aspiration pneumonia is obscured because nonscreened mild stroke patients are at even lower risk than the screened patients), (3) absence of consensus regarding the most accurate and reliable screening tool, and (4) the complexity of dysphagia management, which depends not only on the use of a sensitive initial screen but also on appropriate management of screen failures, including follow-up expert assessment (eg, by a speech-language pathologist), further investigations to identify the mechanisms of dysphagia (eg, by swallow videofluoroscopy), and initiation of an appropriate treatment plan (eg, by modifying the consistency of the diet or by enteral feeding).

After extensive discussion, the writing committee decided to offer 2 new dysphagia management measures for evaluation and pilot testing, intended to replace the current GWTG-Stroke/PCNASR and AMA PCPI dysphagia screening measures. The first new measure, dysphagia screening within 24 hours, adds a timed component that was intended to ensure that patients are assessed reasonably quickly and not left without oral nutrition for extended periods because of an inability to perform screening rather than an inability to swallow. The second new measure, dysphagia assessment passed before first oral intake, is similar to the previous GWTG-Stroke/PCNASR/AMA PCPI measure with the exception that there must be documentation that the dysphagia assessment was not just performed but passed before first oral intake. The previous measure simply required documentation that a dysphagia screen was documented, without linking the results of the screen to the decision regarding oral intake. By requiring that the dysphagia assessment results are documented and acted on appropriately, the committee hypothesizes that the new measure should be more closely associated with decreased risk of pneumonia. The committee encourages the pilot testing of these new dysphagia measures; however, until the feasibility of these new measures is confirmed, it is reasonable for organizations or programs such as AHA GWTG-Stroke and CDC PCNASR to continue the use of their current dysphagia screening measures.

NIHSS assessment is based on a Class I, Level B guideline recommendation.[4] Although an NIHSS documentation measure was submitted for consideration by the NQF in 2012 and was not endorsed, because of a cited lack of evidence of a link with improved patient outcomes,[14] the writing committee believed that measure merited reconsideration. The committee considered the measure to be highly desirable, even though stroke

assessment alone is not a therapeutic intervention, because an objective assessment of stroke severity is a necessary step to provide other processes of care that are proven to improve health outcomes (most importantly, provision of intravenous tissue-type plasminogen activator but also the need for assessment for rehabilitation). Therefore, NIHSS assessment should improve patient outcomes by enabling other processes of care when appropriate. Additionally, stroke severity is the most important determination of patient outcomes[23]; consequently, complete NIHSS assessment would enable the risk adjustment for stroke severity that will be critical for development of accurate outcome measures for ischemic stroke. Documentation of the NIHSS in clinical practice is currently modest; however, the relatively high documentation rate in GWTG-Stroke (40%–50%),[33] despite the absence of specific targeted efforts to promote NIHSS documentation, suggests that NIHSS documentation in practice is feasible and might be substantially increased by quality improvement efforts. An NIHSS assessment performance measure is currently being piloted by The Joint Commission as part of a plan for certification of comprehensive stroke centers. The committee encourages use of standardized certification programs for NIHSS assessment.

Cardiac monitoring for the first 24 hours after stroke admission is based on a Class I, Level B guideline recommendation.[4] Monitoring may reveal a cause for ischemic stroke, such as paroxysmal atrial fibrillation, or may reveal dangerous arrhythmias (for which stroke patients are at risk) that require management.[34,35] It is not intended that adherence to this measure should delay early discharge of mild stroke patients; it is intended for patients for whom there are other reasons for admission for at least 24 hours. More data are needed on the current prevalence of cardiac monitoring in the first 24 hours of stroke and the impact of improved monitoring on stroke outcomes. The committee encourages additional research to link provision of cardiac monitoring with the frequency of detected of cardiac arrhythmias, changes in patient management, and differences in patient outcomes.

Early carotid imaging in ischemic stroke is based on a Class I, Level A recommendation.[4] Carotid imaging is a necessary step to determine eligibility for carotid endarterectomy or stenting. Carotid imaging in stroke or TIA is currently performed in 70% to 80% of patients.[36,37] The committee discussed the suitability of a measure for carotid endarterectomy or stenting in eligible patients; however, it was recognized that such a measure would be challenging to implement for hospital-based performance measurement, because management could occur in either the inpatient and outpatient settings or involve transfers between institutions (eg, a patient with minor stroke diagnosed with carotid stenosis might have an urgent outpatient endarterectomy or be transferred to another hospital for the operation). The committee anticipates that a subsequent Stroke Performance Oversight Committee performance measures writing group charged with developing comprehensive measures for secondary prevention of stroke will revisit measure development for carotid endarterectomy or stenting. Patients with contraindications to urgent endarterectomy or stenting (eg, because of large infarctions) should be excluded from the measure denominator based on physician documentation of the contraindication.

In summary, 15 performance measures for patients hospitalized with new ischemic stroke are presented: 10 are endorsed for immediate use, and 5 are new measures that will require testing in the field. Of the 10 measures endorsed for immediate use, 8 are also endorsed by the NQF, and 2 are based on existing performance measures used by The Joint Commission, AHA GWTG-Stroke, and CDC PCNASAR (Table 3). Many potential additional measures were considered but not considered feasible because of concerns about the link with improved health outcomes or feasibility of measurement (online-only Data Supplement). Because performance measurement is not static but rather evolves because of accumulating scientific evidence on best practice, the writing committee will continue as a standing committee to curate the measures, comprehensively updating existing measures and considering new measures every 3 years, with interim focused updates issued as needed. This ongoing supervision will ensure the measures remain consistent with best practice and emerging evidence on the feasibility, reliability, and effectiveness of the existing measures.

