Clinical Performance Measures for Adults Hospitalized With Intracerebral Hemorrhage

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

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Intracerebral hemorrhage (ICH) is a subtype of stroke that results from spontaneous nontraumatic bleeding into the parenchyma of the brain. ICH accounts for ≈10% to 15% of all strokes and carries a disproportionately high risk of early death and long-term disability.[1] Evidence for optimal treatment of ICH has lagged behind that for ischemic stroke, and consequently, metrics specific to ICH care have not been widely promulgated. However, numerous more recent studies and clinical trials of various medical and surgical interventions for ICH have been published and form the basis of evidence-based guidelines for the management of ICH that have been developed by the American Heart Association (AHA)/American Stroke Association (ASA) and other international organizations.[2–4] Thus, the translation of these guidelines into actionable performance measures is a priority to improve the delivery of care and to improve outcomes for patients with ICH.

A clinical 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."[5] Performance measures are being increasingly used for quality improvement, external reporting, regulatory oversight by hospital and program accreditation groups, and possibly pay-for-performance programs.[6] Performance measures differ from guidelines in that most rigorous guidelines describe a desirable treatment or process of care that is derived from a review of existing medical evidence using standardized criteria and levels of evidence.[7] However, guidelines traditionally do not take the next step of describing specifically how their implementation will be assessed in a quantitative way in order to assess compliance. Rigorous performance measures often take the strongest highest-level guidelines and provide a method for directly measuring and reporting them with the goal of improving healthcare quality.[8] In addition to being evidence-based, they need to be developed with attention to feasibility and whether they are actionable and clearly interpretable.[9]

In 2014, the AHA/ASA published "Clinical Performance Measures for Adults Hospitalized With Acute Ischemic Stroke."[10] This document outlined 15 proposed performance measures for acute ischemic stroke created with the use of a standardized methodology for performance measure

*The findings and conclusions in this manuscript are those of the author and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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development that has been used for other AHA cardiovascular performance measure sets.[11,12] These ICH performance measures represent the next AHA/ASA stroke-specific measure set and were developed with this same methodology. The present document on ICH follows that ischemic stroke document substantially, borrowing wording when appropriate to ensure similarity and harmonization across AHA/ASA performance measure approaches.[10] The process was overseen by the AHA/ASA Stroke Performance Oversight Committee and coordinated by an independent volunteer writing group of medical professionals from different specialties with assistance from the AHA/ASA professional staff. The primary purpose of these ICH Performance Measures is to promote adherence to guideline-recommended care.

Methods

The process used by the AHA/ASA ICH Performance Measure Writing Group was adapted from the methodology developed jointly by the American College of Cardiology and AHA for the development of performance measures for cardiovascular care.[11,12] The writing group was tasked by the AHA to develop performance measures related to emergency department and inpatient care of adults (≥18 years of age) hospitalized with ICH as the principal admitting condition. The group first determined the definition of ICH and the care period to be covered by the performance measures. Group members then reviewed existing AHA/ASA guidelines relevant to ICH for suitability for conversion to performance measures on the basis of the strength of guideline recommendation and evidence base, feasibility of data collection, reliability for comparison across hospitals, and potential to improve patient outcome. Specific guideline recommendations selected were then converted into performance measures by specifying eligible patients through specific inclusion and exclusion criteria and the measure numerator and denominator that would allow quantitative reporting of aggregate data. Previously existing performance measures that might apply to ICH that were already developed or endorsed by the National Quality Forum (NQF) or other groups such as the Centers for Disease Control and Prevention (CDC) or The Joint Commission (TJC) were also reviewed, and when possible, an attempt was made to harmonize these new AHA/ASA ICH performance measures with those already endorsed. Draft ICH performance measures were released for public comment. After the close of the public comment period, these comments were reviewed by the writing group, and the performance measures were revised as deemed appropriate. New measures deserve pilot testing before widespread adoption.

Structure and Membership of the Writing Group

The writing group was selected by the AHA/ASA Stroke Performance Oversight Committee and was designed to include a diverse set of experienced clinicians with expertise in both the guideline-concordant management of ICH and performance measure development. Represented specialties included vascular neurology, neurosurgery, neurocritical care, neuroendovascular care, physical medicine and rehabilitation, cardiology, hematology, emergency medicine, public health, and nursing. AHA staff members provided administrative assistance and direction for the process but were not involved directly in selecting the specific performance measures. Work was conducted via multiple confidential conference calls and e-mail; in-person writing group meetings did not occur.

Table 1. *ICD-10-CM* Principal Diagnosis Codes for Eligible Patients With an ICH Diagnosis

I61.0 Nontraumatic ICH in hemisphere, subcortical
I61.1 Nontraumatic ICH in hemisphere, cortical
I61.2 Nontraumatic ICH in hemisphere, unspecified
I61.3 Nontraumatic ICH in brainstem
I61.4 Nontraumatic ICH in cerebellum
I61.5 Nontraumatic ICH, intraventricular
I61.6 Nontraumatic ICH, multiple localized
I61.8 Other nontraumatic ICH
I61.9 Nontraumatic ICH, unspecified
I62.9 Nontraumatic intracranial hemorrhage, unspecified

ICD-10-CM indicates *International Classification of Diseases, 10th Revision, Clinical Modification*; and ICH, intracerebral hemorrhage.

Adapted from the Centers for Medicare and Medicaid Services ICD-10 Assessment and Maintenance Toolkit.[13]

Disclosure of Relationships With Industry

All members of the writing group were volunteers who donated their time and efforts without monetary or other compensation. Writing group members were required to disclose in writing all financial relationships with industry relevant to this topic according to standard AHA reporting policies.

Definition of ICH

ICH was defined as spontaneous bleeding into the parenchyma of the brain not caused by trauma. There are multiple different causes for ICH, including hypertension, coagulopathy, underlying vascular anomalies, sympathomimetic drugs of abuse, and cerebral amyloid angiopathy. These performance measures are meant to apply to the same condition described in the AHA/ASA "Guidelines for the Management of Spontaneous Intracerebral Hemorrhage."[2] Thus, intracranial hemorrhage that is caused by an initial arterial or venous infarct does not apply, nor does intraparenchymal hemorrhage that occurs as a result of trauma or of treatment with tissue-type plasminogen activator. These performance measures also do not apply to acute ischemic stroke or subarachnoid hemorrhage, which are the subject of other current or future documents. In addition, these performance measures are intended for patients for whom the principal reason for hospital admission is ICH. Patients who are admitted to the hospital for another reason (eg, acute myocardial infarction) and develop an ICH during hospitalization are excluded. Although these patients should generally be treated according to the ICH guidelines, concerns of the writing group about the feasibility of case ascertainment, diagnosis attribution, and data reliability led to exclusion of these patients from documented assessment with these performance measures. Table 1 includes a list of *International Classification of Diseases, 10th Revision,*

Clinical Modification principal diagnosis codes for eligible patients with an ICH diagnosis in whom these performance measures are considered applicable.

