American Academy of Neurology
American College of Radiology
National Committee for Quality Assurance
American Medical Association-convened Physician
Consortium for Performance Improvement®

Stroke and Stroke Rehabilitation
Performance Measurement Set

Status: PCPI Approved
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Executive Summary:
Toward Improving Outcomes for Stroke and Stroke Rehabilitation Patients

Purpose of Measurement Set

The American Academy of Neurology (AAN), American College of Radiology (ACR), National Committee for Quality Assurance (NCQA) and the American Medical Association (AMA)-convened Physician Consortium for Performance Improvement® (PCPI™) formed a Stroke and Stroke Rehabilitation Work Group to identify and define quality measures toward improving outcomes for patients with stroke, transient ischemic attack (TIA) and patients undergoing stroke rehabilitation. This work represents the formal periodic review and maintenance of an existing measurement set.

Reasons for Prioritizing Improvement in Stroke and Stroke Rehabilitation[1]

High Impact Topic Area

Stroke Prevalence

- An estimated 7 000 000 Americans ≥ 20 years of age have had a stroke. Overall stroke prevalence during this period is an estimated 3.0%.
- The prevalence of silent cerebral infarction is estimated to range from 6% to 28%, with higher prevalence with increasing age. The prevalence estimates also vary depending on the population studied (eg, ethnicity, sex, risk factor profile), definition of silent cerebral infarction, and imaging technique. It has been estimated that 13 million people had prevalent silent stroke in the 1998 US population.

Stroke Incidence

- Each year, ≈ 795 000 people experience a new or recurrent stroke. Approximately 610 000 of these are first attacks and 185 000 are recurrent attacks. Of all strokes, 87% are ischemic and 10% are intracerebral hemorrhagic strokes, whereas 3% are subarachnoid hemorrhage strokes.
- Each year, ≈ 55 000 more women than men have a stroke.
- Women have a higher lifetime risk of stroke than men. In the FHS, lifetime risk of stroke among those 55 to 75 years of age was 1 in 5 for women (20% to 21%) and approximately 1 in 6 for men (14% to 17%).
- On average, women are older at stroke onset than men (≈ 75 years compared with 71 years)
- Blacks have a risk of first-ever stroke that is almost twice that of whites.
- In the national REGARDS cohort, in 27 744 participants followed up over 4.4 years (2003-2010), the overall age-and sex-adjusted black/white incidence rate ratio was 1.51, but for ages 45 to 54 years, it was 4.02, whereas for those ≥ 85 years of age, it was 0.86. Similar trends for decreasing incidence erate ratio wer seen in the GCNKSS.
- The BASIC (Brain Attack Surveillance in Corpus Christi) project (NINDS) demonstrated an increased incidence of stroke among Mexican Americans compared with non-Hispanic whites in a community in southeast Texas. The crude 3-year cumulative incidence (2000-2002) was 16.8 per 1000 in Mexican Americans and 13.6 per 1000 in non-Hispanic whites. Specifically, Mexican Americans had a higher cumulative incidence for ischemic stroke at younger ages (45-59 years of age: RR 2.04, 95% CI 1.55-2.69; 60-74 years of age: RR 1.58, 95% CI 1.31-1.91) but not at older ages (≥ 75 years of age: RR 1.12, 95% CI 0.94-1.32). Mexican Americans also had a higher incidence of intracerebral hemorrhage and subarachnoid hemorrhage than non-Hispanic whites, adjusted for age.
- The age-adjusted incidence of first ischemic stroke per 1000 was 0.88 in whites, 1.91 in blacks, and 1.49 in Hispanics according to data from the Northern Manhattan Hispanics according to data from the Northern Manhattan Study (NOMAS; NINDS) for 1993 to 1997. Among blacks, compared with whites, the relative rate of intracranial atherosclerotic stroke was 5.85; of extracranial atherosclerotic stroke, 3.18; of lacunar stroke, 3.09; and of cardioembolic stroke, 1.58. Among Hispanics (primarily Cuban and Puerto Rican), compared with whites, the relative rate of intracranial atherosclerotic stroke was 5.00; of extracranial atherosclerotic stroke, 1.71; of lacunar stroke, 2.32; and of cardioembolic stroke, 1.42.

TIA Prevalence and Incidence

- In a nationwide survey of US adults, the estimated prevalence of self-reported physician-diagnosed TIA was 2.3%, which translates into ≈5 million people. The true prevalence of TIA is greater, because many patients who experience neurological symptoms consistent with a TIA fail to report it to their healthcare provider.
- Approximately 15% of all strokes are heralded by a TIA.
- Individuals who have a TIA and survive the initial high-risk period have a 10-year stroke risk of roughly 19% and a combined 10-year stroke, MI, or vascular death risk of 43% (4% per year).
- Within 1 year of TIA, ≈ 12% of patients will die.

Rigorous Clinical Evidence Base

Evidence-based clinical practice guidelines are available for the management of stroke and stroke rehabilitation. This measurement set is based on guidelines from:

- American Academy of Neurology
- American Stroke Association
- American Association of Neuroscience Nurses
- American College of Chest Physicians
- American College of Cardiology
- American Geriatrics Society
- National Heart Lung and Blood Institute

Stroke and Stroke Rehabilitation Outcomes

Ideally, a set of measures for patients with stroke and stroke rehabilitation will include both measures of outcomes as well as measures of processes that are known to positively influence desirable outcomes. Desired outcomes for stroke and stroke rehabilitation include:

1. Reduce delays in stroke treatments
2. Decrease symptom severity
3. Decrease incidence of recurrent stroke
4. Decrease preventable harmful events of stroke and stroke treatment
5. Increase stroke survival rates
6. Attain highest level of function after stroke
7. Promote patient centered decision making

Stroke and Stroke Rehabilitation Work Group Recommendations

The recommended measures below may be used for quality improvement and accountability.

- Measures addressing underuse of effective services (evaluation and treatment strategies)

Measure #1: Deep Vein Thrombosis Prophylaxis (DVT) for Ischemic Stroke or Intracranial Hemorrhage
Measure #2: Discharged on Antithrombotic Therapy
Measure #3: Anticoagulant Therapy Prescribed for Atrial Fibrillation at Discharge
Measure #4a: Tissue Plasminogen Activator (t-PA) Considered (Paired Measure)
Measure #4b: Tissue Plasminogen Activator (t-PA) Initiated (Paired Measure)
Measure #5: Screening for Dysphagia
Measure #6: Rehabilitation Services Ordered
Measure #8: Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) Reports
Measure #9: Artificial Feeding Patient/Caregiver Preferences
Measure #11: Lipid Management
Measure #12: Blood Pressure Control
Measure #13: Imaging for Transient Ischemic Attack or Ischemic Stroke

- Measures addressing safety

Measure #10a: Potentially Avoidable Harmful Events: Urinary Tract Infection
Measure #10b: Potentially Avoidable Harmful Events: Stage III or Greater Decubiti
Measure #10c: Potentially Avoidable Harmful Events: Fall with Fracture or Acute Subdural Hematoma

- Measures addressing patient-centered care

Measure #9: Artificial Feeding Patient/Caregiver Preferences
Measure #10a: Potentially Avoidable Harmful Events: Urinary Tract Infection

Measure #10b: Potentially Avoidable Harmful Events: Stage III or Greater Decubiti
Measure #10c: Potentially Avoidable Harmful Events: Fall with Fracture or Acute Subdural Hematoma

- Measures addressing desired outcomes

Measure #10a: Potentially Avoidable Harmful Events: Urinary Tract Infection
Measure #10b: Potentially Avoidable Harmful Events: Stage III or Greater Decubiti
Measure #10c: Potentially Avoidable Harmful Events: Fall with Fracture or Acute Subdural Hematoma

Other Potential Measures
The Work Group considered several other potential measures, though ultimately determined that they were not appropriate for inclusion in the measure set.

Measure Harmonization
When existing hospital-level or plan-level measures are available for the same measurement topics, the PCPI attempts to harmonize the measures to the extent feasible.

Technical Specifications
There are several data sources available for collecting performance measures; generally different data sources require different sets of measure specifications, due to the structure of the systems storing the data. The American Medical Association (AMA)-convened Physician Consortium for Performance Improvement® (the PCPI™), recognizes that Electronic Health Records (EHRs) are the state of the art for clinical encounters and is focusing significant resources and expertise toward specifying and testing measures within EHRs, as they hold the promise of providing the relevant clinical data for measures and for providing feedback to physicians and other health care providers that is timely and actionable.

The type of specifications provided for this measurement set are aligned with the PCPI plans to focus on the development of EHR specifications for new measure development projects, consistent with the information shared at the PCPI membership meeting held in October 2011. While the PCPI values prospective claims reporting programs and the data these programs can provide, the PCPI is looking to leverage the data in EHRs. This new focus will align the PCPI with national initiatives that highlight the benefits and wealth of data that EHRs bring to healthcare. The PCPI intends to maintain prospective claims specifications for measures that are currently reportable in national reporting programs.

Additional detailed information regarding PCPI Specifications Methodology is included in the Technical Specifications section of this document.

Another venue for advancing this work in EHR data measurement is the AMA/NCQA/HIMSS Electronic Health Record Association (EHRA) Collaborative (see www.ama-assn.org/go/collaborative).

Testing and Implementation of the Measurement Set
Several of the measures presented here represent updates to existing measures for Stroke and Stroke Rehabilitation. They have therefore been utilized, in their previous specifications, in national performance measurement projects such as the CMS Physician Quality Reporting Initiative (PQRI) project. In addition, specific research projects, including a project jointly sponsored by the American Academy of Neurology (AAN) and the Physician Consortium for Performance Improvement (PCPI), have been conducted to test the reliability of these measures in various settings. Results of these testing projects have been considered and resulted in modifications to the measures, where appropriate.

Feasibility Testing

The AAN/PCPI measure testing project found the measures to be feasible. Their use in the PQRI program also indicates general feasibility.

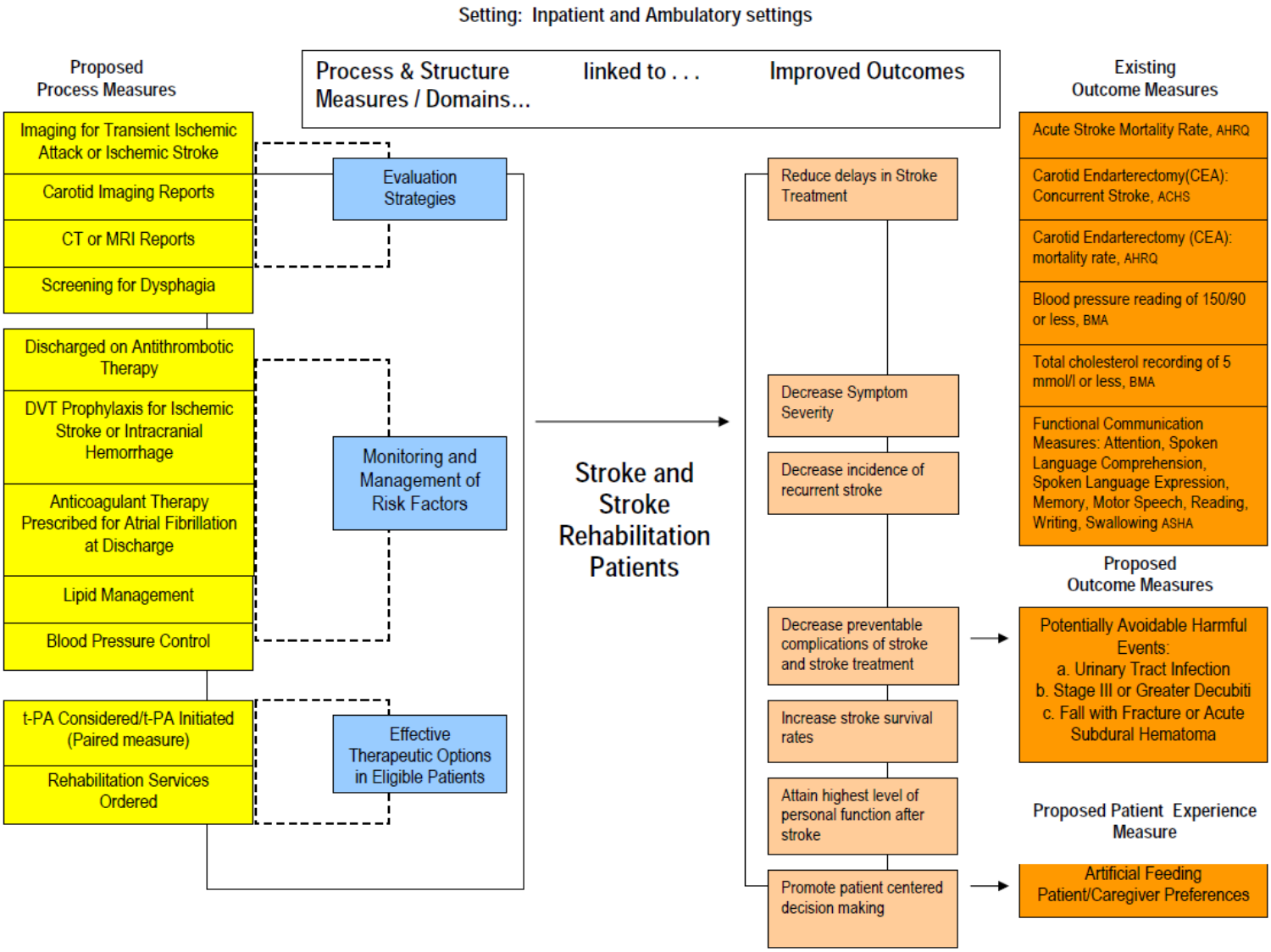
Reliability Testing

The AAN/PCPI measure testing project found the measure reliability to range from substantial to almost perfect., with kappas ranging from 0.73 to 1.0. Agreement percentages from inter-rater reliability testing ranged from 92.3% – 100%.

Other measures in the set are being made available without any prior testing. The PCPI recognizes the importance of testing all of its measures and encourages testing of the Stroke and Stroke Rehabilitation measurement set by organizations or individuals positioned to do so. The Measure Testing Protocol was approved by the PCPI in 2007 and is available on the PCPI web site (see Position Papers at www.physicianconsortium.org); interested parties are encouraged to review this document and to contact PCPI staff. The PCPI will welcome the opportunity to promote the initial testing of these measures and to ensure that any results available from testing are used to refine the measures before implementation.

Links to Outcomes:

The proposed measures focus on accurate and appropriate evaluation and monitoring of disease status and associated symptoms. These measures can help guide treatment, enhance patient safety and decrease potentially preventable harmful events, lead to higher levels of personal functioning, and ease patient and caregiver burden through referrals to additional sources for support.



Please note the following:

-Measures are applicable to several different populations including patients with ischemic stroke, transient ischemic attack (TIA) and intracranial hemorrhage.

-Potentially Avoidable Harmful Events measures are being considered as a composite measure

Purpose of the Measurement Set:

The American Academy of Neurology (AAN), American College of Radiology (ACR), National Committee for Quality Assurance (NCQA) and Physician Consortium for Performance Improvement (PCPI™) formed a Stroke and Stroke Rehabilitation Work Group to identify and define quality measures toward improving outcomes for outpatients and inpatients with stroke and stroke rehabilitation. The Work Group aimed to develop a comprehensive set of measures that support the efficient delivery of high quality health care in each of the Instituite of Medicine's (IOM) six aims for quality improvement (safe, effective, patient centered, timely, efficient, and equitable).

In 2006, the AAN, ACR, and PCPI developed a set of measures for patients with stroke and stroke rehabilitation. The majority of the measures received endorsement from the National Quality Forum, have been tested in a variety of implementation and demonstration projects, and are in use at the national level. This work represents the formal periodic review and maintenance of an existing measurement set. The PCPI stipulates a regular review of measures every 3 years or when there is a major change in scientific evidence, results from testing or other issues noted that materially affect the integrity of the measure.