Appendix

Appendix–Ischemic Stroke Performance Measures

1. Venous thromboembolism (VTE) prophylaxis	
Percentage of patients prescribed VTE prophylaxis on hospital day 0 or 1	
Numerator	Ischemic stroke patients prescribed VTE prophylaxis* on the day of admission (day 0) or the day after admission (day 1), or who have documentation why no VTE prophylaxis was given†
Denominator	Included patients • All patients with ischemic stroke
	Excluded patients • <18 y of age • Length of stay <2 d • Length of stay >120 d • "Comfort measures only" documented on hospital day 0 or 1 • Enrolled in clinical trials related to stroke • Admitted for "elective carotid intervention"
Period of assessment	Hospital day 0 or 1
Sources of data	Prospective flow sheet, retrospective medical record review, electronic medical record
Rationale	
Pulmonary embolism from deep venous thrombosis (DVT) accounts for nearly 10% of deaths after stroke. For nonambulatory patients, administration of antithrombotic agents and external compression devices reduce the risk of DVT.	
Source for recommendation	
From the 2013 American Heart Association (AHA)/American Stroke Association (ASA) "Guidelines for the Early Management of Patients With Acute Ischemic Stroke"[4]: 1. Subcutaneous administration of anticoagulants is recommended for treatment of immobilized patients to prevent DVT *(Class I; Level of Evidence A)*. 2. The use of intermittent external compression devices is reasonable for treatment of patients who cannot receive anticoagulants (*Class IIa; Level of Evidence B*).	
Method of reporting	
• Per patient: Documentation of whether VTE prophylaxis was prescribed on hospital day 0 or 1. • Per patient population: Percentage of patients prescribed VTE prophylaxis was prescribed on hospital day 0 or 1.	
Challenges to implementation	
• Expanding numbers of antithrombotic and anticoagulant agents will necessitate frequent updates to the measure.	
Analogous measures endorsed by other organizations	
• Analogous measures endorsed or used by: National Quality Forum (NQF; STK-01, NQF #0434), The Joint Commission (TJC), the AHA Get With The Guidelines–Stroke (GWTG-Stroke), the Centers for Disease Control and Prevention (CDC) Paul Coverdell National Acute Stroke Registry (PCNASR), the American Medical Association Physician Consortium for Performance Improvement (AMA PCPI), and the Centers for Medicare and Medicaid Services (CMS) Hospital Inpatient Quality Reporting Program (HIQRP)	

*Prophylaxis for VTE may include intermittent pneumatic compression devices or medications. Medications for VTE prophylaxis include heparin, low-molecular-weight heparin, apixaban, rivaroxaban, and fondaparinux.

†Reasons could include that the patient is ambulatory or the patient is undergoing full-dose anticoagulation for other reasons.

Appendix. Continued

2. Discharged on antithrombotic therapy	
Percentage of patients with ischemic stroke who are discharged on antithrombotic therapy	
Numerator	Ischemic stroke patients prescribed antithrombotic therapy‡ at hospital discharge
Denominator	Included patients • All patients with ischemic stroke
	Excluded patients • <18 y of age • Length of stay >120 d • "Comfort measures only" documented • Enrolled in clinical trials related to stroke • Admitted for "elective carotid intervention" • Discharged to another hospital • Left against medical advice • Died • Discharged to home for hospice care • Discharged to a healthcare facility for hospice care • With a documented reason for not prescribing antithrombotic therapy at discharge
Period of assessment	Hospital discharge
Sources of data	Prospective flow sheet, retrospective medical record review, electronic medical record

Rationale

Antithrombotic medications have been shown to reduce morbidity, mortality, and stroke recurrence rates in ischemic stroke patients. Data from large studies suggest that antithrombotic medications should be prescribed at hospital discharge unless contraindicated.

Source for recommendation

From the 2011 AHA/ASA "Guidelines for the Prevention of Stroke in Patients With Stroke or Transient Ischemic Attack"[38]:

1. For patients with noncardioembolic ischemic stroke or transient ischemic attack (TIA), the use of antiplatelet agents rather than oral anticoagulation is recommended to reduce the risk of recurrent stroke and other cardiovascular events *(Class I; Level of Evidence A)*.
2. Aspirin (50–325 mg/d) monotherapy *(Class I; Level of Evidence A)*, the combination of aspirin 25 mg and extended-release dipyridamole 200 mg twice daily *(Class I; Level of Evidence B)*, and clopidogrel 75 mg monotherapy *(Class IIa; Level of Evidence B)* are all acceptable options for initial therapy. The selection of an antiplatelet agent should be individualized on the basis of patient risk factor profiles, cost, tolerance, and other clinical characteristics.
3. For patients with ischemic stroke or TIA with paroxysmal (intermittent) or permanent atrial fibrillation (AF), anticoagulation with a vitamin K antagonist (target international normalized ratio [INR] 2.5; range, 2.0–3.0) is recommended *(Class I; Level of Evidence A)*. For patients unable to take oral anticoagulants, aspirin alone *(Class I; Level of Evidence A)* is recommended. The combination of clopidogrel plus aspirin carries a risk of bleeding similar to that of warfarin and therefore is not recommended for patients with a hemorrhagic contraindication to warfarin *(Class III; Level of Evidence B)*.

Method of reporting

- Per patient: Documentation of whether antithrombotic medications were prescribed at discharge.
- Per patient population: Percentage of patients prescribed antithrombotic medications at discharge.

Challenges to implementation

- Expanding numbers of antithrombotic medications and anticoagulant agents will necessitate frequent updates to the measure.

Analogous measures endorsed by other organizations

- Analogous measures endorsed or used by: NQF (STK-02, NQF #0435), TJC, AHA GWTG-Stroke, CDC PCNASR, AMA PCPI, and CMS HIQRP

‡Antithrombotic medications may include aspirin (acetylsalicylic acid), clopidogrel, combination aspirin plus dipyridamole, warfarin, heparin, low-molecular-weight heparins, dabigatran, rivaroxaban, apixaban, or others, prescribed at doses intended to prevent arterial thrombosis or embolism. The numerator should not include patients prescribed only lower doses of these drugs intended to prevent deep vein thrombosis rather than recurrent ischemic stroke.