Dimensions of Care

The acute hospital inpatient setting for the primary treatment of a patient with ICH was chosen as the setting for assessment of these performance measures. As with acute ischemic stroke, it is recognized that there are multiple dimensions of care for ICH, including the prehospital setting, the emergency department, rehabilitation, and outpatient care directed at primary and secondary prevention. Most other stroke-related performance measures (such as those from TJC,[13] AHA's Get With The Guidelines–Stroke,[14] the the CDC's Paul Coverdell National Acute Stroke Program,[15] and the AHA/ASA ischemic stroke performance measures[10]) have used the inpatient setting for this purpose because it represents a well-identified period of care that generally has good documentation of patient parameters and administered treatments as part of the medical record.[16] However, it is recognized that there are elements relevant to the care of patients with ICH that are not sufficiently captured by the use of the inpatient setting such as administration of longer-term rehabilitation and interventions focusing on prevention such as long-term blood pressure control. The writing group discussed the feasibility of assessment of performance measures in various settings and felt that restricting the dimension of care to the acute inpatient setting was a reasonable compromise for this first set of ICH performance measures. It was felt important that all hospitals involved in the acute care of patients with ICH should be considered under these performance measures; thus, they apply to hospitals that might transfer a patient with ICH after initial assessment or receive that patient in transfer after initial stabilization at another acute care hospital.

In addition, it would be most desirable for performance measures to be directly linked to patient-specific outcomes as opposed to processes of care.[17] Outcomes can be intermediate-term or acute outcomes (eg, development of pneumonia during the inpatient setting) or long-term outcomes (eg, functional outcome at 6 months after ICH or recurrence of ICH in the years after the initial event). The ability to use outcomes as opposed to processes of care in these performance measures was a substantial part of the discussion by the writing group. Ultimately, consideration of feasibility of measurement and harmonization with existing performance measures from other organizations (especially those measures that are NQF endorsed) weighed substantially in the decisions on which performance measures to put forth and how they should be structured.

Literature Review

The primary source for review of potential performance measures was the 2015 AHA/ASA "Guidelines for the Management of Spontaneous Intracerebral Hemorrhage."[2] The 2016 AHA/ASA "Guidelines for Adult Stroke Rehabilitation and Recovery" were also reviewed.[18] In addition, other documents of existing performance measures or quality metrics were reviewed to assess whether there were current performance measures developed for ischemic stroke or ICH that should be considered for inclusion and harmonization. The AHA/ASA "Metrics for Measuring Quality of Care in Comprehensive Stroke Centers" and "Clinical Performance Measures for Adults Hospitalized With Acute Ischemic Stroke" were reviewed for potential measures that would apply to ICH and should be considered for inclusion.[10,19] Currently active performance measures from other organizations, including TJC, the CDC's Paul Coverdell National Acute Stroke Program, NQF, AHA's Get With The Guidelines–Stroke, the American Medical Association-convened Physician Consortium for Performance Improvement, the Centers for Medicare & Medicaid Services Hospital Inpatient Quality Reporting Program, and NQF, were reviewed specifically in terms of whether measures analogous to those proposed here existed in other performance measurement sets currently in use and, if so, to consider harmonization across them when appropriate.

Selection and Development of Performance Measures

The process for the selection and development of these ICH performance measures used an approach from the AHA/ASA Stroke Performance Oversight Committee similar to that used for the 2014 AHA/ASA ischemic stroke performance measures.[10] Only Class I (high consensus for benefit) and Class III (high consensus for harm) recommendations according to the AHA/ASA criteria for recommendations and classification of Levels of Evidence were considered candidates for development into performance measures (Supplemental Tables 2 and 3). The writing group met by teleconference and through e-mail correspondence to review all Class I and III recommendations from the 2015 AHA/ASA ICH guidelines for suitability to develop into performance measures. Potentially applicable metrics from the AHA/ASA "Metrics for Measuring Quality of Care in Comprehensive Stroke Centers" manuscript were also added to the list for consideration.[19] Standard criteria for performance measure development were determined before initial review and were derived from principles set forth previously by the AHA and the American College of Cardiology.[11,12] These criteria included (1) likelihood that measure adherence would result in improved patient outcomes; (2) interpretability; (3) actionability; (4) precise numerator and denominator that could be defined; (5) reliability; (6) validity; and (7) feasibility for implementation. On the basis of the writing group discussion and voting, if a specific guideline recommendation was felt not to meet the above criteria, then it was not moved forward for development as a potential performance measure.

From this list of potential performance measures, subgroups of the writing group developed formal measurement set specifications in draft form for each potential performance measure. These specifications included numerator, denominator, period of assessment, data sources, rationale and specific recommendations from which it was derived, method of reporting, and challenges to implementation. Each writing group member participated in the development of at least 2 draft performance measures. Subsequent teleconferences were held in which each of these drafts was reviewed by the writing group with input designed to improve the measurement set specifications before voting by the writing group. During these teleconferences, existing performance measures from

other organizations as described previously were reviewed with special attention given to NQF-endorsed measures. Draft measurement set specifications were revised when deemed appropriate in order to harmonize with existing measures.

Each measure was then voted on for inclusion or exclusion with a standardized ballot form that included a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) on various aspects concerning suitability for submission as a performance measure. The ballots allowed measures to be rated separately on these various dimensions: evidence-based, interpretable, actionable, design of numerator and denominator, reliability, validity, and feasibility for implementation, as well as an overall assessment. Ballots were then reviewed and discussed on follow-up conference calls for consensus among the writing group for ultimate inclusion in the performance measure set.

Review and Endorsement

In February 2017, the ICH 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 measurement set specifications for each of the 9 specific performance measures proposed. Relevant healthcare organizations and professional societies were alerted to the publication of the document and encouraged to comment. Numerous comments were received, which were reviewed by the writing group via e-mail and in teleconference to determine whether changes to a specific measure should be made. When deemed appropriate, these changes were made before the development of this final manuscript describing the ICH performance measures. Peer review of this manuscript was then conducted by reviewers selected by the AHA. After peer review and appropriate revisions, these ICH performance measures were approved by the AHA Science Advisory and Coordinating Committee and the AHA Executive Committee. They should be considered valid until either updated or rescinded by the AHA/ASA Stroke Performance Oversight Committee.

Performance Measures for Adults Hospitalized With ICH

Patient Population and Care Period

The patient population is patients with spontaneous ICH, as defined in Definition of ICH in the Methods section, and the care period is the acute hospitalization for diagnosis and management of new ICH, from emergency department arrival at an acute care hospital to discharge from acute care. For patients who are initially seen at 1 hospital (in the emergency department or hospital intensive care unit or ward) and transferred to another hospital, care at both hospitals is eligible for assessment with these performance measures based on the measures that would be relevant for the extent of care delivered at each respective hospital. The performance measures were not designed for use for elective admissions (eg, evaluation or management of vascular anomalies such as arteriovenous malformations or cavernous malformations) or for inpatient ICH in which stroke occurred after hospital admission for another reason. Accordingly, these admission types are excluded from the measure denominators, as they are for current NQF-endorsed ICH measures. The writing group agreed that it is appropriate to exclude admissions with length of stay >120 days, as is done in the NQF-endorsed ICH measures, to avoid double counting patients when generating quarterly reports.

ICH may be identified by discharge *International Classification of Diseases* codes (as required by TJC), prospective or retrospective surveillance of admission logs by the hospital team, or a combination (as allowed by AHA's Get With The Guidelines–Stroke). *International Classification of Diseases, 10th Revision, Clinical Modification* codes for ICH are shown in Table 1. The choice of method of case ascertainment and diagnosis via administrative billing codes versus chart review may depend on many registry-specific factors, including available resources, and the writing group endorses either method as a valid means of case ascertainment.