The current measure development project aimed to review and update these existing Stroke and Stroke Rehabilitation measures to ensure they reflect the latest guideline recommendations, address areas most in need of performance improvement, and incorporate results from testing projects. The Work Group also looked to the development of new measures with particular attention to exploring the development of outcome and composite or bundled measures.

Importance of Topic[1]

Stroke Prevalence

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- Within 1 year of TIA, ≈ 12% of patients will die.

Stroke Mortality

- On average, every 4 minutes, someone dies of a stroke.
- Stroke accounted for ≈ 1 of every 18 deaths in the United States in 2008.
- When considered separately from other CVDs, stroke ranks No. 4 among all causes of death, behind diseases of the heart, cancer, and CLRD. Stroke mortality in 2008 was 134 148; any-mention mortality in 2008 was 223 841 and the death rate was 40.7.
- From 1998 to 2008, the annual stroke death rate decreased 34.8%, and the acutal number of stroke deaths declined 19.4%.
- Conclusions about changes in stroke death rates from 1980 to 2005 are as follows:
  - There was a greater decline in stroke death rates in men than in women, with a male-to-female ratio decreasing from 1.11 to 1.03
  - There were greater declines in stroke death rates in men than in women among people ≥ 65 years of age than among younger ages.
- More women than men die of stroke each year because of the larger number of elderly women. Women accounted for 60.1% of US stroke deaths in 2008.

Hospital Discharges/Ambulatory Care Visits

- From 1999 to 2009, the number of ipatient discharges from short-stay hospitals with stroke as the first-listed diagnosis remained about the same, with discharges of 961 000 and 971 000, respectively.
- Data from 2009 from the Hospital Discharge Survey of the NCHS showed that the average length of stay for discharges with stroke as the first-listed diagnosis was 5.3 days.
- In 2003, men and women accounted for roughly the same number of hospital stays for stroke in the 18 to 44 year-old age group. After 65 years of age, women were the majority. Among people 65 to 84 years of age, 54.5% of stroke patients were women, whereas among the oldest age group, women constituted 69.7% of all stroke patients.
- In 2009, there wre 768 000 ED visits and 127 000 outpatient department visits with stroke as the first-listed diagnosis. In 2009, physician office visits for a first-listed diagnosis of stroke totaled 3 327 000..

Cost

- The direct and indirect cost of stroke in 2008 was $34.3 billion.
- The estimated direct medicl cost of stroke for 2008 is $18.8 billion. This includes hospital outpatient or office-based provider visits, hospital inpatient stays, ED visits, prescirbed medicines, and home health care.

- The mean expense per person for stroke care in the United States in 2007 was estimated at $7657.
- The mean lifetime cost of ischemic stroke in the United States is estimated at $140,048. This includes inpatient care, rehabilitation and follow-up care necessary for lasting deficits.
- Inpatient hospital costs for an acute stroke event account for 70% of first-year poststroke costs.
- The largest components of short-term care costs were room charges (50%), mdical management (21%), and diagnostic costs (19%).

Opportunity for Improvement

Get With the Guidelines

In an assessment of the impact of Get With the Guidelines-Stroke, a national stroke quality improvement program to address treatment gaps, Schwamm and colleagues[2] compared baseline adherence (2003) to eight performance measures that reflect stroke guideline recommendations with follow-up performance at years 2 through 5. This study measured adherence for 322,847 hospitalized patients discharged with a diagnosis of ischemic stroke or transient ischemic attack. Adherence at year 5 (2007) for all performance measures was significantly different than at baseline (at $p < 0.0001$).

Performance Measures	% Adherence (baseline)	% Adherence (year 5)
Acute interventions		
Intravenous tPA in patients who arrive <2 hours after symptom onset	42.1	72.8
Antithrombotic medication within 48 hours of admission	91.5	97.0
Deep vein thrombosis prophylaxis within 48 hours of admission for nonambulatory patients	73.8	89.5
Discharge interventions		
Discharge use of antithrombotic medication	95.7	98.9
Discharge use of anticoagulation for atrial fibrillation	95.0	98.4
Treatment for low-density lipoprotein >100 mg/dL in patients meeting National Cholesterol Education Program Adult Treatment Panel III guidelines	76.6	88.3
Counseling or medication for smoking cessation	65.2	93.6
System measure		
Composite score – total number of 7 interventions above performed among eligible patients divided by the total number of possible interventions among eligible patients (**mean ± SD**)	83.5±26.6	94.0±16.0

Paul Coverdell National Acute Stroke Registry (PCNASR)

The Paul Coverdell National Acute Stroke Registry (PCNASR) was established by the CDC in 2001. In a study of adherence to acute stroke care performance measures, George and colleagues[3] reviewed data from 2005-2007, representing 56,969 patients from 195 hospitals in Georgia, Illinois, Massachusetts, and North Carolina. Overall, the clinical diagnosis for registry stroke cases was hemorrhagic stroke (13.8% of cases), ischemic stroke (56.2%), ill-defined stroke (i.e., medical record did not specify ischemic or hemorrhagic stroke; 7.3%), and TIA (21.6%).

Performance Measures	% Adherence
Received antithrombotic therapy at discharge	97.6
Received antithrombotic therapy within 48 hours of admission or by the end of the second hospital day	94.6
Assessed for rehabilitation services	90.1
Received deep venous thrombosis prophylaxis	85.5
Received anticoagulation therapy for atrial fibrillation	82.5
Received smoking cessation counseling	78.6
Received lipid level testing	69.9
Received stroke education	58.8

Received dysphagia screening	56.7
Received tissue plasminogen activator (among eligible patients)	39.8

Stroke Practice Improvement Network

The Stroke Practice Improvement Network (SPIN) was a multi-centered, prospective longitudinal study designed to develop and test strategies to improve the quality of in hospital stroke care. Hinchey and colleagues[4] reviewed baseline adherence rates and achievable benchmarks for 9 stroke performance measures within a study of 2294 patients admitted with acute ischemic stroke at 17 hospitals. The benchmarks represent the average performance for the top 10% of the sites adjusted for differences in the numbers of patients at each site.

Performance Measures	% Mean Adherence	% Benchmark
Door to needle time of ≤1 hour for tPA (tPA1)	17	52
Screening for dysphagia	62	94
Prophylaxis for deep vein thrombosis (DVT)	78	99
Warfarin for atrial fibrillation	87	100
Discharge on antithrombotics	98	100
tPA considered	69	93
Etiology documented	97	100
Smoking assessed, and counsel (smoke) given	64	90
stroke education and resources given	64	98

Processes of care for acute stroke

In a retrospective cohort study of 1487 patients, 18 years or older, with an ischemic stroke or transient ischemic attack (TIA) onset no more than 2 days before admission and a neurologic deficit on admission, Bravata and colleagues[5] assessed processes of care. Processes were chosen based on three criteria: (1) the process was a quality measure proposed by a national organization interested in stroke care and was reviewed by the National Expert Stroke Panel; (2) prior (published) evidence linked the process with improved mortality or reduced institutionalization; and (3) the process was a component of acute stroke care.

Processes	% Prevalence of Processes
Neurological evaluation	92
Swallowing evaluation	44
Deep vein thrombosis (DVT) prophylaxis	87
Early mobilization	59
Blood pressure (BP) management	41
Fever management	34
No episode treated	54
Some episodes treated	18
All episodes treated	29
Hypoxia management	13
No episode treated	36
Some episodes treated	17
All episodes treated	47

Barriers to Stroke Care[1]:

- On the basis of NHIS data, the inability to afford medications among stroke survivors increased significantly from 8.1% to 12.7% between 1997 and 2004. Compared with stroke survivors able to afford medications, those unable to afford them more frequently reported lack of transportation, no health insurance, no usual place of care, income < $20 000, and out-of-pocket medical expenses ≥ $2000.

- In 2002, ≈ 21% of US counties did not have a hospital, 31% lacked a hospital with an ED, and 77% did not have a hospital with neurological services.
- Data from the Paul Coverdell National Acute Stroke Registry were analyzed from the 142 hospitals that participated in the 4 registry states. More patients were transported by ambulance than by other means (43.6%). Time of stroke symptom onset was recorded for 44.8% of the patients. Among these patients, 48% arrived at the ED within 2 hours of symptom onset. Significantly fewer blacks (42.4%) arrived within 2 hours of symptom onset than did whites (49.5%, and significantly fewer nonambulance patients (36.2%) arrived within 2 hours of symptom onset than did patients transported by ambulance (58.6%).
- NHIS data from 1998 to 2002 found that younger stroke survivors (45-64 years) self-reported worse access to physician care and medication affordability than older stroke survivors. Compared with older patients, younger stroke survivors were more likely to be male (52% versus 47%), to be black (19% versus 10%), and to lack health insurance (11% versus 0.4%). Lack of health insurance was associated with reduced access to care.
- Data from 142 hospitals participating in the Paul Coverdell National Acute Stroke Registry found that fewer than 48% of stroke patients arrived at the ED within 2 hours of symptom onset in 2005 to 2006. Blacks were less likely to arrive within the 2-hour window than whites (42.4% versus 49.5%). Among those arriving within 2 hours, 65.2% received imaging within 1 hour of ED arrival; significantly fewer women received imaging within 1 hour than men (62.9% versus 67.6%), but no differences were observed by racial group.
- Results from the BASIC project found that women were less likely to arrive at the ED within 3 hours of stroke symptom onset than men (OR 0.7, 95% CI 0.5-0.9). Mexican Americans were 40% less likely to arrive by EMS than non-Hispanic whites, even after adjustment for age, National Institutes of Health Stroke Scale score, education, history of stroke, and insurance status. Language fluency was not associated with time to hospital arrival or use of EMS. The receipt of tissue-type plasminogen activator was low (1.5%) but did not differ by sex or race.

The PCPI believes that performance measure data should be stratified by race, ethnicity, and primary written and spoken language to assess disparities and initiate subsequent quality improvement activities addressing identified disparities. These categories are consistent with recent national efforts to standardize the collection of race and ethnicity data. A 2008 National Quality Forum (NQF) report endorsed 45 practices including stratification by the aforementioned variables. A 2009 Institute of Medicine (IOM) report "recommends collection of the existing Office of Management and Budget (OMB) race and Hispanic ethnicity categories as well as more fine-grained categories of ethnicity (referred to as granular ethnicity and based on one's ancestry) and language need (a rating of spoken English language proficiency of less than very well and one's preferred language for health-related encounters)."

Clinical Evidence Base

Evidence-based clinical practice guidelines are available for the management of stroke and stroke rehabilitation. This measurement set is based on guidelines from:

- American Academy of Neurology
- American Stroke Association
- American Association of Neuroscience Nurses
- American College of Chest Physicians
- American College of Cardiology
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These guidelines meet all of the required elements and many, if not all, of the preferred elements outlined in a recent PCPI position statement establishing a framework for consistent and objective selection of clinical practice guidelines from which PCPI work groups may derive clinical performance measures. Clinical practice guidelines serve as the foundation for the development of performance measures. Performance measures, however, are not clinical practice guidelines

and cannot capture the full spectrum of care for all patients with stroke and stroke rehabilitation. The guideline principles with the strongest recommendations and often the highest level of evidence (well designed randomized-controlled trials) served as the basis for measures in this set.

Stroke and Stroke Rehabilitation Outcomes

Ideally, a set of measures for patients with stroke and stroke rehabilitation will include both measures of outcomes as well as measures of processes that are known to positively influence desirable outcomes. Desired outcomes for stroke and stroke rehabilitation include:

1. Reduce delays in stroke treatments
2. Decrease symptom severity
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4. Decrease preventable harmful events of stroke and stroke treatment
5. Increase stroke survival rates
6. Attain highest level of function after stroke
7. Promote patient centered decision making

Intended Audience, Care Setting, and Patient Population

The PCPI encourages use of these measures by physicians, other health care professionals, and healthcare systems, where appropriate, to manage the care for patients aged 18 years and older with diagnosis of ischemic stroke, transient ischemic attack, and/or intracranial hemorrhage. These measures are meant to be used to calculate performance and/or reporting at the practitioner level. Performance measurement serves as an important component in a quality improvement strategy but performance measurement alone will not achieve the desired goal of improving patient care. Measures can have their greatest effect when they are used judiciously and linked directly to operational steps that clinicians, patients, and health plans can apply in practice to improve care.

Stroke and Stroke Rehabilitation Work Group Recommendations

This measurement set includes measures that focus on appropriate evaluation and management of ischemic stroke, TIA, or intracranial hemorrhage and associated symptoms, appropriate use of imaging and thrombolytic therapy, increasing patient awareness and participation in treatment decisions, care coordination, promoting and enhancing patient safety.

The Stroke and Stroke Rehabilitation Work Group focused on current quality gaps in care in order to identify processes that could potentially improve patient outcomes for patients with ischemic stroke, TIA, or intracranial hemorrhage. The Links to Outcomes table illustrates how each measure is linked to a process, which may eventually lead to an improved outcome.

These clinical performance measures are designed for practitioner level quality improvement to achieve better outcomes for patients with the aforementioned diagnoses. Unless otherwise indicated, the measures are also appropriate for accountability if the appropriate methodological, statistical, and implementation rules are achieved.

The measures listed below may be used for quality improvement and accountability.

• Measures addressing underuse of effective services (evaluation and treatment strategies)	
Measure #1:	Deep Vein Thrombosis Prophylaxis (DVT) for Ischemic Stroke or Intracranial Hemorrhage
Measure #2:	Discharged on Antithrombotic Therapy
Measure #3:	Anticoagulant Therapy Prescribed for Atrial Fibrillation at Discharge
Measure #4a:	Tissue Plasminogen Activator (t-PA) Considered (Paired Measure)
Measure #4b:	Tissue Plasminogen Activator (t-PA) Initiated (Paired Measure)
Measure #5:	Screening for Dysphagia
Measure #6:	Rehabilitation Services Ordered
Measure #8:	Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) Reports
Measure #9:	Artificial Feeding Patient/Caregiver Preferences

Measure #11: Lipid Management
Measure #12: Blood Pressure Control
Measure #13: Imaging for Transient Ischemic Attack or Ischemic Stroke

- Measures addressing safety

Measure #10a: Potentially Avoidable Harmful Events: Urinary Tract Infection
Measure #10b: Potentially Avoidable Harmful Events: Stage III or Greater Decubiti
Measure #10c: Potentially Avoidable Harmful Events: Fall with Fracture or Acute Subdural Hematoma

- Measures addressing patient-centered care

Measure #9: Artificial Feeding Patient/Caregiver Preferences
Measure #10a: Potentially Avoidable Harmful Events: Urinary Tract Infection
Measure #10b: Potentially Avoidable Harmful Events: Stage III or Greater Decubiti
Measure #10c: Potentially Avoidable Harmful Events: Fall with Fracture or Acute Subdural Hematoma

- Measures addressing desired outcomes

Measure #10a: Potentially Avoidable Harmful Events: Urinary Tract Infection
Measure #10b: Potentially Avoidable Harmful Events: Stage III or Greater Decubiti
Measure #10c: Potentially Avoidable Harmful Events: Fall with Fracture or Acute Subdural Hematoma

These measures also support the efficient delivery of high quality health care in many of the Institute of Medicine's (IOM) six aims for quality improvement as described in the following table:

IOM Domains of Health Care Quality		Safe	Effective		Patient-centered	Timely	Efficient	Equitable
			Underuse	Overuse				
Draft Measures								
1	Deep Vein Thrombosis Prophylaxis (DVT) for Ischemic Stroke or Intracranial Hemorrhage		√			√		√
2	Discharged on Antithrombotic Therapy		√					√
3	Anticoagulant Therapy Prescribed for Atrial Fibrillation at Discharge		√			√		√
4a	Tissue Plasminogen Activator (t-PA) Considered (Paired Measure)		√			√		√
4b	Tissue Plasminogen Activator (t-PA) Initiated (Paired Measure)		√			√		√
5	Screening for Dysphagia		√					√
6	Rehabilitation Services Ordered		√					√
7	Carotid Imaging Reports	Effective February 2009, this measure is replaced by the Radiology: Stenosis Measurement in Carotid Imaging Reports measure.						
8	Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) Reports		√			√		√
9	Artificial Feeding Patient/Caregiver Preferences		√		√			√
10a	Potentially Avoidable Harmful Events: Urinary Tract Infection	√			√			√
10b	Potentially Avoidable Harmful Events: Stage III or Greater Decubiti	√			√			√
10c	Potentially Avoidable Harmful Events: Fall with Fracture or Acute Subdural Hematoma	√			√			√
11	Lipid Management		√					√
12	Blood Pressure Control		√					√
13	Imaging for Transient Ischemic Attack or Ischemic Stroke		√			√		√

Retired Measures

A number of circumstances might warrant the retirement of a measure from a measurement set including, but not limited to:

- The measure no longer remains clinically relevant/appropriate as determined by current guidelines and scientific evidence
- To avoid excessive clinician burden, other performance measures, such as outcome measures, may take precedence
- High clinician performance, implying that the measure no longer represents an opportunity for quality improvement
- Testing results demonstrating poor feasibility of data collection or weak correlation with improved health outcomes
- Identification of significant unintended consequences of measurement.