Appendix. Continued

3. Discharge on anticoagulation for patients with AF or atrial flutter	
Percentage of patients with ischemic stroke and AF or atrial flutter who are discharged on anticoagulation therapy	
Numerator	Ischemic stroke patients prescribed anticoagulation therapy§ at hospital discharge
Denominator	Included patients • Ischemic stroke patients with documented AF or atrial flutter
	Excluded patients • <18 y of age • Length of stay >120 d • "Comfort measures only" documented • Enrolled in clinical trials related to stroke • Admitted for "elective carotid intervention" • Discharged to another hospital • Left against medical advice • Died • Discharged to home for hospice care • Discharged to a healthcare facility for hospice care • With a documented reason for not prescribing anticoagulation therapy at discharge
Period of assessment	Hospital discharge
Sources of data	Prospective flow sheet, retrospective medical record review, electronic medical record
Rationale	
Anticoagulant medications have been shown to reduce stroke recurrence rates in ischemic stroke patients with AF.	
Source for recommendation	
From the 2011 AHA/ASA "Guidelines for the Prevention of Stroke in Patients With Stroke or Transient Ischemic Attack"[38]: 1. For patients with ischemic stroke or TIA with paroxysmal (intermittent) or permanent AF, anticoagulation with a vitamin K antagonist (target INR 2.5; range, 2.0–3.0) is recommended *(Class I; Level of Evidence A)*.	
Method of reporting	
• Per patient: Documentation of whether anticoagulation was prescribed at discharge. • Per patient population: Percentage of patients prescribed anticoagulation at discharge.	
Challenges to implementation	
• Expanding numbers of antithrombotic and anticoagulant agents will necessitate frequent updates to the measure.	
Analogous measures endorsed by other organizations	
• Analogous measures endorsed or used by: NQF(STK-03, NQF #0436), TJC, AHA GWTG-Stroke, CDC PCNASR, AMA PCPI, and CMS HIQRP	

§Anticoagulant medications include warfarin, apixaban, dabigatran, rivaroxaban, intravenous heparin, and subcutaneous low-molecular-weight heparin. The numerator should not include patients prescribed only lower doses of these drugs intended to prevent deep vein thrombosis rather than recurrent ischemic stroke.

Appendix. Continued

4. Thrombolytic therapy	
Percentage of patients with acute ischemic stroke who arrive at this hospital within 2 h of time last known well for whom intravenous tissue-type plasminogen activator (tPA) was initiated at this hospital within 3 h of time last known well	
Numerator	Ischemic stroke patients for whom an intravenous thrombolytic therapy regimen was initiated at this hospital within 3 h (≤180 min) of time last known well
Denominator	Included patients • Acute ischemic stroke patients whose time of arrival is within 2 h (≤120 min) of time last known well
	Excluded patients • <18 y of age • Length of stay >120 d • "Comfort measures only" documented on hospital day 0 or 1 • Enrolled in clinical trials related to stroke • Admitted for "elective carotid intervention" • Time last known well to arrival in the emergency department >2 h • Documented reason for not starting an intravenous thrombolytic agent
Period of assessment	First 3 h after arrival
Sources of data	Prospective flow sheet, retrospective medical record review, electronic medical record
Rationale	
Intravenous tPA is proven to reduce disability from ischemic stroke when administered within 3 h of time last known well.	
Source for recommendation	
From the 2013 AHA/ASA "Guidelines for the Early Management of Patients With Acute Ischemic Stroke"[4]: 1. Intravenous recombinant tPA (rtPA; 0.9 mg/kg, maximum dose 90 mg) is recommended for selected patients who may be treated within 3 h of onset of ischemic stroke *(Class I; Level of Evidence A)*. 2. Intravenous rtPA is reasonable in patients whose blood pressure can be lowered safely (to below 185/110 mm Hg) with antihypertensive agents, with the physician assessing the stability of the blood pressure before starting intravenous rtPA *(Class I; Level of Evidence B)*. 3. Intravenous fibrinolytic therapy is recommended in the setting of early ischemic changes (other than frank hypodensity) on computed tomography (CT), regardless of their extent *(Class I; Level of Evidence A)*. 4. Intravenous rtPA is reasonable in patients with a seizure at the time of onset of stroke if evidence suggests that residual impairments are secondary to stroke and not a postictal phenomenon *(Class IIa; Level of Evidence C)*. Use of intravenous fibrinolysis in patients with conditions of mild stroke deficits, rapidly improving stroke symptoms, major surgery in the preceding 3 mo, and recent myocardial infarction may be considered, and potential increased risk should be weighed against the anticipated benefits *(Class IIb; Level of Evidence C)*. These circumstances require further study. 5. Frank hypodensity on nonenhanced CT may increase the risk of hemorrhage with fibrinolysis and should be considered in treatment decisions. If frank hypodensity involves more than one third of the middle cerebral artery territory, intravenous rtPA treatment should be withheld *(Class III; Level of Evidence A)*.	
Method of reporting	
• Per patient: Documentation of whether intravenous thrombolysis was given within 3 h of last known wel1. • Per patient population: Percentage of patients treated with intravenous thrombolysis within 3 h of last known well.	
Challenges to implementation	
• Lack of documentation or ambiguity regarding medical or patient reasons for not receiving intravenous thrombolysis.	
Analogous measures endorsed by other organizations	
• Analogous measures endorsed or used by: NQF (STK-04, NQF #0437), TJC, AHA GWTG-Stroke, CDC PCNASR, AMA PCPI, and CMS HIQRP	