Brief Summary of the Measurement Set

Table 2 shows the AHA/ASA performance measure set for adults hospitalized with ICH. The set consists of 9 measures. This includes several measures that are already endorsed as ICH performance measures by other organizations, some that are analogous to measures already endorsed by others but revised either to make them directly relevant to ICH (venous thromboembolism prophylaxis) or to harmonize with ischemic stroke measures (2 dysphagia measures), and 3 new measures. For example, 2 measures are currently already endorsed by the NQF, and 3 have analogous measures that are similar to NQF-endorsed measures but were revised for this ICH measure set.[20] Two are currently part of TJC Primary and Comprehensive Stroke Center criteria, and 1 measure is similar to a Comprehensive Stroke Center criteria measure but revised. Two measures are either identical or analogous to the CDC's Paul Coverdell National Acute Stroke Program measures. Three are identical to measures in the AHA/ASA ischemic stroke performance measure set. The Discussion provides additional comments on the measures, including the limitations of some of the current measures, opportunities for improvement, and recommendations for implementation and field testing. Appendix Table A1 provides full specifications for each measure.

Data Collection

The process whereby data are collected for reporting of performance measures influences data quality, cost of assessment, and ultimately the ways that the data can be used. To maximize the reliability of data capture, a prospectively designed report form should be used. The move of hospitals and healthcare systems to electronic health records means that some data elements can be automatically captured through these systems. Some data elements (eg, laboratory results or medications dispensed) have highly structured elements in electronic health records that facilitate automatic data abstraction, whereas other data elements (eg, baseline severity score or performance of a swallowing screen) are captured in less structured formats or require prospective addition of standardized elements to narrative admission and progress notes to increase compliance and to facilitate data abstraction. Capturing and verifying the accuracy of these elements and other crucial clinical data

Table 2. AHA/ASA Performance Measure Set for Hospitalized Patients With ICH

No.	Performance Measure	NQF Endorsed	CDC PCNASR/AHA GWTG-Stroke	TJC	CMS HIQRP	AHA Ischemic Stroke Performance Measure	New Measure
1	Baseline severity score	✓		✓			
2	Coagulopathy reversal			o			
3	Venous thromboembolism prophylaxis	o	o	o	o	o	
4	Admission unit						✓
5	Dysphagia screen: assessment	o	o			✓	
6	Dysphagia screen: management	o	o			✓	
7	Long-term blood pressure treatment						✓
8	Assessed for rehabilitation	✓	✓	✓	✓	✓	
9	Avoid corticosteroids						✓

✓ indicates identical measure present in other measurement set; o, analogous but not identical measure present in other measurement set; AHA, American Heart Association; ASA, American Stroke Association; CDC, Centers for Disease Control and Prevention; CMS, Centers for Medicare & Medicaid Services; GWTG-Stroke, Get With The Guidelines–Stroke; HIQRP, Hospital Inpatient Quality Reporting Program; ICH, intracerebral hemorrhage; NQF, National Quality Forum; PCNASR, Paul Coverdell National Acute Stroke Registry; and TJC, The Joint Commission.

(eg, a contraindication to a process) 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) or independent abstracter review (in the case of chart review–based performance data). To avoid bias and to ensure accurate numerators and denominators for reporting of overall hospital compliance with these performance measures, we recommend that data should be collected on all consecutive patients rather than a convenience sample.

Discussion

The goal of this project has been to develop an ICH-specific performance measure set derived from high-level recommendations from evidence-based guidelines. These performance measures are based principally on the AHA/ASA guidelines for management of spontaneous ICH and were developed with the use of standardized prespecified criteria delineated by the AHA and American College of Cardiology for overall performance measure development. Each performance measure derives directly from a Level I or Level III recommendation from the 2015 AHA/ASA ICH guidelines, although in several instances the specific wording and construction of the performance measures were revised or enhanced to harmonize with existing performance measures in use from other organizations, to align with similar measures for ischemic stroke that reasonably apply across all stroke subtypes, and to allow formal measurement for reporting purposes. The purpose of these performance measures is to improve the quality of care for patients with ICH by providing hospitals, stroke teams, and regulatory bodies with a way to directly measure and potentially benchmark this quality of care. The writing group, through its internal discussions and deliberations, understands that many domains of care important to the patient with ICH are not represented specifically by a performance measure because of the lack of AHA/ASA Class I or Class III recommendations for a specific aspect of treatment. However, concordance with current guideline-recommended care is strongly encouraged even in the absence of a specific performance measure linked to all aspects of care. It is hoped that this proposed ICH performance measure set will provide an initial toolkit for assessing quality of care and that it will be revised and expanded as evidence-based care for ICH expands.

These performance measures are designed for use within hospitals in the United States. They may be useful in other countries as well, either as directly assessed performance measures or as an example by which other countries may assess appropriate ICH performance measures optimized for their own system of care. When adoption outside the United States is considered, it is appropriate to consider the relevance of the specific aspects of each performance measure to local context and modify if needed.[21] In addition, these performance measures are intended to complement similar existing efforts by other organizations and regulatory bodies in the United States given that the overall goals of improving ICH quality of care and being able to measure this quality are similar across groups. This is why significant effort was made to harmonize these performance measures with other existing measures, especially when these earlier measures had been endorsed by the NQF. When the writing group felt that an existing performance measure was not optimal, the relevant performance measure was made according to writing group specifications, and this divergence is described in more detail later. Finally, it is recognized that all 9 of these proposed performance measures assess process and not patient outcome directly. The writing group spent a substantial amount of time discussing whether patient outcomes could be used rather than process, and this was the initial desire for several of the original drafts of performance measure specification sets. Examples of this could include less hematoma expansion with timely coagulopathy reversal, lower pneumonia rates from dysphagia screening, and improved functional outcome from rehabilitation services. However, a

gap remains between many processes of care derived from evidence-based guidelines and performance metrics that meet the various criteria such as feasibility, interpretability, and ability to be reliably and directly measured in the context of current stroke care. Consequently, most if not all current and endorsed ICH and ischemic stroke performance measures target processes of care. The writing group felt that as the field of quality assessment and performance measurement moves forward in stroke, priority should be placed on piloting outcome assessment for various performance measures with the goal of future transition from process measurement to patient-based outcome measurement. What follows is a brief discussion of each performance measure with a focus on unique or potentially controversial issues in its development.

The recommendation for a baseline severity score in all patients with acute ICH was new in the 2015 AHA/ASA ICH guidelines and was considered as a metric for Comprehensive Stroke Centers in the 2011 AHA/ASA recommendations. Numerous baseline severity scores for ICH exist,[22–24] with the general goal of their use being to improve communication and risk stratification in terms of the patient's clinical condition and not to attempt to provide a precise numeric prognostic estimate. The ICH score is the most widely used and validated score for baseline severity stratification. Whether to require a specific baseline severity score (such as the ICH score[22]) or to allow any of a variety of existing severity scores (such as the FUNC [Functional Outcome in Patients with Primary Intracerebral Hemorrhage] score,[23] the Glasgow Coma Scale score, the National Institutes of Health Stroke Scale score, or others as chosen by a specific hospital or individual physician) was a point of discussion for these performance measures and the 2015 ICH guidelines themselves. TJC requires a baseline ICH severity score as part of its metrics for Comprehensive Stroke Centers, and the ICH score is the only severity score used in this context. This TJC performance measure is endorsed by the NQF. Thus, the writing group felt that harmonization with the existing NQF-endorsed measure was a high priority in order to reduce heterogeneity and to improve standardization of care. This approach was largely affirmed by others during the public comment period. Components of the ICH score and 1 straightforward method of calculating ICH hematoma volume can be found in work by Hemphill et al[22] and Kothari et al.[25]