The rationale for retiring the following measure from the previous Stroke and Stroke Rehabilitation measurement set is provided below.

Retired AAN/ACR/AMA PCPI/NCQA Measure	Rationale
Overuse Measure – Avoidance of Intravenous Heparin	While avoidance of intravenous heparin is important, the measure was constructed to be implemented for quality improvement only. The measure was not used in any quality improvement initiatives, therefore, no data was collected for the measure. Current evidence-based guideline recommendations for antithrombotic and thrombolytic therapy for ischemic stroke do not support full-dose anticoagulation with IV, SC, or low-molecular-weight heparins or heparinoids for patients with acute ischemic stroke (ACCP 2008). The work group unanimously voted to retire the measure.

Other Potential Measures

The Work Group considered several potential measures, which were ultimately not included in the measurement set. While each performance measure is intended to support quality improvement in one or more of the IOM domains (safe, effective, patient centered, timely, efficient, and equitable), the development of composite and outcome measures, and measures to evaluate stroke risk proved more difficult.

During their deliberations, the Work Group members sought to develop outcomes measures while additionally including a composite measure in the Stroke and Stroke Rehabilitation measurement set. Three potentially avoidable harmful events measures are included in the current measurement set. Originally, it was intended that these three would be combined into a composite measure. However, the Work Group noted the importance of testing each component of the measure for validity and reliability, prior to combining them into a composite. As there is currently no testing data for any of these three individual measures, the Work Group decided to leave these as separate measures so that they can be individually tested. When testing data is available, the combination of these three measures into a single composite can be re-assessed.

The potentially avoidable harmful events measures aim to focus on outcomes of stroke treatment by measuring the number of potentially avoidable harmful events for stroke patients during a one week inpatient hospital stay. The Work Group considered three additional potentially avoidable harmful events measures which were not ultimately included in the measurement set: Pneumonia, Pulmonary Embolism, and Deep Vein Thrombosis. The Work Group decision to remove these components resulted from the fact that current data does not indicate that these potential harmful events are necessarily a direct result of stroke treatment and may result from factors exogenous to the care a patient receives for stroke, TIA, or intracranial hemorrage.

One draft measure addressed Transient Ischemic Attack (TIA) Risk Stratification. The purpose of the measure was to focus on the assessment of future stroke risk for patients with TIA,

presenting to the Emergency Department. Although a number of scoring tools have been researched in the medical literature and are available for use, they have not been well validated in their ability to predict recurrent stroke or stroke severity and are not appropriate for making management decisions on an individual basis (Giles, Stroke 2010). The Work Group concluded that this measure should not move forward until more research is conducted to support the validity of current scoring tools or a new tool has been developed.

A non-invasive imaging performance measure was also included in the original draft measurement set. The intent of this measure was to assess the use of imaging to appropriately identify patients who are eligible for carotid endarterectomy procedures to prevent stroke. During the course of this measure's development it became evident that there are currently other national initiatives which seek to develop measures for similar purposes. Given the common goal of seeking harmonization and facilitating conversation about this topic, the PCPI convened a discussion about this issue with other stakeholders. Consensus was not immediately reached and conversations are ongoing. As such, the Work Group decided to table this measure.

Measure Harmonization

When existing hospital-level or plan-level measures are available for the same measurement topics, the PCPI attempts to harmonize the measures to the extent feasible. Several of the Stroke and Stroke Rehabilitation measures in this set were partially or fully harmonized with similar measures developed by the The Joint Commission.

Technical Specifications: Overview

There are several data sources available for collecting performance measures; generally different data sources require different sets of measure specifications, due to the structure of the systems storing the data. The American Medical Association (AMA)-convened Physician Consortium for Performance Improvement® (the PCPI™), recognizes that Electronic Health Records (EHRs) are the state of the art for clinical encounters and is focusing significant resources and expertise toward specifying and testing measures within EHRs, as they hold the promise of providing the relevant clinical data for measures and for providing feedback to physicians and other health care providers that is timely and actionable.

The type of specifications provided for this measurement set are aligned with the PCPI plans to focus on the development of EHR specifications for new measure development projects, consistent with the information shared at the PCPI membership meeting held in October 2011. While the PCPI values prospective claims reporting programs and the data these programs can provide, the PCPI is looking to leverage the data in EHRs. This new focus will align the PCPI with national initiatives that highlight the benefits and wealth of data that EHRs bring to healthcare. The PCPI intends to maintain prospective claims specifications for measures that are currently reportable in national reporting programs.

Additional detailed information regarding PCPI Specifications Methodology is included in the Technical Specifications section of this document.

Another venue for advancing this work in EHR data measurement is the AMA/NCQA/HIMSS Electronic Health Record Association (EHRA) Collaborative (see www.ama-assn.org/go/collaborative).

Below, we have outlined Stroke and Stroke Rehabilitation measures that are appropriate for each type of reporting: prospective claims-based reporting and/or EHR reporting. To align with the national focus on EHRs, the PCPI will continue to maintain measures that have been specified for prospective claims-based reporting and are already included in such a program (eg, PQRS). The PCPI will only develop new specifications for prospective claims-based reporting if there is a lack of reportable measures for a given specialty (ie, fewer than 3 measures).

Measures recommended (and specified by PCPI) for implementation in a Prospective Claims-Based reporting program:

Measure #1: Deep Vein Thrombosis (DVT) Prophylaxis for Ischemic Stroke or Intracranial Hemorrhage

Measure #2: Discharged on Antithrombotic Therapy
Measure #3: Anticoagulant Therapy Prescribed for Atrial Fibrillation at Discharge
Measure #5: Screening for Dysphagia
Measure #6: Rehabilitation Services Ordered
Measure #8: Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) Reports
Measure #11: Lipid Management

Measures recommended (and specified by PCPI) for implementation in an Electronic Health Record (EHR):
Measure #1: Deep Vein Thrombosis (DVT) Prophylaxis for Ischemic Stroke or Intracranial Hemorrhage
Measure #2: Discharged on Antithrombotic Therapy
Measure #3: Anticoagulant Therapy Prescribed for Atrial Fibrillation at Discharge
Measure #4a: Tissue Plasminogen Activator (t-PA) Considered
Measure #4b: Tissue Plasminogen Activator (t-PA) Initiated
Measure #5: Screening for Dysphagia
Measure #6: Rehabilitation Services Ordered
Measure #8: Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) Reports
Measure #9: Patient/Caregiver Nutritional Preferences
Measure #11: Lipid Management
Measure #12: Blood Pressure Management
Measure #13: Imaging for Transient Ischemic Attack or Ischemic Stroke

Measure Exclusions and Exceptions

Exclusions arise when patients who are included in the initial patient or eligible population for a measure do not meet the denominator criteria specific to the intervention required by the numerator. Exclusions are absolute and apply to all patients and therefore are not part of clinical judgment within a measure.

Exceptions are used to remove patients from the denominator of a performance measure when a patient does not receive a therapy or service AND that therapy or service would not be appropriate due to specific reasons for which the patient would otherwise meet the denominator criteria. Exceptions are not absolute, and are based on clinical judgment, individual patient characteristics, or patient preferences.

For **process measures**, the American Medical Association (AMA)-convened Physician Consortium for Performance Improvement® (the PCPI™) provides three categories of reasons for which a patient may be excluded from the denominator of an individual measure:

- **Medical reasons**
  Includes:
  - not indicated (absence of organ/limb, already received/performed, other)
  - contraindicated (patient allergic history, potential adverse drug interaction, other)

- **Patient reasons**
  Includes:
  - patient declined
  - social or religious reasons
  - other patient reasons

- **System reasons**
  Includes:
  - resources to perform the services not available
  - insurance coverage/payor-related limitations
  - other reasons attributable to health care delivery system

These measure exception categories are not available uniformly across all measures; for each measure, there must be a clear rationale to permit an exception for a medical, patient, or system reason. For some measures, examples have been provided in the measure exception language of

instances that would constitute an exception. Examples are intended to guide clinicians and are not all-inclusive lists of all possible reasons why a patient could be excluded from a measure. The exception of a patient may be reported by appending the appropriate modifier to the CPT Category II code designated for the measure:

- **Medical reasons**: modifier 1P
- **Patient reasons**: modifier 2P
- **System reasons**: modifier 3P

Although this methodology does not require the external reporting of more detailed exception data, the PCPI recommends that physicians document the **specific** reasons for exception in patients' medical records for purposes of optimal patient management and audit-readiness. The PCPI also advocates the systematic review and analysis of each physician's exceptions data to identify practice patterns and opportunities for quality improvement. For example, it is possible for implementers to calculate the percentage of patients that physicians have identified as meeting the criteria for exception.

Please refer to documentation for each individual measure for information on the acceptable exception categories and the codes and modifiers to be used for reporting.

Testing and Implementation of the Measurement Set

Several of the measures presented here represent updates to existing measures for Stroke and Stroke Rehabilitation. They have therefore been utilized, in their previous specifications, in national performance measurement projects such as the CMS Physician Quality Reporting Initiative (PQRI) project. In addition, specific research projects, including a project jointly sponsored by the American Academy of Neurology (AAN) and the Physician Consortium for Performance Improvement (PCPI), have been conducted to test the reliability of these measures in various settings. Results of these testing projects have been considered and resulted in modifications to the measures, where appropriate.

Feasibility Testing

The AAN/PCPI measure testing project found the measures to be feasible. Their use in the PQRI program also indicates general feasibility.

Reliability Testing

The AAN/PCPI measure testing project found the measure reliability to range from substantial to almost perfect., with kappas ranging from 0.73 to 1.0. Agreement percentages from inter-rater reliability testing ranged from 92.3% – 100%.

Other measures in the set are being made available without any prior testing. The PCPI recognizes the importance of testing all of its measures and encourages testing of the Stroke and Stroke Rehabilitation measurement set by organizations or individuals positioned to do so. The Measure Testing Protocol was approved by the PCPI in 2007 and is available on the PCPI web site (see Position Papers at www.physicianconsortium.org); interested parties are encouraged to review this document and to contact PCPI staff. The PCPI will welcome the opportunity to promote the initial testing of these measures and to ensure that any results available from testing are used to refine the measures before implementation.

Measure #1: Venous Thromboembolism (VTE) Prophylaxis for Ischemic Stroke or Intracranial Hemorrhage

(Inpatient Setting)

Stroke and Stroke Rehabilitation

Measure Description

Percentage of patients aged 18 years and older with a diagnosis of ischemic stroke or intracranial hemorrhage who were administered VTE prophylaxis the day of or the day after hospital admission

Measure Components

Numerator Statement	Patients who were administered Venous Thromboembolism (VTE) prophylaxis the day of or the day after hospital admission **Definitions:** **VTE Prophylaxis**-Can include Low Molecular Weight Heparin (LMWH), Low-Dose Unfractionated Heparin (LDUH), low-dose subcutaneous heparin, or intermittent pneumatic compression devices. *The above list of medications/drug names and devices is based on clinical guidelines and other evidence. The specified drugs and devices were selected based on the strength of evidence for their clinical effectiveness. This list of selected drugs and devices may not be all-inclusive or current. Physicians and other health care professionals should refer to the FDA's web site page entitled "**Drug Safety Communications"** for up-to-date drug recall and alert information when prescribing medications, and to the FDA's web site page entitled "**Medical Device Safety**" for up-to-date device recall and alert information when utilizing medical devices. **Day after hospital admission -** ends at 11:59pm on the second day of hospitalization
Denominator Statement	All patients aged 18 years and older with a diagnosis of ischemic stroke or intracranial hemorrhage
Denominator Exclusions	All patients that expired during inpatient stay are excluded
Denominator Exceptions	Documentation of medical reason(s) for not administering DVT Prophylaxis the day of or the day after hospital admission (eg, patient is ambulatory, patient already on warfarin or another anticoagulant, other medical reason(s)) Documentation of patient reason(s) for not administering DVT Prophylaxis the day of or the day after hospital admission (eg, patient is receiving comfort care only, patient left against medical advice, other patient reason(s))
Supporting Guideline & Other References	Subcutaneous unfractionated heparin, LMW heparins, and heparinoids may be considered for DVT prophylaxis in at-risk patients with acute ischemic stroke, recognizing that nonpharmacologic treatments for DVT prevention also exist. (Grade A) (AAN/ASA, Reaffirmed 2008)[6]

	Aspirin is a potential intervention to prevent deep vein thrombosis but is less effective than anticoagulants. (Class IIa, Level of Evidence A) (ASA, 2007)[7] The use of intermittent external compression devices is recommended for treatment of patients who cannot receive anticoagulants. (Class IIa, Level of Evidence B) (ASA, 2007)[7] Subcutaneous administration of anticoagulants is recommended for treatment of immobilized patients to prevent deep vein thrombosis (Class I, Level of Evidence A). The ideal timing for starting these medications is not known. (ASA, 2007)[7] For acutely ill hospitalized medical patients at increased risk of thrombosis, we recommend anticoagulant thromboprophylaxis with lowmolecular- weight heparin [LMWH], low-dose unfractionated heparin (LDUH) bid, LDUH tid, or fondaparinux (Grade 1B). (ACCP, 2012)[8] For acutely ill hospitalized medical patients at low risk of thrombosis, we recommend against the use of pharmacologic prophylaxis or mechanical prophylaxis (Grade 1B). (ACCP, 2012)[8] For acutely ill hospitalized medical patients who are bleeding or at high risk for bleeding, we recommend against anticoagulant thromboprophylaxis (Grade 1B). (ACCP, 2012)[8] For acutely ill hospitalized medical patients at increased risk of thrombosis who are bleeding or at high risk for major bleeding, we suggest the optimal use of mechanical thromboprophylaxis with graduated compression stockings (GCS) (Grade 2C) or intermittent pneumatic compression (IPC) (Grade 2C) , rather than no mechanical thromboprophylaxis. When bleeding risk decreases, and if VTE risk persists, we suggest that pharmacologic thromboprophylaxis be substituted for mechanical thromboprophylaxis (Grade 2B). (ACCP, 2012)[8] Early implementation of anticoagulant therapy or physical compression modalities should be considered for all stroke patients who cannot ambulate at 2 days and who are at risk for DVT or pulmonary embolus (Class I, Level of Evidence A). Early mobility should always be attempted if safe for the patient. (Class I, Level of Evidence B) (ASA , 2009)[9] After documentation of cessation of bleeding, low-dose subcutaneous low-molecular-weight heparin or unfractionated heparin may be considered for prevention of venous thromboembolism in patients with lack of mobility after 1 to 4 days from onset. (Class IIb, Level of Evidence B) (ASA, 2010)[10] Patients with ICH should have intermittent pneumatic compression for prevention of venous thromboembolism in addition to elastic stockings. (Class I, Level of Evidence B) (ASA, 2010)[10]