Appendix. Continued

5. Antithrombotic therapy‖ by end of day 2	
Percentage of patients with ischemic stroke who had antithrombotic therapy‖ administered by end of hospital day 2	
Numerator	Ischemic stroke patients who had antithrombotic therapy administered by end of hospital day 2
Denominator	Included patients • All patients with ischemic stroke
	Excluded patients • <18 y of age • Length of stay >120 d • "Comfort measures only" documented • Enrolled in clinical trials related to stroke • Admitted for "elective carotid intervention" • Intravenous or intra-arterial thrombolytic agent administered at this hospital or within 24 h before arrival • Documented reason for not prescribing antithrombotic therapy by end of hospital day 2
Period of assessment	Hospital discharge
Sources of data	Prospective flow sheet, retrospective medical record review, electronic medical record
Rationale	
Two large trials each demonstrated a nonsignificant trend in reduction in death or disability when treatment with aspirin was begun within 48 h of stroke; when data from the trials were combined, a modest but statistically significant benefit was seen.	
Source for recommendation	
From the 2013 AHA/ASA "Guidelines for the Early Management of Patients With Acute Ischemic Stroke"[4]: 1. Oral administration of aspirin (initial dose is 325 mg) within 24–48 h after stroke onset is recommended for treatment of most patients *(Class I; Level of Evidence A).*	
Method of reporting	
• Per patient: Documentation of whether antithrombotic therapy was administered by end of hospital day 2 • Per patient population: Percentage of patients administered antithrombotic therapy by end of hospital day 2	
Challenges to implementation	
• Expanding numbers of antithrombotic and anticoagulant agents will necessitate frequent updates to the measure.	
Analogous measures endorsed by other organizations	
• Analogous measures endorsed or used by: NQF (STK-05, NQF #0438), TJC, AHA GWTG-Stroke, CDC PCNASR, AMA PCPI, and CMS HIQRP	

‖Antithrombotic agents may include aspirin (acetylsalicylic acid), clopidogrel, combination aspirin plus dipyridamole, warfarin, heparin, low-molecular-weight heparins, dabigatran, rivaroxaban, apixaban, or others, prescribed at doses intended to prevent arterial thrombosis or embolism. The numerator should not include patients prescribed only lower doses of these drugs intended to prevent deep vein thrombosis rather than recurrent ischemic stroke.

Appendix. Continued

6. Discharged on statin medication	
Percentage of patients with ischemic stroke who are discharged on 3′-hydroxymethylglutaryl coenzyme A reductase inhibitor (statin) medication	
Numerator	Ischemic stroke patients prescribed statin medication at hospital discharge
Denominator	Included patients • Ischemic stroke patients with a low-density lipoprotein cholesterol (LDL-C) ≥100 mg/dL, OR LDL-C not measured, OR who were taking a lipid-lowering medication before hospital arrival
	Excluded patients • <18 y of age • Length of stay >120 d • "Comfort measures only" documented • Enrolled in clinical trials related to stroke • Admitted for "elective carotid intervention" • Discharged to another hospital • Left against medical advice • Died • Discharged to home for hospice care • Discharged to a healthcare facility for hospice care • Documented reason for not prescribing statin therapy at discharge
Period of assessment	Hospital discharge
Sources of data	Prospective flow sheet, retrospective medical record review, electronic medical record
Rationale	
Randomized controlled trials show that statin therapy in stroke survivors reduces the risk of subsequent cardiovascular events and recurrent fatal or nonfatal stroke.	
Source for recommendation	
From the 2011 AHA/ASA "Guidelines for the Prevention of Stroke in Patients With Stroke or Transient Ischemic Attack"[38]: 1. Statin therapy with intensive lipid-lowering effects is recommended to reduce risk of stroke and cardiovascular events among patients with ischemic stroke or TIA who have evidence of atherosclerosis and an LDL-C level ≥100 mg/dL and who are without known coronary heart disease (CHD) *(Class I; Level of Evidence B)*. 2. For patients with atherosclerotic ischemic stroke or TIA and without known CHD, it is reasonable to target a reduction of at least 50% in LDL-C or a target LDL-C level of <70 mg/dL to obtain maximum benefit *(Class IIa; Level of Evidence B)*. 3. Patients with ischemic stroke or TIA with elevated cholesterol or comorbid coronary artery disease should be otherwise managed according to NCEP III (Third Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Cholesterol in Adults) guidelines, which include lifestyle modification, dietary guidelines, and medication recommendations *(Class I; Level of Evidence A)*.	
Method of reporting	
• Per patient: Documentation of whether statin was prescribed at discharge. • Per patient population: Percentage of patients prescribed statin at discharge.	
Challenges to implementation	
• None anticipated.	
Analogous measures endorsed by other organizations	
• Analogous measures endorsed or used by: NQF (STK-06, #0439), TJC, AHA GWTG-Stroke, CDC PCNASR, and CMS HIQRP	

Appendix. Continued

7. Stroke education	
Percentage of patients with ischemic stroke who receive stroke education before hospital discharge	
Numerator	Ischemic stroke patients who receive, or whose caregivers receive, educational materials addressing all of the following: • Activation of emergency medical system (to call 9-1-1 when a stroke is suspected) • Need for follow-up after discharge • Medications prescribed at discharge: informed regarding purpose, correct dose, and major side effects and precautions associated with each prescribed medication • Risk factors for stroke • Warning signs and symptoms of stroke
Denominator	Included patients • All patients with ischemic stroke
	Excluded patients • <18 y of age • Length of stay >120 d • "Comfort measures only" documented • Enrolled in clinical trials related to stroke • Admitted for "elective carotid intervention" • Discharged to another acute care hospital • Left against medical advice • Died • Discharged to home for hospice care • Discharged to a healthcare facility for hospice care • Documented reason for not providing stroke education at discharge
Period of assessment	Hospital discharge
Sources of data	Prospective flow sheet, retrospective medical record review, electronic medical record
Rationale	
Stroke education provides stroke survivors and their families/caregivers with needed information on risk factors for stroke, how to reduce risk, how to manage their medications, how to recognize warning signs and symptoms for stroke, and what to do in case of new acute stroke symptoms. This information should promote adherence to therapeutic recommendations for prevention of recurrent stroke and increase the number of patients eligible for acute stroke therapies, thereby improving health outcomes.	
Source for recommendation	
From the 2010 AHA/ASA scientific statement "Comprehensive Overview of Nursing and Interdisciplinary Rehabilitation Care of the Stroke Patient"[39]: 1. Follow-up contacts with family caregivers should be arranged and performed after discharge by a designated healthcare provider (HCP) in inpatient and outpatient settings *(Class I; Level of Evidence A)*. 2. A designated HCP should provide information in a variety of formats as appropriate (eg, written information, individual face-to-face education, family conferences, World Wide Web sites, stroke organizations) *(Class I; Level of Evidence C)*. 3. Assessment and reinforcement of caregiver knowledge of stroke warning signs, lifestyle changes, and risk factors for secondary stroke prevention is recommended in inpatient and outpatient settings *(Class I; Level of Evidence B)*. 4. Additional areas for caregiver education and training should include medication management, the survivor's condition and treatment plans, and poststroke complications *(Class I; Level of Evidence B)*. From the 2013 AHA/ASA "Guidelines for the Early Management of Patients With Acute Ischemic Stroke"[4]: 5. Activation of the 9-1-1 system by patients or other members of the public is strongly recommended *(Class I; Level of Evidence B)*.	
Method of reporting	
• Per patient: Documentation of whether stroke education was provided before hospital discharge. • Per patient population: Percentage of patients provided stroke education before hospital discharge.	
Challenges to implementation	
• Difficulty in providing effective education for patients who do not speak English; who have low literacy skills; who have impaired hearing, vision, or memory that may affect understanding, learning, and retaining information; or who lack caregiver support. • Potential lack of clarity in documentation of each required element of stroke education. • There is uncertainty regarding whether providing educational materials alone is sufficient to change health-related behaviors and improve outcomes. Additional research is needed on how to most effectively provide education that changes behavior, suitable for reliable implementation at hospitals nationwide (see "Discussion" for details).	
Analogous measures endorsed by other organizations	
• Analogous measures endorsed or used by: TJC, AHA GWTG-Stroke, CDC PCNASR, and CMS HIQRP	