The performance measure for reversal of coagulopathy follows from the 2015 AHA/ASA ICH guidelines Class I recommendation for discontinuation of vitamin K antagonists in patients with acute ICH with an elevated international normalized ratio and administration of therapy to replace vitamin K–dependent clotting factors. The 2015 ICH guidelines do not provide a Class I recommendation as to whether to use prothrombin complex concentrates or fresh-frozen plasma and do not specify a time frame in which therapy must be administered. The optimal therapy and timing for vitamin K antagonist reversal in acute ICH have received notable attention in the time since the literature review for the 2015 ICH guidelines occurred.[26,27] Although a recent clinical trial suggested superiority of prothrombin complex concentrates over fresh-frozen plasma,[28] the writing group felt that the level of existing recommendations and available data best supported that, to meet this performance measure, the administration of either was acceptable. TJC has an existing Comprehensive Stroke Center metric about this topic. However, the writing group felt that the absence of any time frame for administration did not appropriately reflect quality because treatment with prothrombin complex concentrates or fresh-frozen plasma at a time point outside the hyperacute period was not the intended approach and meeting the metric by treating many hours after ictus was not reflective of quality care. Thus, initiation within 90 minutes of emergency department presentation (door-to-needle time) was chosen for this performance measure because it combines the expected time frame for the initial head computed tomography in stroke evaluation with treatment timing from a recent clinical trial of coagulopathy reversal. Although this new door-to-needle time for the initiation of coagulopathy reversal requires piloting, it is expected that high compliance will be achieved now and that future revisions will target a shorter door-to-needle time of 60 minutes, analogous to that for acute ischemic stroke. Per the recommendation in the 2015 ICH guidelines, intravenous vitamin K must also be administered to meet this performance measure. The fact that this measure applies to the presenting hospital (or a transfer-receiving hospital if therapy was not started at the initial hospital) was considered important because it emphasizes that just transferring a patient with ICH is insufficient to meet certain performance measures that pertain to early aspects of care. This measure deserves pilot testing, and it is reasonable for additional data such as type of treatment (prothrombin complex concentrates or fresh-frozen plasma) and time to international normalized ratio correction to be recorded. Again, public comment was generally supportive of the requirement of an early time frame for treatment. The 2015 ICH guidelines did not include a Class I recommendation for reversal of newer anticoagulant agents such as dabigatran, rivaroxaban, or apixaban. Thus, the writing group felt that a specific performance measure should not be developed at this time. However, this is an important issue for future guideline and performance measure updates.

Venous thromboembolism prophylaxis exists as a measure for patients with ICH in the CDC's Paul Coverdell National Acute Stroke Program and is an NQF-endorsed measure. An analogous performance measure is present in the AHA/ASA ischemic stroke performance measures that allows the use of anticoagulant medications or mechanical devices to meet the measure. For ICH, the use and optimal timing of anticoagulant medications remain without Class I recommendations. However, the use of pneumatic compression devices on the day of hospital admission is a Class I recommendation from the 2015 AHA/ASA ICH guidelines and is required to successfully meet this performance measure. For purposes of harmonization with analogous performance measures from other groups, use of pneumatic compression devices on day 0 (admission day) or day 1 of hospitalization is considered acceptable.

Three measures in this ICH performance measure set are identical to those in the AHA/ASA ischemic stroke measure set. They relate to dysphagia screening and rehabilitation services. All 3 of these measures derive from an independent Class I recommendation in the 2015 AHA/ASA ICH guidelines. However, these are also issues that generally apply to all stroke patients,

and this factored significantly into the writing group's deliberations on whether to draft entirely independent and unique performance measures on these topics for ICH or to consider whether the existing performance measures on these topics should be adopted for ICH. In the 2014 AHA/ASA ischemic stroke performance measures, there is extensive discussion of the challenges and controversies concerning the use of dysphagia screening as a performance measure.[10] In that document, the decision was made to create 2 dysphagia measures, 1 measure for screening within 24 hours of hospital admission and 1 measure that requires passing of a dysphagia screen before oral intake. As of this writing, NQF endorses a measure for dysphagia screening before oral intake, but it does not specify a time or require that the dysphagia screen is passed. The ICH performance measure writing group extensively discussed the existing controversies in dysphagia screening and ultimately felt that harmonization with the 2 measures from the ischemic stroke set made the most sense. Similarly, the writing group recognized that the performance measure requiring assessment for rehabilitation is associated with high compliance already and does not specify the type of rehabilitation services provided.[29] Even so, the writing group felt it was important to have a performance measure that pertained to rehabilitation services because this is a Class I recommendation in the ICH guidelines, and harmonization with the ischemic stroke set was prioritized given that there were no ICH-specific rehabilitation recommendations that superseded this.

Three new ICH-specific performance measures are proposed as part of this measure set. These new measures deserve pilot testing to assess feasibility and reliability. The new measures relate to hospital admission unit, long-term blood pressure management, and corticosteroid use for intracranial pressure management. It is recognized that for ICH specifically, improved outcomes are seen in patients who are managed in a specialized hospital neurological intensive care unit or stroke unit. It appears that this effect is in addition to the impact of any 1 specific targeted intervention and may indicate that hospital units such as these create a milieu in which overall care is optimized.[30–32] Although there is not an existing analogous performance measure from other organizations, TJC requires that certified Primary and Comprehensive Stroke Centers have such hospital units. To avoid failing this measure in this ICH performance measure set, hospitals that do not have such units are required to transfer patients in the emergency setting to another hospital with these capabilities. This emphasizes the importance of stroke systems of care. A potential challenge related to the implementation of this measure is verification of expertise in such hospital units. The 2015 AHA/ASA ICH guidelines do not provide specifics for how this can be assessed; TJC indicates that specialized training, including certification in an educational course such as Emergency Neurological Life Support,[33] would be a potential indicator.

Hypertension is the most common cause of ICH, and the 2015 AHA/ASA ICH guidelines contain a new prevention-focused recommendation for the initiation of blood pressure control immediately after ICH onset.[1,2] The related new performance measure does not apply to specific targets or agents for acute blood pressure control in patients with ICH in the emergency department or intensive care unit. Rather, it focuses on the initiation of blood pressure treatment during the inpatient setting with the goal of improving long-term blood pressure management for purposes of secondary prevention. The writing group ideally preferred a measure that directly assessed achieving long-term blood pressure control as an outpatient after ICH. However, development of this into a performance measure was not considered feasible or actionable at this time because of the often limited information on outpatient records and the challenge of following up with patients who may be seen in different healthcare systems. Thus, this new performance measure requires that patients with ICH are prescribed a pharmacological antihypertensive treatment at the time of hospital discharge or have a documented blood pressure indicating that they do not have hypertension. As a new performance measure, pilot testing is warranted, and it is hoped that, with the advance of electronic medical records, a future performance measure might target documentation of long-term compliance and control. The new AHA definition of hypertension as a blood pressure >130/80 mm Hg was incorporated as the target for initiation of treatment.[34]

Corticosteroids are not recommended for treating elevated intracranial pressure or cerebral edema in patients with ICH.[2] There is limited information on the extent to which this still occurs. Some members of the writing group felt this was a rare occurrence and thus a performance measure focusing on this was likely to have very high compliance already. However, other members were concerned that there was still substantial use. Pilot testing during initial implementation may help clarify this. Note that the goal of this performance measure is zero use, and the wording of the measurement set reflects this. A potential challenge is identifying clear documentation in the medical record for an alternative reason (eg, asthma exacerbation) if corticosteroids are administered.