Measure Importance

Relationship to desired outcome	Patients on bed rest are at high risk for deep vein thrombosis. DVT prevention is important for all patients who have suffered a stroke or an intracranial hemorrhage and may have decreased mobility. The intent of this measure is to

	assure that adequate DVT prophylaxis is received for either diagnosis. As noted in the clinical recommendation statements, the appropriate type of prophylaxis differs by diagnosis. Anticoagulants are generally contraindicated in patients with intracranial hemorrhage. These patients are still at risk for DVT so they should receive prophylaxis with mechanical devices. Low-dose subcutaneous heparin may be initiated on the second day after onset of the hemorrhage.
Opportunity for Improvement	Pulmonary embolism accounts for ≈10% of deaths after stroke, and the complication may be detected in ≈1% of patients who have had a stroke. Pulmonary emboli generally arise from venous thrombi that develop in a paralyzed lower extremity or pelvis. Besides being associated with a life-threatening pulmonary event, symptomatic deep vein thrombosis also slows recovery and rehabilitation after stroke. The risk of deep vein thrombosis is highest among immobilized and older patients with severe stroke[7].
IOM Domains of Health Care Quality Addressed	• Effective • Timely • Equitable
Exception Justification	A medical reason exception has been included so that clinicians can exclude patients for whom DVT prophylaxis may not be appropriate (eg, patient is ambulatory, patient already on warfarin or another anticoagulant, other medical reason(s)). A patient reason exception has been included for patients who may decline receiving DVT prophylaxis (eg, patient is receiving comfort care only, patient left against medical advice, other patient reason(s)).
Harmonization with Existing Measures	The PCPI attempts to harmonize measures with other existing measures to the extent feasible. This measure has been edited to achieve a partial harmonization with the Joint Commission measure, Venous Thromboembolism (VTE) Prophylaxis. In particular, warfarin has been added to the list of medical exceptions, instead of being listed as a form of treatment. Also, this measure does not include the documentation for reasons why no DVT prophylaxis was administered, as these patients will be captured in the exceptions.

Measure Designation

Measure purpose	• Quality improvement • Accountability
Type of measure	• Process
Level of Measurement	• Individual practitioner
Care setting	• Inpatient
Data source	• Electronic health record (EHR) data • Prospective Claims-Based Reporting •

Measure #2: Discharged on Antithrombotic Therapy
(Inpatient Setting)
Stroke and Stroke Rehabilitation

Measure Description

Percentage of patients aged 18 years and older with a diagnosis of ischemic stroke or transient ischemic attack (TIA) who were prescribed antithrombotic therapy at discharge

Measure Components

Numerator Statement	Patients who were prescribed antithrombotic therapy at discharge **Definitions:** **Antithrombotic Therapy** – Aspirin, combination of aspirin and extended-release dipyridamole, clopidogrel, ticlopidine, warfarin, low molecular weight heparin, dabigatran, rivaroxaban* *The above list of medications/drug names is based on clinical guidelines and other evidence. The specified drugs were selected based on the strength of evidence for their clinical effectiveness. This list of selected drugs may not be all-inclusive or current. Physicians and other health care professionals should refer to the FDA's web site page entitled "**Drug Safety Communications"** for up-to-date drug recall and alert information when prescribing medications. **Prescribed** – May include prescription given to the patient for antithrombotic therapy at discharge OR antithrombotic therapy to be continued after discharge as documented in the discharge medication list
Denominator Statement	All patients aged 18 years and older with a diagnosis of ischemic stroke or transient ischemic attack (TIA)
Denominator Exclusions	All patients that expired during inpatient stay are excluded
Denominator Exceptions	Documentation of medical reason(s) for not prescribing antithrombotic therapy at discharge (eg, patients admitted for performance of elective carotid intervention, patient had stroke during hospital stay, other medical reason(s)). Documentation of patient reason(s) for not prescribing antithrombotic therapy at discharge (eg, patient is receiving comfort care only, patient left against medical advice, other patient reason(s)).
Supporting Guideline & Other References	For acutely ill hospitalized medical patients at increased risk of thrombosis, we recommend anticoagulant thromboprophylaxis with lowmolecular- weight heparin [LMWH], low-dose unfractionated heparin (LDUH) bid, LDUH tid, or fondaparinux (Grade 1B). (ACCP, 2012)[8] For acutely ill hospitalized medical patients at low risk of thrombosis, we recommend against the use of pharmacologic prophylaxis or mechanical prophylaxis (Grade 1B). (ACCP, 2012)[8]

	For acutely ill hospitalized medical patients who are bleeding or at high risk for bleeding, we recommend against anticoagulant thromboprophylaxis (Grade 1B). (ACCP, 2012)[8] For acutely ill hospitalized medical patients at increased risk of thrombosis who are bleeding or at high risk for major bleeding, we suggest the optimal use of mechanical thromboprophylaxis with graduated compression stockings (GCS) (Grade 2C) or intermittent pneumatic compression (IPC) (Grade 2C) , rather than no mechanical thromboprophylaxis. When bleeding risk decreases, and if VTE risk persists, we suggest that pharmacologic thromboprophylaxis be substituted for mechanical thromboprophylaxis (Grade 2B). (ACCP, 2012)[8] In acutely ill hospitalized medical patients who receive an initial course of thromboprophylaxis, we suggest against extending the duration of thromboprophylaxis beyond the period of patient immobilization or acute hospital stay (Grade 2B). (ACCP, 2012)[8] For patients with noncardioembolic ischemic stroke or 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) (ASA, 2010)[11] Aspirin (50 mg/d to 325 mg/d) monotherapy (Class I, Level of Evidence A), the combination of aspirin 25 mg and extended-release dipyridamole 200mg 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. (ASA, 2010)[11] For patients allergic to aspirin, clopidogrel is reasonable. (Class IIa, Level of Evidence C) (ASA, 2010)[11] The addition of aspirin to clopidogrel increases the risk of hemorrhage and is not recommended for routine secondary prevention after ischemic stroke or TIA. (Class III, Level of Evidence A) (ASA, 2010)[11] For patients who have an ischemic stroke while taking aspirin, there is no evidence that increasing the dose of aspirin provides additional benefit. Although alternative antiplatelet agents are often considered, no single agent or combination has been studied in patients who have had an event while receiving aspirin (Class IIb Level of Evidence C) (ASA, 2010)[11] Dabigatran is useful as an alternative to warfarin for the prevention of stroke and systemic thromboembolism in patients with paroxysmal to permanent AF and risk factors for stroke or systemic embolization who do not have a prosthetic heart valve or hemodynamically significant valve disease, severe renal failure (creatinine clearance <15 mL/min) or advanced liver disease (impaired baseline clotting function). (Class I Level of Evidence: B) (ACCF/AHA/HRS, 2011)[12] 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 to 3.0) is recommended. (Class I, Level of Evidence A) (ASA, 2011)[11]

	Patients with ischemic stroke or TIA in the setting of acute MI compicated by LV mural thombus formation identified by echocardiography or another cardiac imaging technique should be treated with oral anticoagulation (target INR 2.5, range 2.0 to 3.0) for at least 3 months. (Class I, Level of Evidence B) (ASA, 2011)[11] Warfarin (INR 2.0 to 3.0), aspirin(81 mg daily), clopidogrel (75 mg daily), or the combination of aspirin (25 mg twice daily) plus extended-release dipyramidamole (200 mg twice daily) may be considered to prevent recurrent ischemic events in patients with previous ischemic stroke or TIA and cardiomyopathy. (Class IIb, Level of Evidence B) (ASA, 2011)[11] For patients with ischemic stroke or TIA who have rheumatic mitral valve disease, whether or not AF is present, long-term warfarin therapy is reasonable with an INR target range of 2.5 (range, 2.0 to 3.0). (Class IIa, Level of Evidence C) (ASA, 2011)[11] For patients with ischemic stroke or TIA who have mechanical prosthetic heart valves, warfarin is recommended with an INR target of 3.0 (range, 2.5 to 3.5). (Class I, Level of Evidence B) (ASA, 2011)[11] For patients with noncardioembolic ischemic stroke or 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) (ASA, 2011)[11]

Measure Importance

Relationship to desired outcome	The focus on stroke as an outcome is important because patients who experience a stroke or TIA are most likely to have a stroke as their next serious vascular outcome. Platelet antiaggregation drugs prevent strokes. The selection of individual drugs is primarily based on interpretation of their relative efficacy, safety, and cost. Therefore, following a stroke, patients should be prescribed antithrombotic therapy to decrease the risk of additional strokes.	
Opportunity for Improvement	Reported rates of stroke recurrence range from 13% to 53%. Stroke ranks third as a cause of death in the United States. Among survivors, recurrence is common with cumulative disability among those affected[13]. Survivors of a transient ischemic attack (TIA) or stroke represent a population at increased risk of subsequent stroke. Approximately one quarter of the 795000 strokes that occur each year are recurrent events[11]. Cardiogenic cerebral embolism is responsible for approxiamtely 20% of ischemic strokes[11].	
IOM Domains of Health Care Quality Addressed	• Effective • Equitable	
Exception Justification	A medical reason exception has been included so that clinicians can exclude patients for whom antithrombotic therapy at discharge may not be appropriate (eg, patients admitted for performance of elective carotid intervention, patient had stroke during hospital stay, other medical reason(s)). A patient reason exception has been included for patients who may decline receiving antithrombotic therapy at discharge (eg, patient is comfort care only, patient left against medical advice,	

	other patient reason(s)).
Harmonization with Existing Measures	The PCPI attempts to harmonize measures with other existing measures to the extent feasible. This measure has been edited to achieve harmonization with the Joint Commission measure, Discharged on Antithrombotic Therapy.

Measure Designation

Measure purpose	• Quality improvement • Accountability
Type of measure	• Process
Level of Measurement	• Individual practitioner
Care setting	• Inpatient
Data source	• Electronic health record (EHR) data • Prospective Claims-Based Reporting

Measure #3: Anticoagulant Therapy Prescribed for Atrial Fibrillation at Discharge
(Inpatient Setting)
Stroke and Stroke Rehabilitation

Measure Description

Percentage of patients aged 18 years and older with a diagnosis of ischemic stroke or transient ischemic attack (TIA) with documented permanent, persistent, or paroxysmal atrial fibrillation, who were prescribed an anticoagulant at discharge

Measure Components

Numerator Statement	Patients who were prescribed an anticoagulant at discharge **Definitions:** **Anticoagulants** – warfarin, low molecular weight heparin, dabigatran, rivaroxaban* *The above list of medications/drug names is based on clinical guidelines and other evidence. The specified drugs were selected based on the strength of evidence for their clinical effectiveness. This list of selected drugs may not be all-inclusive or current. Physicians and other health care professionals should refer to the FDA's web site page entitled "**Drug Safety Communications"** for up-to-date drug recall and alert information when prescribing medications. **Prescribed** – May include prescription given to the patient for an anticoagulant at discharge or anticoagulant to be continued after discharge as documented in the discharge medication list.
Denominator Statement	All patients aged 18 years and older with a diagnosis of ischemic stroke or transient ischemic attack (TIA) with documented permanent, persistent, or paroxysmal atrial fibrillation **Definitions:** **First Detected –** only one diagnosed episode **Persistent Atrial Fibrillation** – Recurrent episodes that last more than 7 days **Paroxysmal Atrial Fibrillation** – Recurrent episodes that self terminate in less than 7 days **Permanent Atrial Fibrillation** – An ongoing long term episode
Denominator Exclusions	All patients that expired during inpatient stay are excluded
Denominator Exceptions	Documentation of medical reason(s) for not prescribing an anticoagulant at discharge (eg, other medical reason(s)). Documentation of patient reason(s) for not prescribing an anticoagulant at discharge (eg, patient is receiving comfort care only, patient left against medical advice, other patient reason(s)).
Supporting Guideline & Other References	Antithrombotic therapy to prevent thromboembolism is recommended for all patients with AF, except those with lone AF or contraindications. (Class I, Level of Evidence A) (ACC/AHA/ESC, 2006)[14] The selection of the antithrombotic agent should be based upon the absolute

	risks of stroke and bleeding and the relative risk and benefit for a given patient. (Class I, Level of Evidence A) (ACC/AHA/ESC, 2006)[14] For patients with AF, including those with paroxysmal AF, who are at low risk of stroke (eg, CHADS 2 [congestive heart failure, hypertension, age _ 75 years, diabetes mellitus, prior stroke or transient ischemic attack] score 5 0), we suggest no therapy rather than antithrombotic therapy (Grade 2B) . For patients who do choose antithrombotic therapy, we suggest aspirin (75 mg to 325 mg once daily) rather than oral anticoagulation (Grade 2B) or combination therapy with aspirin and clopidogrel (Grade 2B). (ACCP, 2012)[8] For patients with AF, including those with paroxysmal AF, who are at intermediate risk of stroke (eg, CHADS 2 score 5 1), we recommend oral anticoagulation rather than no therapy (Grade 1B) . We suggest oral anticoagulation rather than aspirin (75 mg to 325 mg once daily) (Grade 2B) or combination therapy with aspirin and clopidogrel (Grade 2B) . For patients who are unsuitable for or choose not to take an oral anticoagulant (for reasons other than concerns about major bleeding), we suggest combination therapy with aspirin and clopidogrel rather than aspirin (75 mg to 325 mg once daily) (Grade 2B). (ACCP, 2012)[8] For patients with AF, including those with paroxysmal AF, who are at high risk of stroke (eg, CHADS 2 score 5 2), we recommend oral anticoagulation rather than no therapy (Grade 1A), aspirin (75 mg to 325 mg once daily) (Grade 1B) , or combination therapy with aspirin and clopidogrel (Grade 1B) . For patients who are unsuitable for or choose not to take an oral anticoagulant (for reasons other than concerns about major bleeding), we recommend combination therapy with aspirin and clopidogrel rather than aspirin (75 mg to 325 mg once daily) (Grade 1B). (ACCP, 2012)[8] For patients with AF, including those with paroxysmal AF, for recommendations in favor of oral anticoagulation, we suggest dabigatran 150 mg twice daily rather than adjusted-dose VKA therapy (target INR range, 2.0-3.0) (Grade 2B). (ACCP, 2012)[8] For patients with ischemic stroke or TIA with persistent or paroxysmal (intermittent) or permanent AF, anticoagulation with vitamin K antagonist (target INR, 2.5; range, 2.0 to 3.0) is recommended. (Class I, Level of Evidence A) (ASA, 2010)[11] 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) (ASA, 2010)[11] For patients with AF at high risk for stroke (stroke or TIA within 3 months, $CHADS_2$ score of 5 or 6, mechanical or rheumatic valve disease) who require temporary interruption of oral anticoagulation, bridging therapy with an LMWH administered subcutaneously is reasonable. (Class IIa; Level of Evidence C) (ASA, 2010)[11] Dabigatran is useful as an alternative to warfarin for the prevention of stroke and

	systemic thromboembolism in patients with paroxysmal to permanent AF and risk factors for stroke or systemic embolization who do not have a prosthetic heart valve or hemodynamically significant valve disease, severe renal failure (creatinine clearance <15 mL/min) or advanced liver disease (impaired baseline clotting function). (Class I Level of Evidence: B) (ACCF/AHA/HRS, 2011)[12]

Measure Importance

Relationship to desired outcome	In patients with nonvalvular AF, prior stroke or TIA is the strongest independent predictor of stroke, significantly associated with stroke in all 6 studies in which it was evaluated with incremental relative risk between 1.9 and 3.7 (averaging approximately 3.0). The pathogenic constructs of stroke in AF are incomplete, but available data indicate that all patients with prior stroke or TIA are at high risk of recurrent thromboembolism and require anticoagulation unless there are firm contraindications in a given patient[14]. Patients with atrial fibrillation (permanent, persistent, or paroxysmal) and stroke should be prescribed an anticoagulant to prevent recurrent strokes.	
Opportunity for Improvement	In a small, retrospective, population-based study in Olmsted County, Minnesota, over 3 decades, the 15-y cumulative stroke rate in people with lone AF (defined as those younger than 60y with no clinical history or echocardiographic signs of cardiopulmonary disease) was 1.3%. Conversely, in the Framingham Study, the age-adjusted stroke rate over a mean follow-up period of 11y was 28.2% in those with lone AF, more liberally defined to include patients with a history of hypertension or cardiomegaly on chest roentgenography,, compared with 6.8% in normal controls. In the SPAF study, the annualized rate of ischemic stroke during aspirin treatment was similar in those with paroxysmal (3.2%) and permanent (3.3%) AF. Those with prior stroke or TIA have a rate of subsequent stroke of 10% to 12% per year when treated with aspirin, and these patients benefit substantially from adjusted-dose oral anticoagulation[14].	
IOM Domains of Health Care Quality Addressed	• Effective • Timely • Equitable	
Exception Justification	A medical reason exception has been included so that clinicians can exclude patients for whom anticoagulant therapy at discharge may not be appropriate (eg, other medical reason(s)). A patient reason exception has been included for patients who may decline receiving anticoagulant therapy at discharge (eg, patient is comfort care only, patient left against medical advice, other patient reason(s)).	
Harmonization with Existing Measures	The PCPI attempts to harmonize measures with other existing measures to the extent feasible. This measure has been edited to achieve a partial harmonization with the Joint Commission measure, Anticoagulation Therapy for Atrial Fibrillation/Flutter. In particular, the current denominator exceptions include elements from the Joint Commission measure list of excluded populations. This measure also includes documentation of a plan to prescribe the anticoagulant after discharge, if one was not described at discharge.	