Appendix. Continued

8. Tobacco use counseling	
Percentage of patients with ischemic stroke with a history of smoking cigarettes or using other tobacco products within the last year who are, or whose caregivers are, counseled during the hospital stay to cease use of tobacco products or begin treatment during the hospital stay for tobacco addiction	
Numerator	• Patients who were given, or whose caregivers were given, counseling or treatment, during the hospital stay, to cease smoking or using other tobacco products
Denominator	Included patients • All patients with ischemic stroke
	Excluded patients • <18 y of age • Length of stay >120 d • "Comfort measures only" documented • Enrolled in clinical trials related to stroke • Admitted for "elective carotid intervention" • Discharged to another hospital • Left against medical advice • Died • Discharged to home for hospice care • Discharged to a healthcare facility for hospice care • Patient did not smoke cigarettes or use other tobacco products during the past year • Documented reason for not providing smoking cessation advice or counseling
Period of assessment	Hospital stay
Sources of data	Prospective flow sheet, retrospective medical record review, electronic medical record
Rationale	
Cigarette smoking is a strong risk factor for ischemic stroke. Smoking cessation has been associated with a reduction in the tobacco-related risk of cardiovascular events and stroke.	
Source for recommendation	
From the 2011 AHA/ASA "Guidelines for the Prevention of Stroke in Patients With Stroke or Transient Ischemic Attack"[38]: 1. HCPs should strongly advise every patient with stroke or TIA who has smoked in the past year to quit *(Class I; Level of Evidence C)*. 2. Counseling, nicotine products, and oral smoking cessation medications are effective for helping smokers quit *(Class I; Level of Evidence A)*.	
Method of reporting	
• Per patient: Documentation of whether stroke education was provided at discharge. • Per patient population: Percentage of patients provided stroke education at discharge.	
Challenges to implementation	
• None anticipated.	
Analogous measures endorsed by other organizations	
• Analogous measures endorsed or used by: NQF (#0027), TJC, AHA GWTG-Stroke, and CDC PCNASR	

Appendix. Continued

9. Assessed for rehabilitation	
Percentage of patients with ischemic stroke assessed for, or who received, rehabilitation services	
Numerator	• Patients who were assessed for, or who received, rehabilitation services during the hospital stay¶
Denominator	Included patients • All patients with ischemic stroke
	Excluded patients • <18 y of age • Length of stay >120 d • "Comfort measures only" documented • Enrolled in clinical trials related to stroke • Admitted for "elective carotid intervention" • Discharged to another hospital • Left against medical advice • Died • Discharged to home for hospice care • Discharged to a healthcare facility for hospice care
Period of assessment	Hospital stay
Sources of data	Prospective flow sheet, retrospective medical record review, electronic medical record
Rationale	
Stroke is a leading cause of serious, long-term disability. Stroke rehabilitation by an interdisciplinary team leads to reduced morbidity and improved functional outcomes.	
Source for recommendation	
From the 2013 AHA/ASA "Guidelines for the Early Management of Patients With Acute Ischemic Stroke"[4]: 1. The use of comprehensive specialized stroke care (stroke units) that incorporates rehabilitation is recommended *(Class I; Level of Evidence A)*. 2. Early mobilization of less severely affected patients and measures to prevent subacute complications of stroke are recommended *(Class I, Level of Evidence C)*.	
Method of reporting	
• Per patient: Documentation of whether the patient was assessed for, or received, rehabilitation services during the hospital stay. • Per patient population: Percentage of patients who were assessed for, or received, rehabilitation services during the hospital stay.	
Challenges to implementation	
• None identified. However, compliance to the measure is already quite high, and the association between assessment and initiation of an appropriate rehabilitation plan is unmeasured, which leaves uncertainty regarding the impact of the measure on improved outcomes. (See "Discussion" for details.)	
Analogous measures endorsed by other organizations	
• Analogous measures endorsed or used by: NQF (STK-10, #0441), TJC, AHA GWTG-Stroke, CDC PCNASR, and CMS HIQRP; a "rehabilitation services ordered" measure is offered by AMA-PCPI and endorsed by NQF (#0244)	

¶The assessment should be documented in the medical record by a physician, physical therapist, occupational therapist, or speech language pathologist, as appropriate. If rehabilitation is not needed, then that should be documented explicitly in the record.