Conclusions

Nine performance measures are proposed as part of this initial AHA/ASA clinical performance measure set for adults hospitalized with ICH. Six either are existing performance measures that are NQF endorsed (n=2) or have analogous performance measures through other organizations or related disease processes (n=4). These 6 measures are endorsed for immediate use. Three new measures are proposed, and it is recommended that they be implemented now but also that pilot testing occur during this implementation in case revisions are desirable to improve their feasibility, actionability, and reliability. Many more issues were considered for performance measures but did not meet the criteria for inclusion in this set (Supplemental Table 1). In addition, the writing group recognizes that there are many issues that might be desirable in performance measures but do not currently meet the high evidence standards (Class I or III recommendations) required for consideration. Quality assessment and performance measure implementation in stroke are still at an early stage, and it is hoped that future advancement of the evidence base for ICH care and broader experience with testing and implementation of performance measures will lead to revisions and expansions with the ultimate goal of improving the care of patients with ICH and stroke in general.

Appendix

Table A1. ICH Performance Measures

1. Baseline Severity Score: Percentage of patients with ICH in whom a baseline severity score is measured and a total score is recorded as part of initial evaluation on arrival at the hospital	
Numerator	Patients in whom an initial severity score is measured and a total score recorded within 6 h of hospital arrival. If an intracranial procedure is performed within 6 h of arrival, the severity score must be measured before this procedure. The ICH score should be used as the baseline severity score.
Denominator	***Included patients:*** All patients with ICH ***Excluded patients:*** <18 y of age Patients who arrive at hospital >48 h after last known well time Length of stay >120 d Clear documentation for comfort care/palliative care measures established before hospital arrival
Period of Assessment	First 6 h after hospital arrival
Sources of Data	Prospective flowsheet, retrospective medical record review, electronic medical record
Rationale	
Baseline clinical evaluation is part of the standard care of every patient with ICH. Measurement of a validated standardized severity score is important for prioritizing interventions, such as intensive care unit admission and surgical intervention, is the main determinant of short-term and long-term prognosis, facilitates communication of stroke severity between survivors, and is essential for risk adjustment to monitor provider and hospital care outcomes. The ICH score is selected for use because it is the most commonly used validated baseline severity score and is required by TJC in its analogous measure.	
Source for Recommendation	
From the 2015 AHA/ASA "Guidelines for the Management of Spontaneous Intracerebral Hemorrhage" 1. A baseline severity score should be performed as part of the initial evaluation of patients with ICH *(Class I; Level of Evidence B).*	
Method of Reporting	
Per patient: documentation of whether a severity score was measured and a total score was recorded as part of the initial evaluation on arrival at the hospital Per patient population: percentage of patients in whom a severity score was measured and a total score was recorded as part of the initial evaluation on arrival at the hospital	
Challenges to Implementation	
Training in ICH score calculation may be needed to produce the most reliable results. Measuring an intracerebral-specific score, such as the ICH score, within 6 h of arrival may be challenging for hospitals without an on-site stroke team, as opposed to a more general measure such as the GCS (which is a component of the ICH score). When hematoma volume is measured as part of a baseline severity score, a validated measure (such as the ABC/2 calculation method) should be used. This requires training.	
Analogous Measures Endorsed by Other Organizations	
Identical measure used by TJC (CSTK-03) and endorsed by NQF (No. 2866)	

AHA indicates American Heart Association; ASA, American Stroke Association; CSTK, Comprehensive Stroke; GCS, Glasgow Coma Score; ICH, intracerebral hemorrhage; NQF, National Quality Forum; and TJC, The Joint Commission.

Appendix. Continued

2. Coagulopathy Reversal: Percentage of patients with ICH and an INR >1.4 resulting from warfarin treatment who receive therapy to replace vitamin K–dependent clotting factors within 90 min of ED presentation and who also receive intravenous vitamin K*	
Numerator	Patients with an INR >1.4 resulting from warfarin treatment who receive therapy to replace vitamin K–dependent clotting factors within 90 min of ED presentation and who also receive intravenous vitamin K*
Denominator	***Included patients:*** Patients with ICH with known onset (or last known well) within 12 h of ED presentation INR >1.4 Known or presumed current warfarin use ***Excluded patients:*** <18 y of age Documented contraindication to treatment with an anticoagulant reversal agent Clear documentation for comfort care/palliative care measures established before hospital arrival Length of stay >120 d Enrolled in a clinical trial that would affect the use of anticoagulant reversal agents Use of nonwarfarin anticoagulants Elevated INR not resulting from warfarin (eg, liver disease) Hospital transfer from another presenting ED where therapy to replace vitamin K–dependent clotting factors was already started
Period of Assessment	Initial 90 min after ED arrival
Sources of Data	Prospective flowsheet, retrospective medical record review, electronic medical record, pharmacy records
Rationale	
Coagulopathy, specifically that resulting from the vitamin K antagonist warfarin, is a significant risk factor for hematoma expansion in ICH, and outcome is worsened in these patients. Time to correction of an elevated INR caused by warfarin has been related to amount of hematoma expansion. Prothrombin complex concentrates and fresh-frozen plasma decrease the INR and quickly reverse the anticoagulant effect of warfarin. Vitamin K is needed to ensure that coagulopathy does not return after the effect of initial reversal has passed.	
Source for Recommendations	
From the 2015 AHA/ASA "Guidelines for the Management of Spontaneous Intracerebral Hemorrhage" 1. Patients with ICH whose INR is elevated because of vitamin K antagonist should have their vitamin K antagonist withheld, receive therapy to replace vitamin K–dependent factors and correct the INR, and receive intravenous vitamin K *(Class I; Level of Evidence C)*. 2. Recombinant factor VIIa does not replace all clotting factors, and although the INR may be lowered, clotting may not be restored in vivo; therefore, recombinant factor VIIa is not recommended for vitamin K antagonist reversal in ICH *(Class III; Level of Evidence C)*.	
Method of Reporting	
Per patient: documentation of administration of therapy to replace vitamin K–dependent clotting factors within 90 min of arrival to the presenting ED Per patient population: percentage of patients treated with therapy to replace vitamin K–dependent clotting factors within 90 min of arrival to the presenting ED	
Challenges to Implementation	
Documentation of time of symptom onset or last known well is not always recorded for ICH. Initiation of coagulopathy reversal agent does not necessarily guarantee adequate INR correction.	
Analogous Measures Endorsed by Other Organizations	
Analogous measure used by TJC (CSTK-04)	

AHA indicates American Heart Association; ASA, American Stroke Association; CSTK, Comprehensive Stroke; ED, emergency department; ICH, intracerebral hemorrhage; INR, international normalized ratio; and TJC, The Joint Commission.

*Acceptable therapies to meet the 90-minute door-to-needle time metric include prothrombin complex concentrate (preferable) or fresh-frozen plasma (acceptable). Treatment with vitamin K alone is not acceptable to meet this measure. However, to meet this performance measure, intravenous vitamin K must also be given. A specific time for the vitamin K administration is not delineated. Recombinant factor VIIa is not recommended by the AHA/ASA ICH guidelines and is not acceptable.