Measure Designation

Measure purpose	• Quality improvement • Accountability
Type of measure	• Process
Level of Measurement	• Individual practitioner

Care setting	• Inpatient
Data source	• Electronic health record (EHR) data • Prospective Claims-Based Reporting

Measure #4a: Tissue Plasminogen Activator (t-PA) Considered (Paired Measure)

(Inpatient Setting-Facility Level Measure)

Stroke and Stroke Rehabilitation

Measure Description

Percentage of patients aged 18 years and older with a diagnosis of ischemic stroke who arrive at the hospital within 4.5 hours of time last known well who were considered for t-PA administration

Measure Components

Numerator Statement	Patients who were considered for t-PA administration **Definitions:** **Patients Considered for t-PA Administration** – Includes patients to whom t-PA was initiated or patients for whom reasons for not being eligible for t-PA therapy are documented. **Time last known well**- Time at which the patient was last known to be without the signs and symptoms of the current stroke or at his or her prior baseline. Variation may exist if the signs and symptoms are not witnessed. (TJC)
Denominator Statement	All patients aged 18 years and older with a diagnosis of ischemic stroke who arrive at the hospital within 4.5 hours of time last known well
Denominator Exclusions	None
Denominator Exceptions	None
Supporting Guideline & Other References	In patients with acute ischemic stroke in whom treatment can be initiated within 3 h of symptom onset, we recommend IV r-tPA over no IV r-tPA (Grade 1A). (ACCP, 2012)[8] In patients with acute ischemic stroke in whom treatment can be initiated within 4.5 but not within 3 h of symptom onset, we suggest IV r-tPA over no IV r-tPA (Grade 2C). (ACCP, 2012)[8] In patients with acute ischemic stroke in whom treatment cannot be initiated within 4.5 h of symptom onset, we recommend against IV r-tPA (Grade 1B). (ACCP, 2012)[8] Intravenous rtPA (0.9 mg/kg, maximum dose 90 mg) is recommended for selected patients who may be treated within 3 hours of onset of ischemic stroke. (Class I, Level of Evidence A) (ASA, 2007)[7]. Besides bleeding complications, physicians should be aware of the potential side effect of angioedema that may cause partial airway obstruction. (Class I, Level of Evidence C) (ASA, 2007)[7]

	A patient whose blood pressure can be lowered safely with anti hypertensive agents may be eligible for treatment, and the physician should assess the stability of the blood pressure before starting rtPA (Class IIa, Level of Evidence B). An elevated blood pressure that requires a continuous infusion of sodium nitroprusside may not be sufficiently stable for the patient to receive rtPA. However, because time is limited, most patients with markedly elevated blood pressure cannot be managed adequately and still meet the 3-hour requirement. (ASA, 2007)[7]. rtPA should be administered to eligible patients who can be treated in the time period of 3 to 4.5 hours after stroke.(Class I, Level of Evidence B) (ASA, 2009)[15] The eligibility criteria for treatment in this time period are similar to those for persons treated at earlier time periods, with any one of the following additional exclusion criteria: Patients older than 80 years, those taking oral anticoagulants with an international normalized ration ≤ 1.7, those with a baseline National Institutes of Health Stroke Scale score > 25, or those with both a history of stroke and diabetes. Therefore, for the 3-to-4.5-hour window, all patients receiving an oral anticoagulant are excluded regardless of their international normalized ratio. The relative utility of rtPA in this time window compared with other methods of thrombus dissolution or removal has not been established. The efficacy of intravenous treatment with rtPA within 3 to 4.5 hours after stroke in patients with these exclusion criteria is not well established **(Class IIb Recommendation, Level of Evidence C)** and requires further study.(ASA, 2009)[15] Patients with persisting symptoms presenting to the emergency department within 150 minutes (or 240 minutes in selected patients) of symptom onset should be evaluated rapidly for treatment with IV tPA. (ICSI, 2010)[16]

Measure Importance

Relationship to desired outcome	The rationale for thrombolytic therapy is based on the recognition that the majority of ischemic strokes are caused by thrombotic or thromboembolic arterial occlusions. Pathologic and angiographic studies demonstrate the presence of occlusive clot in up to 80% of ischemic strokes. Thrombotic occlusion may also be responsible for a significant number of events in the 20% of patients without angiographic evidence of occlusion as the thrombus may have lysed spontaneously prior to delayed vascular imaging or the infarct may be due to microthrombus resulting in small-vessel occlusions which escape angiographic detection[17].	
Opportunity for Improvement	The therapeutic window for rescuing ischemic but still viable brain tissue is attainable for many patients but is challengingly brief. Neuronal death and brain infarction evolve progressively in a time-dependent fashion determined by both the duration and severity of the ischemic insult. Therapeutic strategies designed to restore cerebral perfusion in a timely fashion have the potential to limit the cellular, biochemical, and metabolic consequences of cerebral ischemia that ultimately lead to irreversible brain injury. The ultimate goal of early reperfusion therapy is to reduce or prevent brain infarction and thereby minimize the long term disability, neurologic impairment, and stroke-related mortality.	
IOM Domains of Health Care Quality	• Safe • Timely • Equitable	

Addressed		
Exception Justification	This measure has no exceptions.	
Harmonization with Existing Measures	The PCPI attempts to harmonize measures with other existing measures to the extent feasible. This measure has been edited to achieve a partial harmonization with the Joint Commission measure, Thrombolytic Therapy. In particular, this measure has been divided into two measures, which focus on consideration and administration. This measure focuses only on tPA being considered and uses a different time window for consideration.	

Measure Designation

Measure purpose **Type of measure**	• Quality improvement • Accountability • Process
Level of Measurement	• Facility
Care setting	• Inpatient
Data source	• Electronic health record (EHR) data

Measure #4b: Tissue Plasminogen Activator (t-PA) Initiated (Paired Measure)

(Inpatient Setting – Facility-Level Measure)

Stroke and Stroke Rehabilitation

Measure Description

Percentage of all patients aged 18 years and older with a diagnosis of ischemic stroke who present within two hours of time last known well and who are eligible for t-PA, for whom t-PA was initiated within three hours of time last known well

Measure Components

Numerator Statement	Patients for whom t-PA was initiated within three hours of time last known well **Definition:** **Time last known well**- Time at which the patient was last known to be without the signs and symptoms of the current stroke or at his or her prior baseline. Variation may exist if the signs and symptoms are not witnessed. (TJC)
Denominator Statement	All patients aged 18 years and older with a diagnosis of ischemic stroke who present within two hours of time last known well and who are eligible for t-PA **Denominator definition:** Eligible-Patients are eligible for t-PA if they have an acute neurologic deficit, a clearly defined time of onset of < 180 min before treatment, and a baseline CT showing no evidence of intracranial hemorrhage
Denominator Exclusions	None
Denominator Exceptions	Documentation of medical reason(s) for not initiating Tissue Plasminogen Activator (t-PA) within three hours of time last known well (eg, contraindications, conditions that might lead to increased risk of bleeding or unfavorable outcomes, other medical reason(s)) **Contraindications*** • CT findings of intracranial hemorrhage, subarachnoid hemorrhage, or major infarct signs • History of intracranial hemorrhage, brain aneurysm, vascular malformation, or brain tumor • Internal bleeding (less than 22 days) • IV or IA t-PA given at a transferring hospital • No IV access • Platelets less than 100,000, PTT greater than 40 sec after heparin use • PT greater than 15 or INR greater than 1.7, or unknown bleeding diathesis • Recent intracranial or spinal surgery, head trauma, or stroke (less than 3 months) • Recent surgery/trauma (less than 15 days) • Seizure with postictal residual neurological impairments • Suspicion of subarachnoid hemorrhage

	• Systolic blood pressure greater than 185 or diastolic blood pressure greater than 110 mm hg. • Unable to determine eligibility **<u>Warnings/Conditions that might lead to increased risk of bleeding or unfavorable outcomes*:</u>** • Acute pericarditis • Advanced age • Diabetic hemorrhagic retinopathy or other ophthalmic bleeding • Glucose less than 50 or greater than 400 mg/dl • Hemostatic defects including those secondary to severe renal or hepatic disease • Left heart thrombus • Life expectancy less than 1 year or severe co-morbid illness • Patient currently receiving oral anticoagulants (e.g. Warfarin sodium, Coumadin) • Pregnancy • Rapid improvement • Septic thrombophlebitis or occluded AV cannula at seriously infected site • Stroke severity – Too mild • Stroke severity – Too severe (e.g., NIHSS greater than 22) • Subacute bacterial endocarditis *Lists harmonized with The Joint Commission measure. Documentation of patient reason(s) for not initiating Tissue Plasminogen Activator (t-PA) within three hours of time last known well (eg, patient declined, other patient reason(s))
Supporting Guideline & Other References	In patients with acute ischemic stroke in whom treatment can be initiated within 3 h of symptom onset, we recommend IV r-tPA over no IV r-tPA (Grade 1A). (ACCP, 2012)[8] In patients with acute ischemic stroke in whom treatment can be initiated within 4.5 but not within 3 h of symptom onset, we suggest IV r-tPA over no IV r-tPA (Grade 2C). (ACCP, 2012)[8] In patients with acute ischemic stroke in whom treatment cannot be initiated within 4.5 h of symptom onset, we recommend against IV r-tPA (Grade 1B). (ACCP, 2012)[8] Intravenous rtPA (0.9 mg/kg, maximum dose 90 mg) is recommended for selected patients who may be treated within 3 hours of onset of ischemic stroke. (Class I, Level of Evidence A) (ASA, 2007)[7]. Besides bleeding complications, physicians should be aware of the potential side effect of angioedema that may cause partial airway obstruction. (Class I, Level of Evidence C) (ASA, 2007)[7] A patient whose blood pressure can be lowered safely with anti hypertensive agents may be eligible for treatment, and the physician should assess the stability of the blood pressure before starting rtPA (Class IIa, Level of Evidence B). An elevated blood pressure that requires a continuous infusion of sodium

	nitroprusside may not be sufficiently stable for the patient to receive rtPA. However, because time is limited, most patients with markedly elevated blood pressure cannot be managed adequately and still meet the 3-hour requirement. (ASA, 2007)[7].

Measure Importance

Relationship to desired outcome	Intravenous administration of rtPA is the only FDA-approved medical therapy for treatment of patients with acute ischemic stroke. Its use is associated with improved outcomes for a broad spectrum of patients who can be treated within 3 hours of stroke onset. Earlier treatment (ie, within 90 minutes) may be more likely to result in a favorable outcome. Later treatment, at 90 to 180 minutes, also is beneficial. Patients with major strokes (NIHSS score >22) have a very poor prognosis, but some positive treatment effect with rtPA has been documented[7].	
Opportunity for Improvement	The therapeutic window for rescuing ischemic but still viable brain tissue is attainable for many patients but is challengingly brief. Neuronal death and brain infarction evolve progressively in a time-dependent fashion determined by both the duration and severity of the ischemic insult. Therapeutic strategies designed to restore cerebral perfusion in a timely fashion have the potential to limit the cellular, biochemical, and metabolic consequences of cerebral ischemia that ultimately lead to irreversible brain injury. The ultimate goal of early reperfusion therapy is to reduce or prevent brain infarction and thereby minimize the long term disability, neurologic impairment, and stroke-related mortality[17].	
IOM Domains of Health Care Quality Addressed	• Safe • Timely • Equitable	
Exception Justification	A medical reason exception has been included so that clinicians can exclude patients for whom Tissue Plasminogen Activator (t-PA) was not initiated within three hours of time last known well (eg, other medical reason(s)). Please see the above lists of Contraindications and Warnings/Conditions that might lead to increased risk of bleeding or unfavorable outcomes, which has been harmonized with the list of Warning Conditions that might lead to increased risk of bleeding or unfavorable outcomes included in a comparable measure by The Joint Commission. A patient reason exception has been included for patients who may decline initiation of Tissue Plasminogen Activator (t-PA) within three hours of time last known well (eg, other patient reason(s)). Please see the above lists of Contraindications and Warnings/Conditions that might lead to increased risk of bleeding or unfavorable outcomes, which has been harmonized with the list of exceptions in a comparable measure by The Joint Commission..	
Harmonization with Existing Measures	The PCPI attempts to harmonize measures with other existing measures to the extent feasible. This measure has been edited to achieve a partial harmonization with the Joint Commission measure, Thrombolytic Therapy. In particular, this measure has been divided into two measures, which focus on consideration and administration. This measure focuses on administration of tPA. The lists of contraindications and warnings for tPA have also been harmonized with the Joint Commission.	