Appendix. Continued

10. Time to intravenous thrombolytic therapy	
Percentage of patients with ischemic stroke receiving intravenous tPA therapy during the hospital stay and having a time from hospital arrival to initiation of thrombolytic therapy administration (door-to-needle time) of ≤60 min	
Numerator	• Patients having a time from hospital arrival to initiation of thrombolytic therapy administration (door-to-needle time) of ≤60 min
Denominator	Included patients • Patients receiving intravenous tPA therapy within 4.5 h (270 min) of last known well
	Excluded patients • <18 y of age • Length of stay >120 d • Stroke occurred while in hospital • Patients received in transfer from another inpatient or outpatient facility • Enrolled in clinical trials related to stroke • Admitted for "elective carotid intervention" • Documented reason for delay in initiating tPA#
Period of assessment	First 24 h after arrival
Sources of data	Prospective flow sheet, retrospective medical record review, electronic medical record
Rationale	
Randomized controlled trials show that intravenous tPA reduces disability from stroke at 90 d.	
Source for recommendation	
From the 2013 AHA/ASA "Guidelines for the Early Management of Patients With Acute Ischemic Stroke"[4]: 1. In patients eligible for intravenous rtPA, benefit of therapy is time dependent, and treatment should be initiated as quickly as possible. The door-to-needle time (time of bolus administration) should be within 60 min from hospital arrival *(Class I; Level of Evidence A).*	
Method of reporting	
• Per patient: Documentation of whether the time from hospital arrival to initiation of thrombolytic therapy administration was ≤60 min. • Per patient population: Percentage of patients in whom the time from hospital arrival to initiation of thrombolytic therapy administration was ≤60 min.	
Challenges to implementation	
• Timed data are usually less reliable than categorical data elements. • However, feasibility is suggested based on initial use of the measure within AHA GWTG-Stroke, where it is the primary target for improvement in the AHA Target: Stroke quality improvement initiative.	
Analogous measures endorsed by other organizations	
• Similar measures have been endorsed or used by: NQF(#1952), AHA GWTG-Stroke	

#Valid reasons for delays should be related to patient factors such as the need for urgent medical stabilization (eg, intubation for respiratory failure or airway protection), treatment of elevated blood pressure, fluctuating neurological examination, or initial patient or family refusal. Delays related to hospital or systems factors, such as slow door to CT time, CT technical problems, or delays in obtaining intravenous access, are not allowed.

Appendix. Continued

11. Dysphagia screening within 24 h	
Percentage of patients ≥18 y of age with a diagnosis of ischemic stroke for whom there is documentation that a dysphagia screening was performed within 24 h of admission using a dysphagia screening tool approved by the institution in which the patient is receiving care	
Numerator	Patients for whom there is documentation that a dysphagia screening was performed within 24 h of admission using a dysphagia screening tool approved by the institution in which the patient is receiving care**
Denominator	Included patients • All patients ≥18 y old with a diagnosis of ischemic stroke
	Excluded patients • <18 y of age • Length of stay >120 d • Stroke occurred while in hospital • Enrolled in clinical trials related to stroke • Admitted for "elective carotid intervention" • Discharged before 24 h • Documented reason that dysphagia screening was not indicated. Reasons could include coma, intubation, or that the patient was entirely dependent on enteral feeding (without oral intake of food, liquids, or medications) before hospitalization as a result of a chronic medical condition.
Period of assessment	Within 24 h of hospital admission
Sources of data	Prospective flow sheet, retrospective medical record review, electronic medical record
Rationale	
Dysphagia is present in up to 67% of patients with acute stroke, and of these, almost 50% have aspiration, a prerequisite for aspiration pneumonia. Up to one third of patients who aspirate develop pneumonia. Pneumonia is a serious complication of stroke and is associated with increased mortality. Several studies have demonstrated a reduction in pneumonia after institutional implementation of dysphagia screening protocols, but without randomized control groups. Several swallow screening methods have been published in the literature, each with benefits and limitations, without sufficient evidence to recommend a single consensus method.	
Source for recommendation	
From the 2013 AHA/ASA "Guidelines for the Early Management of Patients With Acute Ischemic Stroke"[4]: 1. Assessment of swallowing before starting eating, drinking, or receiving oral medications is recommended *(Class I; Level of Evidence B)*.	
Method of reporting	
• Per patient: Documentation of whether the patient received a dysphasia screen within 24 h of admission. • Per patient population: Percentage of patients who received a dysphasia screen within 24 h of admission.	
Challenges to implementation	
• Documentation of timing of dysphagia screen may be difficult to locate in chart review. • Requires that institutional dysphagia screening protocols be developed and that adherence to these protocols can be abstracted from the chart.	
Analogous measures endorsed by other organizations	
• None	

**Dysphagia screening may consist of a structured bedside swallowing screen administered by nursing staff, bedside swallow evaluation by a speech-language pathologist, videofluoroscopic swallow evaluation, fiber optic endoscopic evaluation of swallowing, or other method approved by local institutional protocol.