Appendix. Continued

3. Venous Thromboembolism Prophylaxis: Percentage of patients with ICH who receive lower limb pneumatic compression on hospital day 0 or 1	
Numerator	Patients who received VTE prophylaxis using lower limb pneumatic compression on the day of admission (day 0) or the day after admission (day 1) or who have documentation why no pneumatic compression device was used*
Denominator	***Included patients:*** All patients with ICH ***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 a clinical trial that would affect the use of VTE prophylaxis
Period of Assessment	Hospital day 0 or day 1
Sources of Data	Prospective flowsheet, retrospective medical record review, electronic medical record
Rationale	
Pulmonary embolism from DVT accounts for nearly 10% of deaths after stroke. DVT is common in patients with ICH because of decreased mobility. The CLOTS trials demonstrated that pneumatic compression is superior to the use of graduated compression stockings and that DVT occurrence is reduced, especially in patients with ICH, if pneumatic compression was started as early as the day of hospital admission.	
Source for Recommendations	
From the 2015 AHA/ASA "Guidelines for the Management of Spontaneous Intracerebral Hemorrhage" 1. Patients with ICH should have intermittent pneumatic compression for prevention of VTE beginning the day of hospital admission *(Class I; Level of Evidence A).* 2. Graduated compression stockings are not beneficial to reduce DVT or improve outcome *(Class III; Level of Evidence A).*	
Method of Reporting	
Per patient: documentation of whether patient received pneumatic compression on hospital day 0 or 1 Per patient population: percentage of patients receiving pneumatic compression on hospital day 0 or 1	
Challenges to Implementation	
Documentation variability in the description of whether pneumatic compression was used Documentation of contraindication to pneumatic compression	
Analogous Measures Endorsed by Other Organizations	
Analogous measures endorsed or used by NQF (No. 0434), TJC (STK-1), AHA Ischemic Stroke Performance Measure 1, AHA GWTG–Stroke, CDC PCNASP, and CMS HIQRP	

AHA indicates American Heart Association; ASA, American Stroke Association; CDC, Centers for Disease Control and Prevention; CLOTS, Clots in Legs or Stockings After Stroke; CMS, Centers for Medicare & Medicaid Services; CSTK, Comprehensive Stroke; DVT, deep venous thrombosis; GWTG–Stroke, Get With The Guidelines–Stroke; HIQRP, Hospital Inpatient Quality Reporting Program; ICH, intracerebral hemorrhage; NQF, National Quality Forum; PCNASP, Paul Coverdell National Acute Stroke program; TJC, The Joint Commission; and VTE, venous thromboembolism.

*Acceptable contraindications to the use of pneumatic compression include any local leg condition in which the sleeves may interfere, such as dermatitis, vein ligation (immediately postoperative), gangrene, recent skin graft, severe peripheral arterial disease, existing DVT, or severe congestive heart failure with pulmonary edema.

Appendix. Continued

4. Admission Unit: Percentage of patients with ICH who are admitted to an intensive care unit or dedicated stroke unit with physician and nursing neuroscience acute care expertise	
Numerator	Patients admitted to an intensive care unit or dedicated stroke unit with physician and nursing neuroscience acute care expertise
Denominator	***Included patients:*** Patients with ICH admitted to an acute care hospital within 24 h of initial symptom identification ***Excluded patients:*** <18 y of age Length of stay >120 d Clear documentation for comfort care/palliative care measures established before hospital arrival
Period of Assessment	Day of hospital admission to hospital
Sources of Data	Prospective flowsheet, retrospective medical record review, electronic medical record
Rationale	
Patients with ICH are frequently medically and neurologically unstable particularly at the time of initial presentation. Care of patients with ICH in a dedicated neuroscience intensive care unit is associated with a lower mortality rate. Stroke units have demonstrated improved long-term outcome in randomized trials. Presence of a stroke unit is a required component for Primary and Comprehensive Stroke Center certification by TJC.	
Source for Recommendation	
From the 2015 AHA/ASA "Guidelines for the Management of Spontaneous Intracerebral Hemorrhage" 1. Initial monitoring and management of patients with ICH should take place in an intensive care unit or dedicated stroke unit with physician and nursing neuroscience acute care expertise *(Class I; Level of Evidence B).*	
Method of Reporting	
Per patient: documentation of whether a patient was admitted to an intensive care unit or dedicated stroke unit with physician and nursing neuroscience acute care expertise Per patient population: percentage of patients with ICH admitted to an intensive care unit or dedicated stroke unit with physician and nursing neuroscience acute care expertise	
Challenges to Implementation	
Verification of physician and nursing neuroscience care expertise Measure would require hospitals that do not have such an intensive care unit or dedicated stroke unit to transfer the patient with ICH from the ED to a hospital that has this type of intensive care unit or stroke unit.	
Analogous Measures Endorsed by Other Organizations	
For certification, TJC requires Primary Stroke Centers to have a "stroke unit or designated beds for the acute care of stroke patients" and Comprehensive Stroke Centers to have "dedicated neuro-ICU [intensive care unit] beds for complex stroke patients that include staff and licensed independent practitioners with the expertise and experience to provide neuro-critical care 24 hours a day, 7 days a week."	

AHA indicates American Heart Association; ASA, American Stroke Association; ED, emergency department; ICH, intracerebral hemorrhage; and TJC, The Joint Commission.

Appendix. Continued

5. Dysphagia Screening Within 24 h: Percentage of patients ≥18 y of age with a diagnosis of ICH 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 of age with a diagnosis of ICH ***Excluded patients:*** <18 y of age Length of stay >120 d Enrolled in a clinical trial related to stroke that would affect dysphagia screening 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 flowsheet, 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 2015 AHA/ASA "Guidelines for the Management of Spontaneous Intracerebral Hemorrhage" 1. A formal screening procedure for dysphagia should be performed in all patients before the initiation of oral intake to reduce the risk of pneumonia *(Class I; Level of Evidence B).*	
Method of Reporting	
Per patient: documentation of whether the patient received a dysphagia screen within 24 h of admission Per patient population: percentage of patients who received a dysphagia 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	
This measure is identical to the AHA/ASA Ischemic Stroke Performance Measure 11. Analogous measures endorsed or used by NQF (No. 0243), AHA GWTG–Stroke, CDC PCNASP, and AMA PCPI.	

AHA indicates American Heart Association; AMA, American Medical Association; ASA, American Stroke Association; CDC, Centers for Disease Control and Prevention; GWTG–Stroke, Get With The Guidelines–Stroke; ICH, intracerebral hemorrhage; NQF, National Quality Forum; PCNASP, Paul Coverdell National Acute Stroke program; and PCPI, Physician Consortium for Performance Improvement.

*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, fiberoptic endoscopic evaluation of swallowing, or other method approved by local institutional protocol.

Appendix. Continued

6. Passed Dysphagia Screen Before First Oral Intake of Fluids, Nutrition, or Medications: Percentage of patients ≥18 y of age with a diagnosis of ICH 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, although the recommendation was for thickened liquids)
Denominator	***Included patients:*** All patients ≥18 y of age with a diagnosis of ICH who received oral nutrition, fluids, or medication during the hospital stay ***Excluded patients:*** Patients who remained nil per os during the entire hospital stay <18 y of age Length of stay >120 d Enrolled in a clinical trial related to stroke that would affect dysphagia screening
Period of Assessment	Once during each hospital stay
Sources of Data	Prospective flowsheet, 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 2015 AHA/ASA "Guidelines for the Management of Spontaneous Intracerebral Hemorrhage" 1. A formal screening procedure for dysphagia should be performed in all patients before the initiation of oral intake to reduce the risk of pneumonia *(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 intake Per patient population: percentage of patients who received oral intake and passed the most recent dysphagia screen before oral 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	
This measure is identical to the AHA/ASA Ischemic Stroke Performance Measure 12. Analogous measures endorsed or used by NQF (No. 0243), AHA GWTG-Stroke, CDC PCNASP, 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 also that the screen must have been passed, with adoption of an appropriate diet based on the screen results.	