Measure Designation

Measure purpose	• Quality improvement • Accountability

Type of measure	• Process
Level of Measurement	• Facility
Care setting	• Inpatient
Data source	• Electronic health record (EHR) data •

Measure #5: Screening for Dysphagia
(Inpatient Setting)
Stroke and Stroke Rehabilitation

Measure Description

Percentage of patients aged 18 years and older with a diagnosis of ischemic stroke or intracranial hemorrhage who receive any food, fluids or medication by mouth (PO) for whom a dysphagia screening was performed prior to PO intake in accordance with a dysphagia screening tool approved by the institution in which the patient is receiving care

Measure Components

Numerator Statement	Patients for whom a dysphagia screening was performed prior to PO intake in accordance with a dysphagia screening tool approved by the institution in which the patient is receiving care **Definitions:** **Dysphagia Screening** – May include, but is not limited to Videofluoroscopic Swallow Evaluation (VSE), fiberoptic endoscopic evaluation of swallowing (FEES), modified barium swallow, structured bedside swallowing assessment.
Denominator Statement	All patients aged 18 years and older with a diagnosis of ischemic stroke or intracranial hemorrhage who receive any food, fluids or medication by mouth (PO)
Denominator Exclusions	All patients that expired during inpatient stay are excluded
Denominator Exceptions	Documentation of medical reasons(s) for not performing a dysphagia screening prior to taking any foods, fluids or medication by mouth (eg, patient without any focal findings and not thought to be having a stroke when initially evaluated, other medical reason(s)). Documentation of patient reasons(s) for performing a dysphagia screening prior to taking any foods, fluids or medication by mouth (eg, patient left against medical advice, other patient reason(s)).
Supporting Guideline & Other References	Assessment of swallowing before starting eating or drinking is recommended. (Class I, Level of Evidence B) (ASA, 2007)[7]. At the time of the stroke or during the acute stages of a stroke, patients may not be able to clear secretions and could be at high risk for aspiration. Aspiration can result in respiratory compromises due to infection or pulmonary edema. Nurses must frequently auscultate lungs, evaluate for signs of respiratory compromise, and evaluate for signs of dysphagia to prevent the occurrence of aspiration pneumonia. Initial interventions may include elevating the head of the bed (HOB) or turning the patient on his or her side, monitoring the patient during oral intake, and obtaining a formal swallowing evaluation if symptoms of choking are noted. Nurses must do or obtain a bedside swallowing assessment prior to the institution of any oral intake, including medications. (Level 1) (AANN, 2009)[18]

	A swallow assessment should be performed as soon as possible after admission to the hospital, no later than 48 hours after admission. Patients suspected of having swallowing problems should be given nothing by mouth until after a structured bedside swallowing assessment is performed that includes a water challenge. (Level 2) (AANN, 2009)[18] Nurses must monitor patients for clinically observable signs of dysphagia that include coughing or choking on saliva or food, pocketing of food in the mouth, garbled speech, facial muscle weakness, delayed or absent swallow reflex, drooling, watery eyes after any intake, or gurgling voice. Clinically observable signs of aspiration are not always evident because stroke patients can be "silent aspirators." Patients at highest risk include those with infarctions in the brainstem, large hemispheric lesions, multiple strokes, or decreased LOC. Clinical interventions after the initial nursing swallow screen include consulting the speech and language pathologist (SLP) for formal evaluation and further recommendations on diet or techniques for decreasing the risk of aspiration. Also, nurses should perform aggressive oral care. Minimizing the bacterial count in the mouth can decrease the risk of developing aspiration pneumonia if the patient aspirates. (Level 2) (AANN, 2009)[18] In patients with cough, a medical history particularly directed at identifying conditions increasing the likelihood of oralpharyngeal dysphagia and aspiration, as indicated in the table above entitled "Medical Diagnoses and Conditions Associated With Aspiration and Silent Aspiration on Videofluoroscopic Swallow Evaluation (VSE)", should be obtained. Patients with high-risk conditions should be referred for an oral-pharyngeal swallowing evaluation. (Level of evidence, low; benefit, substantial; grade of recommendation, B) (ACCP, 2006) Patients with cough and their caregivers should be questioned regarding perceived swallowing problems, including an association of cough while eating or drinking and a fear of choking while eating and drinking. If a patient with cough reports swallowing problems, further evaluation for oral-pharyngeal dysphagia is indicated. (Level of evidence, low; benefit, substantial; grade of recommendation, B) (ACCP, 2006)[19] Further evaluation, including a chest radiograph and a nutritional assessment, should be considered in patients with cough or conditions associated with aspiration. (Level of evidence, low; benefit, substantial; grade of recommendation, B) (ACCP, 2006)[19] Patients with oral-pharyngeal dysphagia and cough should be referred, ideally to a speech-language pathologist (SLP), for an oral-pharyngeal swallow evaluation. (Level of evidence, low; benefit, substantial; grade of recommendation, B) (ACCP, 2006)[19] In acute stroke patients, the expulsive phase rise time of VC may predict aspiration. The use of this test has not been validated in other patient groups, and further studies comparing the accuracy of objective measures of VC to the clinical swallow evaluation to identify aspiration risk are needed. (Level of evidence, low; benefit, small; grade of recommendation, C) (ACCP, 2006)[19] Patients with dysphagia should undergo VSE or fiberoptic endoscopic evaluation of swallowing (FEES) evaluation of swallow to identify appropriate treatment. (Level of evidence, low; benefit, substantial; grade of recommendation, B) (ACCP,

	2006)[19] Patients with dysphagia should be managed by organized multidisciplinary teams that may include a physician, a nurse, an SLP, a dietitian, and physical and occupational therapists. (Level of evidence, low; benefit, substantial; grade of recommendation, B) (ACCP, 2006)[19] In patients with dysphagia, VSE or FEES can be useful for determining compensatory strategies enabling patients with dysphagia to safely swallow. (Level of evidence, low; benefit, substantial; grade of recommendation, B) (ACCP, 2006)[19] In patients with dysphagia, dietary recommendations should be prescribed when indicated, and can be refined by testing with foods and liquids simulating those in a normal diet during the VSE or FEES. (Level of evidence, low; benefit, substantial; grade of recommendation, B) (ACCP, 2006)[19] Nurses should be familiar with bedside swallow assessment if a formal evaluation cannot be done within the specified period. Stroke patients should be kept NPA until the screen has been performed (Class I, Level of Evidence B). Further studies of dysphagia in the setting of acute stroke should be performed. (ASA, 2009)[9]

Measure Importance

Relationship to desired outcome	Impairments of swallowing are associated with a high risk of pneumonia. Some patients cannot receive food or fluids because of impairments in swallowing or mental status. Patients with infarctions of the brain stem, multiple strokes, major hemispheric lesions, or depressed consciousness are at the greatest risk for aspiration. Swallowing impairments are associated with an increased risk of death. An abnormal gag reflex, impaired voluntary cough, dysphonia, incomplete oral-labial closure, a high NIHSS score, or cranial nerve palsies should alert the physician to the risk. A preserved gag reflex may not indicate safety with swallowing. An assessment of the ability to swallow is important before the patient is allowed to eat or drink[7].	
Opportunity for Improvement	Dysphagia is one of the most common sequelae following acute stroke and head injury, affecting as many as 50% of patients. Emerging evidence now suggests that dysphagia screening in acute stroke survivors provides a statistically significant relative risk reduction (RRR) for pneumonia of more than 80%; a statistically significant RRR in mortality of 70%; areduction in percutaneous endoscopic gastrostomy tube (PEG) insertion; and a reduction in healthcare costs[20]. Unmanaged oropharyngeal dysphagia is associated with an increased risk of airway obstruction, aspiration pneumonia, death, malnutrition, and a decreased quality of life. The prevalence of dysphagia among individuals older than 50 years ranges from 16% to 22% (Bloem et al., 1990; Lindgren & Janson, 1991). In addition, continued advancements in medical technology have resulted in the survival of an increasing number of medically fragile and high-risk infants and children who frequently present with symptoms of dysphagia and require swallowing evaluation and management[21].	
IOM Domains	• Effective	

of Health Care Quality Addressed	• Equitable	
Exception Justification	A medical reason exception has been included so that clinicians can exclude patients for whom dysphagia screening may not be appropriate (eg, patient without any focal findings and not thought to be having a stroke when initially evaluated, other medical reason(s)). A patient reason exception has been included for patients who may decline dysphagia screening (eg, patient left against medical advice, other patient reason(s)).	
Harmonization with Existing Measures	The PCPI attempts to harmonize measures with other existing measures to the extent feasible. Harmonization with existing measures was not deemed applicable to this measure.	

Measure Designation

Measure purpose	• Quality improvement • Accountability
Type of measure	• Process
Level of Measurement	• Individual practitioner
Care setting	• Inpatient
Data source	• Electronic health record (EHR) data • Prospective Claims-Based Reporting

Measure #6: Rehabilitation Services Ordered
(Inpatient Setting)
Stroke and Stroke Rehabilitation

Measure Description

Percentage of patients aged 18 years and older with a diagnosis of ischemic stroke or intracranial hemorrhage for whom occupational, physical, or speech rehabilitation services were ordered at or prior to inpatient discharge OR documentation that no rehabilitation services are indicated at or prior to inpatient discharge

Measure Components

Numerator Statement	Patients for whom occupational, physical, or speech rehabilitation services were ordered at or prior to inpatient discharge OR documentation that no rehabilitation services are indicated at or prior to inpatient discharge **Definitions:** **Rehabilitation Services** – Includes services required in order to improve physical, cognitive (including neuropsychological), behavioral, and speech functions *Rehabilitation order can include one or more of the services listed
Denominator Statement	All patients aged 18 years and older with a diagnosis of ischemic stroke or intracranial hemorrhage
Denominator Exclusions	None
Denominator Exceptions	None
Supporting Guideline & Other References	The use of comprehensive specialized stroke care (stroke units) incorporating rehabilitation is recommended. (Class I, Level of Evidence A) (ASA, 2007)[7] The use of standardized stroke care order sets is recommended to improve general management. (Class I, Level of Evidence B) (ASA, 2007)[7]

Measure Importance

Relationship to desired outcome	Specifically, stroke rehabilitation programs are provided to optimize neurological recovery, teach compensatory strategies for residual deficits, teach activities of daily living (ADLs) and skills required for community living, and provide psychosocial and medical interventions to manage depression[22].	
Opportunity for Improvement	After a stroke, 50% to 70% of patients regain functional independence; however, 15% to 30% of patients are permanently disabled and 20% require institutional care at 3 months after onset. Stroke rehabilitation involves a combined and coordinated use of medical, social, educational, and vocational measures for retraining individuals to reach their maximal physical, psychological, social, vocational, and avocational potential[22].	
IOM Domains of Health Care Quality Addressed	• Effective • Equitable	

Exception Justification	There are no exceptions for this measure.
Harmonization with Existing Measures	The PCPI attempts to harmonize measures with other existing measures to the extent feasible. This measure has been edited to achieve a partial harmonization with the Joint Commission measure, Assessed for Rehabilitation. In particular, this measure is more specific as to which types of rehabilitation should be assessed.

Measure Designation

Measure purpose	• Quality improvement • Accountability
Type of measure	• Process
Level of Measurement	• Individual practitioner
Care setting	• Inpatient
Data source	• Electronic health record (EHR) data • Prospective Claims-Based Reporting

Measure #8: Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) Reports
(Inpatient and Ambulatory Settings)
Stroke and Stroke Rehabilitation

Measure Description

Percentage of final reports for CT or MRI studies of the brain performed either:

- In the hospital within 24 hours of arrival, OR
- In an outpatient imaging center to confirm initial diagnosis of stroke, TIA or intracranial hemorrhage.

For patients aged 18 years and older with either a diagnosis of ischemic stroke or transient ischemic attack (TIA) or intracranial hemorrhage OR at least one documented symptom consistent with ischemic stroke or TIA or intracranial hemorrhage that includes documentation of the presence or absence of each of the following: hemorrhage and mass lesion and acute infarction

Measure Components

Numerator Statement	Final reports of the initial CT or MRI that include documentation of the presence or absence of each of the following: hemorrhage and mass lesion and acute infarction **Numerator Note:** Equivalent terms or synonyms for hemorrhage, mass lesion, or infarction, if documented in the CT or MRI report, would meet the measure
Denominator Statement	All final reports for CT or MRI studies of the brain performed either: • In the hospital within 24 hours of arrival, OR • In an outpatient imaging center to confirm initial diagnosis of stroke, TIA or intracranial hemorrhage.* For patients aged 18 years and older with either a diagnosis of ischemic stroke or TIA or intracranial hemorrhage OR at least one documented symptom consistent with ischemic stroke or TIA or intracranial hemorrhage *Final reports for outpatient imaging studies of the brain performed to confirm initial diagnosis are eligible for this measure whether or not patient is subsequently referred to the hospital.
Denominator Exclusions	None
Denominator Exceptions	None
Supporting Guideline & Other References	Imaging of the brain is recommended before initiating any specific therapy to treat acute ischemic stroke. (Class I, Level of Evidence A) (ASA, 2007)[7] In most instances, CT will provide the information to make decisions about emergency management. (Class I, Level of Evidence A) (ASA, 2007)[7] The brain imaging study should be interpreted by a physician with expertise in reading CT or MRI studies of the brain. (Class I, Level of Evidence C) (ASA, 2007)[7]

Some findings on CT, including the presence of a dense artery sign, are associated with poor outcomes after stroke. (Class I, Level of Evidence A) (ASA, 2007)[7]

Multimodal CT and MRI may provide additional information that will improve diagnosis of ischemic stroke. (Class I, Level of Evidence A) (ASA, 2007)[7]

Rapid neuroimaging with CT or MRI is recommended to distinguish ischemic stroke from ICH (Class I, Level of Evidence A) (ASA, 2010)[10]

Patients with TIA should preferably undergo neuroimaging evaluation within 24 hours of symptom onset. MRI, including DWI, is the preferred brain diagnostic imaging modality. If MRI is not available, head CT should be performed (Class I, Level of Evidence B).(AAN, 2010)[26]

DWI [Diffusion Weighted Imaging] should be considered superior to noncontrast CT scan for the diagnosis of acute ischemic stroke in patients presenting within 12 hours of symptom onset (Level A) (AAN, 2010)[23].

Diagnostic Imaging Reports:

Findings
The report should use appropriate anatomic, pathologic, and radiologic terminology to describe the findings.

Clinical Issues
The report should address or answer any specific clinical questions. If there are factors that prevent answering of the clinical question, this should be stated explicitly.

Impression
a. Unless the report is brief, each report should contain an "impression" section.
b. A specific diagnosis should be given when possible.
c. A differetial diagnosis should be rendered when appropriate.
d. Follow-up or additional diagnostic studies to clarify or confirm the impression should be suggested when appropriate.
e. Any significant patient reaction should be reported. (ACR, 2010)[24]

Cerebrovascular Disease Appropriateness Summary Table[25]	
Indication	**Appropriate Imaging**
Carotid territory or vertebrobasilar TIA, initial screening survey.	MRI head (without contrast, or without and with contrast) and CT head (without contrast, or with contrast) are considered usually appropriate or indicated
New focal neurologic defect, fixed or worsening. Less than 3 hours.	MRI head (without contrast, or without and with contrast) and CT head (without contrast, or with contrast) are considered usually appropriate or indicated
New focal neurologic defect, fixed or worsening. Three to 24 hours.	MRI head (without contrast, or without and with contrast) and CT head (without contrast, or with contrast) are considered usually appropriate or indicated.
New focal neurologic defect, fixed or	MRI head (without contrast, or without

worsening. Longer than 24 hours.	and with contrast) and CT head (without contrast, or with contrast) are considered usually appropriate or indicated.
Clinically suspected acute subarachnoid hemorrhage (SAH), not yet confirmed.	CT head without contrast is considered usually appropriate or indicated.
Clinically suspected parenchymal hemorrhage (hematoma) not yet confirmed.	CT head without contrast is considered usually appropriate or indicated

This table has been modified, for the purposes of this measure.

Usually appropriate – the study or procedure is indicated in certain clinical settings at a favorable risk-benefit ratio for patients, as supported by published peer-reviewed scientific studies, supplemented by expert opinion.

May be appropriate – the study or procedure may be indicated in certain clinical settings, or the risk-benefit ratio for patients may be equivocal as shown in published peer-reviewed, scientific studies, supplemented by expert opinion.