Appendix. Continued

12. Passed dysphagia screen before first oral intake of fluids, nutrition, or medications	
Percentage of patients ≥18 y of age with a diagnosis of ischemic stroke who were documented to have passed the most recent dysphagia screen before oral intake	
Numerator	Included patients • Patients who were documented to have passed†† the most recent dysphagia screen before oral intake of fluids, nutrition, or medications
	Excluded patients • Patients whose first oral intake was not consistent with the recommendations of the most recent dysphagia screen (eg, a patient was provided thin liquids even though the recommendation was for thickened liquids)
Denominator	Included patients • All patients ≥18 y old with a diagnosis of ischemic stroke or who received oral nutrition, fluids, or medications (intake by mouth [PO]) during the hospital stay
	Excluded patients • Patients who remained NPO (nothing by mouth) during their hospital stay • <18 y of age • Length of stay >120 d • Stroke occurred while in hospital • Enrolled in clinical trials related to stroke • Admitted for "elective carotid intervention"
Period of assessment	Once during each hospital stay
Sources of data	Prospective flow sheet, retrospective medical record review, electronic medical record
Rationale	
Dysphagia is present in up to 67% of patients with acute stroke, and of these, almost 50% have aspiration, a prerequisite for aspiration pneumonia. Up to one third of patients who aspirate develop pneumonia. Pneumonia is a serious complication of stroke and is associated with increased mortality. Several studies have demonstrated a reduction in pneumonia after institutional implementation of dysphagia screening protocols, but without randomized control groups. Several swallow screening methods have been published in the literature, each with benefits and limitations, without sufficient evidence to recommend a single consensus method.	
Source for recommendation	
From the 2013 AHA/ASA "Guidelines for the Early Management of Patients With Acute Ischemic Stroke"[4]: 1. Assessment of swallowing before starting eating, drinking, or receiving oral medications is recommended *(Class I; Level of Evidence B)*.	
Method of reporting	
• Per patient: Documentation of whether the patient who received oral intake had passed the most recent dysphagia screen before oral (PO) intake. • Per patient population: Percentage of patients who received oral intake and passed the most recent dysphagia screen before oral (PO) intake.	
Challenges to implementation	
• Documentation of timing of dysphagia screen in relation to oral intake may be difficult to locate in chart review	
Analogous measures endorsed by other organizations	
• Similar measures have been endorsed or used by: NQF (#0243), TJC (STK 7), AHA GWTG-Stroke, CDC PCNASR, and AMA PCPI. However, a key difference is that in contrast to those measures, the AHA/ASA measure requires not only that a dysphagia screen has been administered before oral intake but that the screen must have been passed, with adoption of an appropriate diet based on the screen results.	

††"Passed" indicates that an oral dysphagia screening protocol was performed according to institutional protocol and that the results of the screen indicated that oral intake, with or without modifications or restrictions (eg, for consistency of liquids or solid food, or supervision during oral intake), was recommended. In cases in which the most recent screening before first oral intake recommended a modified diet or restrictions, the first oral intake should have been consistent with the recommended modifications; if the first oral intake was not consistent with the recommended dietary modification (eg, the patient was provided thin liquids even though the recommendation was for thickened liquids), then the patient should be excluded from the numerator. The methods for dysphagia assessment and recommendations should be based on an institutional protocol and may include some combination of a structured bedside swallowing screen administered by nursing staff, bedside swallow evaluation by a speech-language pathologist, videofluoroscopic swallow evaluation, fiber optic endoscopic evaluation of swallowing, consultation with speech language pathologist or other specialist, or other method approved by local institutional protocol.

Appendix. Continued

13. National Institutes of Health Stroke Scale (NIHSS) score on arrival	
Percentage of patients with ischemic stroke in whom the NIHSS was measured, and a total score recorded, as part of initial evaluation on arrival at the hospital	
Numerator	• Patients in whom the NIHSS was measured and a total score recorded within 24 h of hospital arrival or, if given intravenous or intra-arterial reperfusion therapy, before therapy
Denominator	Included patients • All ischemic stroke patients
	Excluded patients • <18 y of age • Length of stay >120 d • Enrolled in clinical trials related to stroke • Admitted for "elective carotid intervention"
Period of assessment	First 24 h after arrival
Sources of data	Prospective flow sheet, retrospective medical record review, electronic medical record

Rationale

The NIHSS is a validated tool for assessing the initial stroke severity. An objective, standardized assessment of stroke severity is essential for determining eligibility for thrombolytic therapy, is the main determinant of short-term and long-term prognosis from stroke, and facilitates communication of stroke severity between HCPs.

Source for recommendation

From the 2013 AHA/ASA "Guidelines for the Early Management of Patients With Acute Ischemic Stroke"[4]:

1. The use of a stroke rating scale, preferably the NIHSS, is recommended *(Class I; Level of Evidence B)*.

Method of reporting

- Per patient: Documentation of whether NIHSS was measured, and a total score recorded, as part of initial evaluation on arrival at the hospital.
- Per patient population: Percentage of patients in whom the NIHSS was measured, and a total score recorded, as part of initial evaluation on arrival at the hospital.

Challenges to implementation

- The NIHSS requires training to produce the most reliable results.
- Measuring the NIHSS within 24 h may be challenging for hospitals without an on-site stroke team.
- However, feasibility is suggested based on experience as a reporting measure in AHA GWTG-Stroke

Analogous measures endorsed by other organizations

- None. However, a similar measure is being piloted by TJC as part of comprehensive stroke center certification.

Appendix. Continued

14. Cardiac monitoring	
Percentage of patients with ischemic stroke who receive continuous cardiac rhythm monitoring during the first 24 h of admission	
Numerator	• Patients who receive continuous cardiac rhythm monitoring within 2 h of arrival on a hospital unit and for whom rhythm monitoring is continued through the first 24 h of hospital admission – Rhythm monitor should allow real-time review of rhythm – Monitoring may be temporarily discontinued for diagnostic testing
Denominator	Included patients • All ischemic stroke patients
	Excluded patients • <18 y of age • Length of stay >120 d • Stroke occurred while in hospital • "Comfort measures only" documented on hospital day 0 or 1 • Enrolled in clinical trials related to stroke • Admitted for "elective carotid intervention" • Discharged before 24 h
Period of assessment	First 24 h after admission
Sources of data	Prospective flow sheet, retrospective medical record review, electronic medical record
Rationale	
Cardiac disease is a frequent comorbid condition in patients presenting with acute stroke. Myocardial injury, as identified by elevations of serum troponin, occurs in ≈18.1% of patients with acute stroke, and 2%–3% of patients hospitalized with acute stroke have an associated acute myocardial infarction during their hospitalization, which puts them at risk for potentially dangerous cardiac arrhythmias. Strokes involving the insular cortex of the brain are associated with cardiac arrhythmias and sudden death. The prompt diagnosis and management of cardiac arrhythmias that occur in the setting of acute ischemic stroke is critical and is improved with the use of monitoring. In addition, AF, either continuous or paroxysmal, is a common cause of cardiac embolism that leads to ischemic stroke. In many cases, AF was not previously diagnosed. Paroxysmal AF may be missed on an ECG. Expedient identification of the presence of AF assists in determination of appropriate management for secondary stroke prevention.	
Source for recommendation	
From the 2013 AHA/ASA "Guidelines for the Early Management of Patients With Acute Ischemic Stroke"[4]: 1. Cardiac monitoring is recommended to screen for AF and other potentially serious cardiac arrhythmias that would necessitate emergency cardiac interventions. Cardiac monitoring should be performed for at least the first 24 h *(Class I; Level of Evidence B)*.	
Method of reporting	
• Per patient: Documentation of whether the patient received continuous cardiac rhythm monitoring within 2 h of admission on a hospital unit and whether rhythm monitoring was continued through the first 24 h of hospital admission. • Per patient population: Percentage of patients who received continuous cardiac rhythm monitoring within 2 h of admission on a hospital unit and for whom rhythm monitoring was continued through the first 24 h of hospital admission.	
Challenges to implementation	
• Establishing timing of initiation and discontinuation of continuous cardiac monitoring may be difficult.	
Analogous measures endorsed by other organizations	
• None	