AHA indicates American Heart Association; AMA, American Medical Association; ASA, American Stroke Association; CDC, Centers for Disease Control and Prevention; GWTG–Stroke, Get With The Guidelines–Stroke; ICH, intracerebral hemorrhage; NQF, National Quality Forum; PCNASP, Paul Coverdell National Acute Stroke program; and PCPI, Physician Consortium for Performance Improvement.

*"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, although 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, fiberoptic endoscopic evaluation of swallowing, consultation with speech-language pathologist or other specialist, or other method approved by local institutional protocol.

Appendix. Continued

7. Long-Term Blood Pressure Treatment Initiation: Percentage of patients with ICH who are prescribed an oral or transdermal antihypertensive medication or who have a documented BP off medications <130/80 mm Hg at the time of hospital discharge	
Numerator	Patients who are prescribed an oral or transdermal antihypertensive medication or who have a documented BP off medications <130/80 mm Hg at the time of hospital discharge
Denominator	***Included patients:*** All patients with ICH ***Excluded patients:*** <18 y of age Length of stay >120 d "Comfort measures only" documented Enrolled in a clinical trial that would affect the use of antihypertensive medications or a specific BP target Documentation of reason for no long-term antihypertensive medication prescribed at discharge
Period of Assessment	Hospital discharge
Sources of Data	Prospective flowsheet, retrospective medical record review, electronic medical record, pharmacy records
Rationale	
Hypertension is the single most important modifiable risk factor for recurrent stroke among patients who survive ICH. Long-term BP control reduces the risk of recurrent ICH. Randomized clinical trials have found early lowering of BP to be safe after spontaneous ICH.	
Source for Recommendations	
From the 2015 AHA/ASA "Guidelines for the Management of Spontaneous Intracerebral Hemorrhage" 1. BP should be controlled in all patients with ICH *(Class I, Level of Evidence A).* 2. Measures to control BP should begin immediately after ICH onset *(Class I, Level of Evidence A).*	
Method of Reporting	
Per patient: documentation of an oral or transdermal antihypertensive medication prescribed at the time of hospital discharge or a documented BP of <130/80 mm Hg at the time of hospital discharge Per patient population: percentage of patients prescribed an oral or transdermal antihypertensive medication at the time of hospital discharge or a documented BP of <130/80 mm Hg at the time of hospital discharge	
Challenges to Implementation	
Prescription of an antihypertensive agent at hospital discharge does not guarantee long-term BP control Documentation is required because an antihypertensive medication is not prescribed at hospital discharge if the BP at that time is ≥130/80 mm Hg.	
Analogous Measures Endorsed by Other Organizations	
None	

AHA indicates American Heart Association; ASA, American Stroke Association; BP, blood pressure; and ICH, intracerebral hemorrhage.

Appendix. Continued

8. Assessed for Rehabilitation: Percentage of patients with ICH 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 ICH ***Excluded patients:*** <18 y of age Length of stay >120 d "Comfort measures only" documented Enrolled in a clinical trial that would affect the use of rehabilitation services Discharged to another acute care hospital Left against medical advice Died Discharged to home or another healthcare facility for hospice care
Period of Assessment	Acute hospital stay
Sources of Data	Prospective flowsheet, retrospective medical record review, electronic medical record
Rationale	
ICH often results in severe long-term disability. Comprehensive stroke units that include rehabilitation services demonstrate improved outcomes compared with other models of stroke unit care, and most studies of rehabilitation in stroke have included patients with ICH and ischemic stroke.	
Source for Recommendations	
From the 2015 AHA/ASA "Guidelines for the Management of Spontaneous Intracerebral Hemorrhage" 1. It is recommended that all patients with ICH have access to multidisciplinary rehabilitation *(Class I; Level of Evidence A).* From the 2016 AHA/ASA "Guidelines for Adult Stroke Recovery and Rehabilitation" 2. It is recommended that early rehabilitation for hospitalized stroke patients be provided in environments with organized, interprofessional stroke care *(Class I; Level of Evidence A).* 3. It is recommended that stroke survivors receive rehabilitation at an intensity commensurate with anticipated benefit and tolerance *(Class I; Level of Evidence B).*	
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	
Compliance to the measure is already quite high. The association between assessment and initiation of an appropriate rehabilitation plan is unmeasured, leaving uncertainty about the impact of the measure on improved outcomes. Documentation may be challenging to identify if rehabilitation services are delayed on the basis of anticipated institution of care limitations (eg, DNR, hospice, comfort measures only) or acute care hospital transfer.	
Analogous Measures Endorsed by Other Organizations	
Identical measures endorsed or used by NQF (Nos. 0244 and 0441), TJC (STK-10), AHA Ischemic Stroke Performance Measure 9, AHA GWTG-Stroke, and CDC PCNASP	

AHA indicates American Heart Association; ASA, American Stroke Association; CDC, Centers for Disease Control and Prevention; CSTK, Comprehensive Stroke; DNR, do not resuscitate; GWTG–Stroke, Get With The Guidelines–Stroke; ICH, intracerebral hemorrhage; NQF, National Quality Forum; PCNASP, Paul Coverdell National Acute Stroke program; and TJC, The Joint Commission.

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

Appendix. Continued

9. Avoidance of Corticosteroid Use for Elevated Intracranial Pressure: Percentage of patients with ICH who do not receive corticosteroids during acute hospitalization	
Numerator	Patients who do not receive intravenous or oral corticosteroids
Denominator	***Included patients:*** All patients with ICH ***Excluded patients:*** <18 y of age Length of stay >120 d Received corticosteroids before arrival at hospital and being assessed Participation in a clinical trial in which corticosteroids are part of the investigational regimen Documentation of a neurological or other medical condition for which corticosteroids may be indicated, including brain tumor, cerebral venous sinus thrombosis, vasculitis, asthma, COPD, cortisol deficiency, postcraniotomy
Period of Assessment	From ED arrival until acute care hospital discharge
Sources of Data	Prospective flowsheet, retrospective medical record review, electronic medical record, pharmacy records
Rationale	
Corticosteroids may be used for the treatment of cerebral mass effect and elevated intracranial pressure if vasogenic edema is present from brain tumors or cerebral abscess. A prior randomized clinical trial in ICH found increased complications and no outcome benefit. This has also been found in traumatic brain and spinal cord injury, and corticosteroids are not recommended in these conditions.	
Source for Recommendation	
From the 2015 AHA/ASA "Guidelines for the Management of Spontaneous Intracerebral Hemorrhage" 1. Corticosteroids should not be administered for the treatment of elevated intracranial pressure in ICH *(Class III; Level of Evidence B).*	
Method of Reporting	
Per patient: documentation that corticosteroids were given to treat presumed or known elevated intracranial pressure Per patient population: percentage of patients who did not receive corticosteroids for presumed or known elevated intracranial pressure	
Challenges to Implementation	
Determining indication for corticosteroid administration 0% Administration of corticosteroids is the desired result.	
Analogous Measures Endorsed by Other Organizations	
None	

AHA indicates American Heart Association; ASA, American Stroke Association; COPD, chronic obstructive pulmonary disease; ED, emergency department; and ICH, intracerebral hemorrhage.