Measure Importance

Relationship to desired outcome	The CT and MRI findings are critical to initiating care for the patient with stroke. All CT and MRI reports should address the presence or absence of these three important findings. This documentation is particularly vital in the report of the first imaging study performed after arrival at the hospital (whether or not the patient is admitted), on which initial treatment decisions will be based. The denominator language and specifications also allow for inclusion of CT or MRI studies performed in an outpatient imaging center to confirm initial diagnosis of stroke, TIA or intracranial hemorrhage (i.e., not including follow-up studies performed after acute treatment for these diagnoses), regardless of whether the patient is subsequently referred to the hospital.
Opportunity for Improvement	Neuroimaging tests might improve selection of patients who could be treated with reperfusion therapies by identifying those with regions of salvageable brain tissue, a low risk for hemorrhagic transformation, or occlusions of large arteries that might or might not be amenable to therapy. CT and magnetic resonance imaging (MRI) are being used as initial imaging options. The most commonly obtained brain imaging test is noncontrast CT, but individual centers able to obtain MRI with efficiency equal to that of CT are using an MRI strategy in patients without MR contraindications[7]. The high rate of early neurological deterioration after ICH is in part related to active bleeding that may proceed for hours after symptom onset. The earlier time from symptom onset to first neuroimage, the more likely subsequent neuroimages will demonstrate hematoma expansion. Among patients undergoing head CT within 3 hours of ICH onset, 28% to 38% have hematoma expansion of greater than one third on follow-up CT. Hematoma expansion is predictive of clinical deterioration and increased morbidity and mortality[10]. MRI is not as widely available as CT and is generally more expensive. In a study of TIAs evaluated in emergency departments in Ontario, Canada, from May to December 2000, only 3% received MRI within 30 days. A study of TIAs seen in regions throughout the United States from 1992 to 2001 revealed that MRI was

	performed in <5% of cases. However, the rates of neuroimaging with CT or MRI increased significantly over the 10 years of the study, rising to >70% by 2001. The percentage of those with MRI studies in the later years of the study was not specified[26].	
IOM Domains of Health Care Quality Addressed	• Effective • Timely • Equitable	
Exception Justification	There are no exceptions for this measure.	
Harmonization with Existing Measures	The PCPI attempts to harmonize measures with other existing measures to the extent feasible. Harmonization with existing measures was not deemed applicable to this measure.	

Measure Designation

Measure purpose	• Quality improvement • Accountability
Type of measure	• Process
Level of Measurement	• Individual practitioner
Care setting	• Ambulatory care • Inpatient
Data source	• Electronic health record (EHR) data • Prospective Claims-Based Reporting

Measure #9: Patient/Caregiver Nutritional Preferences
(Inpatient Setting)
Stroke and Stroke Rehabilitation

Measure Description

Percentage of patients aged 18 years and older with a diagnosis of ischemic stroke who have had a percutaneous endoscopic gastrostomy tube placed during the acute inpatient stay for the treatment of ischemic stroke, and for whom there is documentation of shared decision making with the patient or the patient's surrogate decision maker and family, before the procedure was completed, that included discussion of at least two forms of providing nutrition, one of which is oral/natural nutrition

Measure Components

Numerator Statement	Patients for whom there is documentation of shared decision making with the patientor the patient's surrogate decision maker and family, before the procedure was completed, that included discussion of at least two forms of providing nutrition, one of which is oral/natural nutrition **Definitions**: **Shared decision making** – an approach where clinicians and patients communicate together using the best available evidence when faced with the task of making decisions, where patients are supported to deliberate about the possible attributes and consequences of options, to arrive at informed preferences in making a determination about the best action and which respects patient autonomy, where this is desired.
Denominator Statement	All patients aged 18 years and older with a diagnosis of ischemic stroke who have had a percutaneous endoscopic gastrostomy tube placed during the acute inpatient stay for the treatment of ischemic stroke
Denominator Exclusions	None
Denominator Exceptions	None
Supporting Guideline & Other References	Assessment of swallowing before starting eating or drinking is recommended. (Class I, Level of Evidence B) (ASA, 2007)[7] Patients who cannot take food and fluids orally should receive nasogastric, nasoduodenal, or PEG feedings to maintain hydration and nutrition while undergoing efforts to restore swallowing. (Class IIa, Level of Evidence B) (ASA, 2007)[7]

Measure Importance

Relationship to desired outcome	Placement of a percutaneous endoscopic gastrostomy (PEG) tube often is used to treat patients who will need prolonged tube feedings. Although this device usually requires less care, complications, including involuntary removal of the tube or peritonitis, may occur. The risk of aspiration pneumonia is not eliminated by the

	use of a PEG. Some evidence suggests that use of the PEG tube is superior to nasogastric tube feedings[7].	
Opportunity for Improvement	Fifty percent of patients with severe strokes were reported to be malnourished at 2 to 3 weeks after the stroke. Malnutrition was associated with higher complications and poorer functional outcomes[9].	
IOM Domains of Health Care Quality Addressed	• Effective • Patient-centered • Equitable	
Exception Justification	There are no exceptions for this measure.	
Harmonization with Existing Measures	The PCPI attempts to harmonize measures with other existing measures to the extent feasible. Harmonization with existing measures was not deemed applicable to this measure.	

Measure Designation

Measure purpose	• Quality improvement • Accountability
Type of measure	• Process
Level of Measurement	• Individual practitioner
Care setting	• Inpatient
Data source	• Electronic health record (EHR) data

Measure #10a:
Potentially Avoidable Harmful Events – Urinary Tract Infection (Quality Improvement only)
(Inpatient Setting)
(measures 10a-10c being considered for aggregation into a composite measure)
Stroke and Stroke Rehabilitation

*For this measure a lower score indicates higher quality

Measure Description

Percentage of patients aged 18 years and older with a diagnosis of ischemic stroke who were hospitalized for seven days or greater, who acquired a Urinary Tract Infection

Measure Components

Numerator Statement	Patients who acquired a Urinary Tract Infection Note: This measure is intended for patients who do not have an indwelling catheter prior to arrival
Denominator Statement	All patients aged 18 years and older with a diagnosis of ischemic stroke, who were hospitalized for seven days or greater
Denominator Exclusions	None
Denominator Exceptions	None
Supporting Guideline & Other References	If possible, the placement of indwelling bladder catheters should be avoided because of the associated risk of urinary tract infections (Class III, Level of Evidence C). Some patients may need prolonged catheter drainage of the bladder, and measures to lower risk of infection should be taken. (ASA, 2007)[7] Infections, such as pneumonia and UTI, should be identified and treated immediately with antibiotics (Class I, Level of Evidence B) (ASA, 2009)[9] Early bowel and bladder care should be instituted to prevent complications such as constipation and urinary retention or infection (Class I, Level of Evidence A). Use of indwelling catheters should be avoided if possible because of the risk of UTI (Class I, Level of Evidence A) (ASA, 2009)[9] If an indwelling catheter is required, excellent pericare and prevention of infection modalities should be instituted to prevent complications. (Class IIa, Level of Evidence C) (ASA, 2009)[9]

Measure Importance

Relationship to desired outcome	Screening of the urine for evidence of infection should be performed whenever a patient develops a fever after stroke. Some patients, especially those with major impairments, are at high risk for urinary incontinence. To ease care and to avoid

	skin complications, some patients will need an indwelling bladder catheter to treat incontinence or urinary retention[7].
Opportunity for Improvement	Urinary tract infections are relatively common among patients with stroke. This complication is most likely associated with more seriously affected patients. Bacteremia or sepsis is a potential complication[7]. UTIs are common, occurring in approximately 15% to 60% of stroke patients, and independently predict poor outcome. The use of an indwelling catheter and changes in sphincter control increase the risk of UTI[9].
IOM Domains of Health Care Quality Addressed	• Safe • Patient-centered • Equitable
Exception Justification	This measure has no exceptions.
Harmonization with Existing Measures	The PCPI attempts to harmonize measures with other existing measures to the extent feasible. Harmonization with existing measures was not deemed applicable to this measure.

Measure Designation

Measure purpose **Type of measure**	• Quality Improvement • Outcome
Level of Measurement	• Individual practitioner
Care setting	• Inpatient
Data source	• QI only – no specifications developed at this time

Measure #10b:
Potentially Avoidable Harmful Events – Stage III or Greater Decubiti (Quality Improvement only)
(Inpatient Setting)
(measures 10a-10c being considered for aggregation into a composite measure)
Stroke and Stroke Rehabilitation

*For this measure, a lower score indicates higher quality.

Measure Description

Percentage of patients aged 18 years and older with a diagnosis of ischemic stroke who were hospitalized for seven days or greater, who developed Stage III or Greater Decubiti

Measure Components

Numerator Statement	Patients who developed Stage III or Greater Decubiti
Denominator Statement	All patients aged 18 years and older with a diagnosis of ischemic stroke, who were hospitalized for seven days or greater
Denominator Exceptions	None
Denominator Exclusions	None
Supporting Guideline & Other References	Frequent turning should be instituted in bedridden patients to prevent skin breakdown (Class I, Level of Evidence A). Use of the Braden Scale in nursing practice can assist in the prediction of stroke patients at high risk of developing pressure ulcers (Class I, Level of Evidence A). Range-of-motion exercises should start in the early phase of acute stroke care once risk has been assessed (Class I, Level of Evidence C) (ASA, 2009)[9]

Measure Importance

Relationship to desired outcome	Early mobilization is favored because it lessens the likelihood of complications such as pneumonia, deep vein thrombosis, pulmonary embolism, and pressure sores. In addition, prolonged immobility may lead to contractures, orthopedic complications, or pressure palsies. Frequent turning, the use of alternating pressure mattresses, and close surveillance of the skin help to prevent pressure sores[7].	
Opportunity for Improvement	Stroke patients are at risk for skin breakdown because of loss of sensation and impaired circulation, older age, decreased level of consciousness, and inability to move themselves because of paralysis. Related complications such as incontinence can accelerate skin breakdown. Major pressure areas are the heels, sacrum, and lateral malleoli[9].	
IOM Domains of Health Care Quality Addressed	• Safe • Patient-centered • Equitable	
Exception	This measure has no exceptions.	

Justification	
Harmonization with Existing Measures	The PCPI attempts to harmonize measures with other existing measures to the extent feasible. Harmonization with existing measures was not deemed applicable to this measure.

Measure Designation

Measure purpose	• Quality Improvement
Type of measure	• Outcome
Level of Measurement	• Individual practitioner
Care setting	• Inpatient
Data source	• QI only – no specifications developed at this time

Measure #10c:
Potentially Avoidable Harmful Events – Fall with Fracture or Acute Subdural Hematoma (Quality Improvement only)

(Inpatient Setting)

(measures 10a-10c being considered for aggregation into a composite measure)

Stroke and Stroke Rehabilitation

*For this measure, a lower score indicates higher quality.

Measure Description

Percentage of patients aged 18 years and older with a diagnosis of ischemic stroke who were hospitalized for seven days or greater, who had a fall with a fracture or acute subdural hematoma

Measure Components

Numerator Statement	Patients who had a fall* with a fracture or acute subdural hematoma **Definition:** **Fall**- A sudden, unintended, uncontrolled downward displacement of a patient's body to the ground or other object. This includes situations where a patient falls while being assisted by another person, but excludes falls resulting from a purposeful action or violent blow
Denominator Statement	All patients aged 18 years and older with a diagnosis of ischemic stroke, who were hospitalized for seven days or greater
Denominator Exclusions	None
Denominator Exceptions	None
Supporting Guideline & Other References	Fall precautions should be initiated, and the stroke patient should be told not to ambulate without assistance. (Class I, Level of Evidence B) (ASA, 2009)[9]

Measure Importance

Relationship to desired outcome	Measures to avoid falls are an important part of mobilization[7]. Minimization of fall risk is a global responsibility. Nurses must implement fall-prevention programs and educate other staff and family members about risks and fall precautions.[9].
Opportunity for Improvement	Falls are a common cause of injury in stroke patients, with hip fractures the most prevalent injury. Hip fractures in the first 7 days after stroke are associated with a poor prognosis and have been recognized as a consequence of hemiplegia since the 1950s. Most fractures occur on the paretic side. Patients with right

	hemispheric infarcts that cause neglect or inattention have the highest fall risk[9].	
IOM Domains of Health Care Quality Addressed	• Safe • Patient-centered • Equitable	
Exception Justification	This measure has no exceptions.	
Harmonization with Existing Measures	The PCPI attempts to harmonize measures with other existing measures to the extent feasible. Harmonization with existing measures was not deemed applicable to this measure.	

Measure Designation

Measure purpose **Type of measure**	• Quality Improvement • Outcome
Level of Measurement	• Individual practitioner
Care setting	• Inpatient
Data source	• QI only – no specifications developed at this time

Measure #11: Lipid Management
(Inpatient Setting)
Stroke and Stroke Rehabilitation

Measure Description

Percentage of patients aged 18 years and older with diagnosis of ischemic stroke who have an LDL-C result < 100 mg/dL (without lipid management therapy) OR patients who are taking any lipid lowering therapy prior to hospitalization for stroke who are prescribed statin therapy at hospital discharge OR patients who have an LDL-C result ≥ 100 mg/dL and who were prescribed statin therapy at hospital discharge

Measure Components

Numerator Statement	Patients who have an LDL-C result < 100 mg/dL (without lipid management therapy) OR Patients who are taking any lipid lowering therapy prior to hospitalization for stroke who are prescribed statin therapy at hospital discharge OR Patients who have an LDL-C result ≥ 100 mg/dL and who were prescribed statin therapy at hospital discharge **Definitions:** **Statin** Therapy– lovastatin, pravastatin, simvastatin, fluvastatin, atorvastatin, , rosuvastatin* *The above list of medications/drug names is based on clinical guidelines and other evidence. The specified drugs were selected based on the strength of evidence for their clinical effectiveness. This list of selected drugs may not be all-inclusive or current. Physicians and other health care professionals should refer to the FDA's web site page entitled "**Drug Safety Communications"** for up-to-date drug recall and alert information when prescribing medications. **Prescribed** – May include prescription given to the patient for statin therapy at discharge OR statin therapy to be continued after discharge as documented in the discharge medication list
Denominator Statement	All patients aged 18 years and older with a diagnosis of ischemic stroke
Denominator Exclusions	All patients that expired during inpatient stay are excluded
Denominator Exceptions	Documentation of medical reason(s) for not prescribing statin therapy at discharge (eg, patient has acute or chronic liver disease, patient is taking a contraindicated medication, , other medical reason(s)). Documentation of patient reason(s) for not prescribing statin therapy at discharge (eg, patient left against medical advice, patient declined, other patient

	reason(s)).
Supporting Guideline & Other References	Statin therapy with intensive lipid-lowering effects is recommended to reduce the risk of stroke and cardiovascular events among patients with ischemic stroke or TIA who have evidence of atherosclerosis, an LDL-C level ≥100 mg/dL, and who are without known CHD. (Class I, Level of Evidence B) (ASA, 2010)[11] 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) (ASA, 2010)[11] Patients with ischemic stroke or TIA with elevated cholesterol or comorbid coronary artery disease should be otherwise managed according to the NCEP III guidelines, which include lifestyle modification, dietary guidelines, and medication recommendations. (Class I; Level of Evidence A) (ASA, 2010)[11] Patients with ischemic stroke or TIA with low HDL-C may be considered for treatment with niacin or gemfibrozil. (Class IIb, Level of Evidence B) (ASA, 2010)[11] Statins should be considered as first-line drugs when LDL-lowering drugs are indicated to achieve LDL treatment goals. (The Third Report of the National Cholesterol Education Program [NCEP] Adult Treatment Panel III [ATPII], 2002)[27] When initiating LDL-lowering therapy in a person at high risk or moderately high risk, the efficacy of therapeutic lifestyle change both to lower LDL-C levels and to reduce risk through other mechanisms must not be overlooked. Lifestyle change must be an integral part of risk reduction therapy. When an LDL-lowering drug is employed in a person at high risk or moderately high risk, a reduction in LDL-C levels of at least 30% to 40% beyond dietary therapy should be achieved if feasible. (NCEP/ATP III Update, 2004)[28]. Bile acid sequesterants should be considered as LDL-lowering therapy for persons with moderate elevations in LDL cholesterol, for younger persons with elevated LDL cholesterol, for women with elevated LDL cholesterol who are considering pregnancy, for persons needing only modest reductions in LDL cholesterol to achieve target goals, and for combination therapy with statins in persons with very high LDL-cholesterol levels (NCEP/ATP III, 2002)[27]. Nicotinic acid should be considered as a therapeutic option for higher-risk persons with atherogenic dyslipidemia. It should be considered as a single agent in higher-risk persons with atherogenic dyslipidemia who do not have a substantial increase in LDL-cholesterol levels, and in combination therapy with other cholesterol-lowering drugs in higher-risk persons with atherogenic dyslipidemia combined with elevated LDL-cholesterol levels (NCEP/ATPIII, 2002)[27]. Fibrates can be recommended for persons with very high triglycerides to reduce risk for acute pancreatitis. They also can be recommended for persons with dysbetalipoproteinemia (elevated beta-VLDL). Fibrate therapy should be considered an option for treatment of persons with established CHD who have low levels of LDL cholesterol and atherogenic dyslipidemia. They also should be

	considered in combination with statin therapy in persons who have elevated LDL cholesterol and elevated atherogenic dyslipidemia. (NCEP/ATPIII, 2002)[27]

Measure Importance

Relationship to desired outcome	A meta-analysis of >90,000 patients included in statin trials showed that the larger the reduction in LDL-C, the greater the reduction in stroke risk[11].	
Opportunity for Improvement	Large epidemiological studies in which ischemic and hemorrhagic strokes were distinguishable have shown a modest association of elevated total cholesterol or low-density lipoprotein cholesterol (LDL-C) with increased risk of ischemic stroke and a relationship between low LDL-C and greater risk of ICH[11].	
IOM Domains of Health Care Quality Addressed	• Effective • Equitable	
Exception Justification	A medical reason exception has been included so that clinicians can exclude patients for whom prescribing a statin may not be appropriate (eg, patient has acute or chronic liver disease, patient is taking a contraindicated medication, patient has an LDL <100, other medical reason(s)). A patient reason exception has been included for patients who may decline receiving a statin (eg, patient left against medical advice, other patient reason(s)).	
Harmonization with Existing Measures	This measure is harmonized with the PCPI approved, Lipid Control measure, which is included in the Chronic Stable Coronary Artery Disease performance measurement set. This measure is also harmonized with the Joint Commission Stroke measure, Discharged on Statin Medication.	