Appendix. Continued

15. Early carotid imaging	
Percentage of patients with ischemic stroke within the last 3 d with carotid imaging results reported by the end of hospital day 2 or hospital discharge, whichever is first.	
Numerator	• Patients with ischemic stroke within the last 3 d who have carotid imaging reported (based on either ultrasound, CT angiography, magnetic resonance imaging angiography, or conventional angiography) by the end of hospital day 2‡‡
Denominator	Included patients • All ischemic stroke
	Excluded patients • <18 y of age • Length of stay >120 d • Stroke occurred while in hospital • "Comfort measures only" documented on hospital day 0 or 1 • Enrolled in clinical trials related to stroke • Admitted for "elective carotid intervention" • Documented reason for not obtaining early carotid imaging.
Period of assessment	First 24 h after assessment in a hospital inpatient setting
Sources of data	Prospective flow sheet, retrospective medical record review, electronic medical record
Rationale	
Patients with symptomatic high-grade carotid stenosis are at high risk for recurrent events and may benefit from early revascularization with carotid endarterectomy or carotid artery stenting. Therefore, if symptoms/signs are referable to the carotid territory, early surveillance of the carotid arteries is critical for detecting a high-risk population appropriate for intervention.	
Source for recommendation	
From the 2013 AHA/ASA "Guidelines for the Early Management of Patients With Acute Ischemic Stroke"[4]: 1. Noninvasive imaging of the cervicocephalic vessels should be performed routinely as part of the evaluation of patients with suspected TIAs *(Class I; Level of Evidence A).* 2. Patients with transient ischemic neurological symptoms should undergo neuroimaging evaluation within 24 h of symptom onset or as soon as possible in patients with delayed presentations *(Class I; Level of Evidence B).*	
Method of reporting	
• Per patient: Documentation of whether the patient had carotid imaging results reported by the end of hospital day 2. • Per patient population: Percentage of patients who had carotid imaging results reported by the end of hospital day 2.	
Challenges to implementation	
• The precise timing of symptom onset may be difficult to elicit, particularly if there is a stuttering course. • Clinicians evaluating the patient may have difficulty identifying the location of the ischemia, including whether the ischemia was in the carotid territory. • Vascular imaging may not be available within 24 h on weekends and holidays. • Care provision could span multiple settings (eg, with initial evaluation in an emergency department and subsequent next-day outpatient carotid imaging assessment).	
Analogous measures endorsed by other organizations	
• None	

‡‡The imaging report should include the degree of stenosis as determined according to the local laboratory-specific standards. For patients discharged before the end of hospital day 2, early carotid imaging should have been reported before hospital discharge. Documented reasons for not obtaining carotid imaging are in the judgment of the treating physician; reasons should be documented explicitly in the chart and may include, but not be limited to, the following: the patient would not be a candidate for carotid revascularization even if a stenosis were found; the location of the ischemia was not in the territory of the carotid arteries; or a carotid imaging study was recently obtained before admission. Documentation that there is a plan to obtain carotid imaging at a later time is not a sufficient reason for not obtaining early carotid imaging.

Disclosures

Writing Group Disclosures

Writing Group Member	Employment	Research Grant	Other Research Support	Speakers' Bureau/Honoraria	Expert Witness	Ownership Interest	Consultant/ Advisory Board	Other
Eric E. Smith	University of Calgary	None	None	None	None	None	None	AHA GWTG Executive and Steering Committees (unpaid volunteer)*
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(*Continued*)

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This table represents the relationships of writing group members that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all members of the writing group are required to complete and submit. A relationship is considered to be "significant" if (a) the person receives $10 000 or more during any 12-month period, or 5% or more of the person's gross income; or (b) the person owns 5% or more of the voting stock or share of the entity, or owns $10 000 or more of the fair market value of the entity. A relationship is considered to be "modest" if it is less than "significant" under the preceding definition.

*Modest.

†Significant.

Reviewer Disclosures

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Moira Kapral	University of Toronto	None	None	None	None	None	None	None
Frederick Masoudi	University of Colorado and Colorado Cardiovascular Outcomes Consortium	None	None	None	None	None	None	Oklahoma Foundation for Medical Quality (contract for CV measures maintenance)†; American College of Cardiology (contract, Senior Medical Officer, NCDR)†
Mathew Reeves	Michigan State University	None	None	None	None	None	None	None
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This table represents the relationships of reviewers that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all reviewers are required to complete and submit. A relationship is considered to be "significant" if (a) the person receives $10 000 or more during any 12-month period, or 5% or more of the person's gross income; or (b) the person owns 5% or more of the voting stock or share of the entity, or owns $10 000 or more of the fair market value of the entity. A relationship is considered to be "modest" if it is less than "significant" under the preceding definition.

†Significant.

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KEY WORDS: AHA scientific statements ■ acute ischemic stroke ■ clinical performance measures