Disclosures

Writing Group Disclosures

Writing Group Member	Employment	Research Grant	Other Research Support	Speakers' Bureau/ Honoraria	Expert Witness	Ownership Interest	Consultant/Advisory Board	Other
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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

Reviewer	Employment	Research Grant	Other Research Support	Speakers' Bureau/ Honoraria	Expert Witness	Ownership Interest	Consultant/ Advisory Board	Other
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*Modest.

†Significant.

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Clinical Performance Measures for Adults Hospitalized With Intracerebral Hemorrhage: Performance Measures for Healthcare Professionals From the American Heart Association/American Stroke Association

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Supplemental Table 1 for Clinical Performance Measures for Adults Hospitalized with Intracerebral Hemorrhage

Intracerebral Hemorrhage Guideline Recommendations Considered by the Committee but Not Selected for Measure Development

Intracerebral Hemorrhage Class I or Class III Recommendations Not Recommended for Translation into Performance Measures	*Criteria on Which Guideline Scored Poorly for Performance Measurement*
1. Rapid neuroimaging with CT or MRI is recommended to distinguish ischemic stroke from ICH.	Current high adherence
2. Patients with a severe coagulation factor deficiency or severe thrombocytopenia should receive appropriate factor replacement therapy or platelets, respectively	Actionability
3. For ICH patients presenting with SBP between 150 and 220 mm Hg and without contraindication to acute BP treatment, acute lowering of SBP to 140 mm Hg is safe.	Improvement in outcomes
4. Glucose should be monitored. Both hyperglycemia and hypoglycemia should be avoided.	Feasibility, actionability
5. Clinical seizures should be treated with antiseizure drugs.	Probable current high adherence, reliability
6. Patients with a change in mental status who are found to have electrographic seizures on EEG should be treated with antiseizure drugs.	Actionability, reliability
7. Patients with cerebellar hemorrhage who are deteriorating neurologically or who have brainstem compression and/or hydrocephalus from ventricular obstruction should undergo surgical removal of the hemorrhage as soon as possible. Initial treatment of these patients with ventricular drainage rather than surgical evacuation is not recommended.	Actionability, reliability
8. rFVIIa does not replace all clotting factors, and although the INR may be lowered, clotting may not be restored in vivo; therefore, rFVIIa is not recommended for VKA reversal in ICH.	Improvement in outcomes, low evidence level
9. Although rFVIIa can limit the extent of hematoma expansion in noncoagulopathic ICH patients, there is an increase in thromboembolic risk with rFVIIa and no clear clinical benefit in unselected patients. Thus, rFVIIa is not recommended.	Probable current high adherence
10. Graduated compression stockings are not beneficial to reduce DVT or improve outcome.	Alternative measure regarding venous thromboembolism already in measure set
11. Prophylactic antiseizure medication is not recommended.	Precise denominator, improvement in outcomes

12. DNAR status should not limit appropriate medical and surgical interventions unless otherwise explicitly indicated.	Interpretability, reliability

Supplemental Table 2 for Clinical Performance Measures for Adults Hospitalized with Intracerebral Hemorrhage

Applying Classification of Recommendations and Levels of Evidence

SIZE OF TREATMENT EFFECT

ESTIMATE OF CERTAINTY (PRECISION) OF TREATMENT EFFECT	CLASS I *Benefit >>> Risk* Procedure/Treatment **SHOULD** be performed/ administered	CLASS IIa *Benefit >> Risk* *Additional studies with focused objectives needed* **IT IS REASONABLE** to perform procedure/administer treatment	CLASS IIb *Benefit ≥ Risk* *Additional studies with broad objectives needed; additional registry data would be helpful* Procedure/Treatment **MAY BE CONSIDERED**	CLASS III *No Benefit* or CLASS III *Harm* Procedure/ Test / Treatment COR III: No Benefit: Not Helpful / No Proven Benefit COR III: Harm: Excess Cost w/o Benefit or Harmful / Harmful to Patient
LEVEL A Multiple populations evaluated* Data derived from multiple randomized clinical trials or meta-analyses	■ Recommendation that procedure or treatment is useful/effective ■ Sufficient evidence from multiple randomized trials or meta-analyses	■ Recommendation in favor of treatment or procedure being useful/effective ■ Some conflicting evidence from multiple randomized trials or meta-analyses	■ Recommendation's usefulness/efficacy less well established ■ Greater conflicting evidence from multiple randomized trials or meta-analyses	■ Recommendation that procedure or treatment is not useful/effective and may be harmful ■ Sufficient evidence from multiple randomized trials or meta-analyses
LEVEL B Limited populations evaluated* Data derived from a single randomized trial or nonrandomized studies	■ Recommendation that procedure or treatment is useful/effective ■ Evidence from single randomized trial or nonrandomized studies	■ Recommendation in favor of treatment or procedure being useful/effective ■ Some conflicting evidence from single randomized trial or nonrandomized studies	■ Recommendation's usefulness/efficacy less well established ■ Greater conflicting evidence from single randomized trial or nonrandomized studies	■ Recommendation that procedure or treatment is not useful/effective and may be harmful ■ Evidence from single randomized trial or nonrandomized studies
LEVEL C Very limited populations evaluated* Only consensus opinion of experts, case studies, or standard of care	■ Recommendation that procedure or treatment is useful/effective ■ Only expert opinion, case studies, or standard of care	■ Recommendation in favor of treatment or procedure being useful/effective ■ Only diverging expert opinion, case studies, or standard of care	■ Recommendation's usefulness/efficacy less well established ■ Only diverging expert opinion, case studies, or standard of care	■ Recommendation that procedure or treatment is not useful/effective and may be harmful ■ Only expert opinion, case studies, or standard of care
Suggested phrases for writing recommendations	should is recommended is indicated is useful/effective/beneficial	is reasonable can be useful/effective/beneficial is probably recommended or indicated	may/might be considered may/might be reasonable usefulness/effectiveness is unknown/unclear/uncertain or not well established	COR III: No Benefit is not recommended is not indicated should not be performed/ administered/ other is not useful/ beneficial/ effective
Comparative effectiveness phrases†	treatment/strategy A is recommended/indicated in preference to treatment B treatment A should be chosen over treatment B	treatment/strategy A is probably recommended/indicated in preference to treatment B it is reasonable to choose treatment A over treatment B		COR III: Harm potentially harmful causes harm associated with excess morbidity/mortality should not be performed/ administered/ other

Supplemental Table 3 for Clinical Performance Measures for Adults Hospitalized with Intracerebral Hemorrhage

Definition of Classes and Levels of Evidence Used in 2015 AHA/ASA Intracerebral Hemorrhage Guidelines Recommendations

Class I	Conditions for which there is evidence for and/or general agreement that the procedure or treatment is useful and effective
Class II	Conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of a procedure or treatment
Class IIa	The weight of evidence or opinion is in favor of the procedure or treatment
Class IIb	Usefulness/efficacy is less well established by evidence or opinion
Class III	Conditions for which there is evidence and/ or general agreement that the procedure or treatment is not useful/effective and in some cases may be harmful

Therapeutic recommendations

Level of Evidence A	Data derived from multiple randomized clinical trials or meta-analyses
Level of Evidence B	Data derived from a single randomized trial or nonrandomized studies
Level of Evidence C	Consensus opinion of experts, case studies, or standard of care

Diagnostic recommendations

Level of Evidence A	Data derived from multiple prospective cohort studies using a reference standard applied by a masked evaluator
Level of Evidence B	Data derived from a single grade A study or one or more case-control studies, or studies using a reference standard applied by an unmasked evaluator
Level of Evidence C	Consensus opinion of experts