Measure Designation

Measure purpose	• Accountability
Type of measure	• Process
Level of Measurement	• Individual practitioner
Care setting	• Inpatient
Data source	• Electronic health record (EHR) data • Prospective Claims-Based Reporting

Measure #12: Blood Pressure Management
(Ambulatory Setting)
Stroke and Stroke Rehabilitation

Measure Description

Percentage of patients aged 18 years and older with a diagnosis of ischemic stroke or transient ischemic attack within three months of ambulatory visit with a blood pressure < 140/90 mmHg OR patients with a blood pressure ≥ 140/90 mmHg and prescribed 2 or more anti-hypertensive agents during the most recent visit during the measurement period

Measure Components

Numerator Statement	Patients with a blood pressure <140/90 mm Hg* OR Patients with a blood pressure ≥140/90 mm Hg and prescribed 2 or more anti-hypertensive agents during the most recent visit during the measurement period **Numerator Note:** Each anti-hypertensive component in a combination medication should be counted individually *BP value used for measure calculation: · Must be specified in medical record if >1 value (systolic/diastolic) recorded, and · Must be value upon which treatment decision was based, and · May be obtained by measurement during office visit, review of home blood pressure log, OR review of 24 hour ambulatory blood pressure monitor **Definitions:** **Prescribed** - May include prescriptions given to the patient for 2 or more anti-hypertensive agents at most recent visit OR patient already taking 2 or more anti-hypertensive agents as documented in current medication list.
Denominator Statement	All patients aged 18 years and older with a diagnosis of ischemic stroke or transient ischemic attack (TIA) within three months of ambulatory visit
Denominator Exclusions	None
Denominator Exceptions	Documentation of medical reason(s) for not prescribing 2 or more anti-hypertensive agents during the most recent visit during the measurement period (eg, only a change in dosage was needed, no change in medication necessary, high blood pressure determined to be clinically necessary by physician, only one anti-hypertensive agent needed to be prescribed, other medical reason(s)). Documentation of patient reason(s) for not prescribing 2 or more anti-hypertensive agents during the most recent visit during the measurement period (eg, patient declined, other patient reason(s)).
Supporting Guideline & Other References	BP reduction is recommended for both prevention of recurrent stroke and prevention of other vascular events in persons who have had an ischemic stroke or TIA and are beyond the first 24 hours. (Class I; Level of Evidence A) (ASA, 2010)[11] Because this benefit extends to persons with and without a documented history of hypertension, this recommendation is reasonable for all patients with ischemic

	stroke or TIA who are considered appropriate for BP reduction (Class IIa; Level of Evidence B) (ASA, 2010)[11] An absolute target BP level and reduction are uncertain and should be individualized, but benefit has been associated with an average reduction of approximately 10/5 mm Hg, and normal BP levels have been defined as <120/80 mm Hg by JNC 7. (Class IIa; Level of Evidence B) (ASA, 2010)[11] Several lifestyle modifications have been associated with BP reduction and are a reasonable part of a comprehensive antihypertensive therapy (Class IIa; Level of Evidence C). These modifications include salt restriction; weight loss; consumption of a diet rich in fruits, vegetables, and low-fat dairy products; regular aerobic physical activity; and limited alcohol consumption. (ASA, 2010)[11] The optimal drug regimen to achieve the recommended level of reduction is uncertain because direct comparisons between regimens are limited. The available data indicate that diuretics or the combination of diuretics and an ACEI are useful (**Class I; Level of Evidence A)**. The choice of specific drugs and targets should be individualized on the basis of pharmacological properties, mechanism of action, and consideration of specific patient characteristics for which specific agents are probably indicated (eg, extracranial cerebrovascular occlusive disease, renal impairment, cardiac disease, and diabetes). (Class IIa; Level of Evidence B) (ASA, 2010)[11]

Measure Importance

Relationship to desired outcome	Overall, there is an association between both systolic and diastolic BP and risk of stroke without a clear threshold even at a systolic BP of 115 mm Hg. Meta-analyses of randomized controlled trials have shown that BP lowering is associated with a 30% to 40% reduction in risk of stroke. Risk reduction is greater with larger reductions in BP without clear evidence of a drug class-specific treatment effect[11].	
Opportunity for Improvement	An estimated 72 million Americans have hypertension, defined as a systolic blood ressure (BP) ≥140 mm Hg or diastolic BP ≥90 mm Hg. (ASA Prevention) – 2010 An elevated blood pressure is often detected in the first hours after stroke. Elevations in blood pressure > 160 mm Hg are detected in >60% of patients with acute stroke. Both elevated and low blood pressures are associated with poor outcome after stroke. For every 10-mm Hg increase >180 mm Hg, the risk of neurological deterioration increased by 40% and the risk of poor outcome increased by 23%[7].	
IOM Domains of Health Care Quality Addressed	• Effective • Equitable	
Exception Justification	A medical reason exception has been included so that clinicians can exclude patients for whom prescribing anti-hypertensive medications may not be appropriate (eg, only a change in dosage was needed, no change in medication necessary, high blood pressure determined to be clinically necessary by physician, only one anti-hypertensive medication needed to be prescribed, other medical reason(s)). A patient reason exception has been included for patients who may decline receiving anti-hypertensive medications (eg, other patient reason(s)).	
Harmonization with Existing Measures	The PCPI attempts to harmonize measures with other existing measures to the extent feasible. This measure has been edited to achieve a partial harmonization with the existing ACC/AHA/PCPI measure, Blood Pressure Measurement, from the	

	Chronic Stable Coronary Artery Disease/Hypertension measurement set. In particular, this measure has also been edited to focus on treating stroke patients specifically, who may require a different approach to blood pressure management.

Measure Designation

Measure purpose	• Accountability
Type of measure	• Process
Level of Measurement	• Individual practitioner
Care setting	• Ambulatory
Data source	• Electronic health record (EHR) data

Measure #13: Imaging for Transient Ischemic Attack or Ischemic Stroke

(Inpatient and Ambulatory Settings)

Stroke and Stroke Rehabilitation

Measure Description

Percentage of patients aged 18 years and older with symptoms or a diagnosis of transient ischemic attack (TIA) or ischemic stroke for whom cross sectional imaging of the brain and imaging of the cervical cerebral vasculature, which at a minimum includes imaging of the carotid artery, was performed within 24 hours of admission for an inpatient stay OR within 72 hours of suspected TIA or ischemic stroke for an outpatient visit

Measure Components

Numerator Statement	Patients for whom cross sectional imaging of the brain* and imaging of the cervical cerebral vasculature, which at a minimum includes imaging of the carotid artery, was performed** within 24 hours of admission for an inpatient stay OR within 72 hours of suspected TIA or ischemic stroke for an outpatient visit *CT or MRI **CTA, MRA or Duplex Doppler ultrasonography
Denominator Statement	All patients aged 18 years and older with symptoms or a diagnosis of TIA or ischemic stroke
Denominator Exclusions	All patients that expired during inpatient stay are excluded
Denominator Exceptions	Documentation of medical reason(s) for not performing cross sectional imaging of the brain and imaging of the cervical cerebral vasculature within 24 hours of admission for an inpatient stay OR within 72 hours for an outpatient visit (eg, other medical reason(s)). Documentation of patient reason(s) for not performing cross sectional imaging of the brain and imaging of the cervical cerebral vasculature within 24 hours of admission for an inpatient stay OR within 72 hours for an outpatient visit (eg, patient left against medical advice/patient declined, other patient reason(s)). Documentation of system reason(s) for not performing cross sectional imaging of the brain and imaging of the cervical cerebral vasculature within 24 hours of admission for an inpatient stay OR within 72 hours for an outpatient visit (eg, other system reason(s)).
Supporting Guideline & Other References	It is reasonable to hospitalize patients with TIA if they present within 72 hours of the event and any of the following criteria are present: a. ABCD2 score of ≥3 (Class IIa, Level of Evidence C). b. ABCD2 score of 0 to 2 and uncertainty that diagnostic workup can be completed within 2 days as an outpatient (Class IIa, Level of Evidence C). c. ABCD2 score of 0 to 2 and other evidence that indicates the patient's event was caused by focal ischemia (Class IIa, Level of Evidence C). (ASA,

2009)[26]

Patients with TIA should preferably undergo neuroimaging evaluation within 24 hours of symptom onset. MRI, including DWI, is the preferred brain diagnostic imaging modality. If MRI is not available, head CT should be performed. (Class I, Level of Evidence B) (ASA, 2009)[26]

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) (ASA, 2009)[26]

Noninvasive testing of the intracranial vasculature reliably excludes the presence of intracranial stenosis and is reasonable to obtain when knowledge of intracranial steno occlusive disease will alter management. Reliable diagnosis of the presence and degree of intracranial stenosis requires the performance of catheter angiography to confirm abnormalities detected with noninvasive testing. (Class I, Level of Evidence A) (ASA, 2009)[26]

Patients with suspected TIA should be evaluated as soon as possible after an event. (Class I, Level of Evidence B) (ASA, 2009)[26]

Initial assessment of the extracranial vasculature may involve any of the following: CUS/TCD, MRA, or CTA, depending on local availability and expertise, and characteristics of the patient. (Class IIa, Level of Evidence B) (ASA, 2009)[26]

If only noninvasive testing is performed before endarterectomy, it is reasonable to pursue 2 concordant noninvasive findings; otherwise, catheter angiography should be considered. **(**Class IIa, Level of Evidence B) (ASA, 2009)[26]

DWI [Diffusion Weighted Imaging] should be considered superior to noncontrast CT scan for the diagnosis of acute ischemic stroke in patients presenting within 12 hours of symptom onset (Level A)[23].

Cerebrovascular Disease Appropriateness Summary Table[25]

Indication	Appropriate Imaging
Carotid territory or vertebrobasilar TIA, initial screening survey.	MRI head (without contrast, or without and with contrast) and CT head (without contrast, or with contrast) are considered usually appropriate or indicated Carotid ultrasound with Doppler also may be appropriate.
New focal neurologic defect, fixed or worsening. Less than 3 hours.	MRI head (without contrast, or without and with contrast) and CT head (without contrast, or with contrast) are considered usually appropriate or indicated
New focal neurologic defect, fixed or worsening. Three to 24 hours.	MRI head (without contrast, or without and with contrast) and CT head (without contrast, or with contrast) are considered usually appropriate or indicated.
New focal neurologic defect, fixed or worsening. Longer than 24 hours.	MRI head (without contrast, or without and with contrast) and CT head (without contrast, or with contrast) are considered usually appropriate or indicated.

This table has been modified, for the purposes of this measure.

	Usually appropriate – the study or procedure is indicated in certain clinical settings at a favorable risk-benefit ratio for patients, as supported by published peer-reviewed scientific studies, supplemented by expert opinion. May be appropriate – the study or procedure may be indicated in certain clinical settings, or the risk-benefit ratio for patients may be equivocal as shown in published peer-reviewed, scientific studies, supplemented by expert opinion.

Measure Importance

Relationship to desired outcome	The goals of the modern neuroimaging evaluation of TIA are (1) to obtain evidence of a vascular origin for the symptoms either directly (evidence of hypoperfusion and/or acute infarction) or indirectly (identification of a presumptive source such as a large-vessel stenosis; (2) to exclude an alternative nonischemic origin; (3) to ascertain the underlying vascular mechanism of the event (eg, large-vessel atherothrombotic, cardioembolic, small-vessel lacunar), which, in turn, allows selection of the optimal therapy; and (4) to identify prognostic outcome categories[26].	
Opportunity for Improvement	MRI is not as widely available as CT and is generally more expensive. In a study of TIAs evaluated in emergency departments in Ontario, Canada, from May to December 2000, only 3% received MRI within 30 days. A study of TIAs seen in regions throughout the United States from 1992 to 2001 revealed that MRI was performed in <5% of cases. However, the rates of neuroimaging with CT or MRI increased significantly over the 10 years of the study, rising to >70% by 2001. The percentage of those with MRI studies in the later years of the study was not specified[26].	
IOM Domains of Health Care Quality Addressed	• Effective • Timely • Equitable	
Exception Justification	A medical reason exception has been included so that clinicians can exclude patients for whom imaging for TIA or ischemic stroke may not be appropriate (eg, other medical reason(s)). A patient reason exception has been included for patients who may decline imaging for TIA or ischemic stroke (eg, patient left against medical advice/patient declined, other patient reason(s)). A system reason exception has been included for patients who are unable to receive imaging for TIA or ischemic stroke due to reasons out of patient and clinician control (eg, other system reasons).	
Harmonization with Existing Measures	The PCPI attempts to harmonize measures with other existing measures to the extent feasible. Harmonization with existing measures was not deemed applicable to this measure.	

Measure Designation

Measure purpose	• Accountability
Type of measure	• Process
Level of Measurement	• Individual practitioner
Care setting	• Inpatient • Ambulatory

Data source	• Electronic health record (EHR) data

Additional Measures Recommended for Use with the Stroke and Stroke Rehabilitation Measure Set

Effective February 2009, the Stroke and Stroke Rehabilitation: Carotid Imaging Reports measure is replaced by the Radiology: Stenosis Measurement in Carotid Imaging Reports measure.

Measure Description:
Percentage of final reports for carotid imaging studies (neck MR angiography [MRA], neck CT angiography [CTA], neck duplex ultrasound, carotid angiogram) performed that include direct or indirect reference to measurements of distal internal carotid diameter as the denominator for stenosis measurement

Additional Information:
Stroke and Stroke Rehabilitation: Carotid Imaging Reports was specified for carotid imaging studies performed on patients aged 18 years and older with a diagnosis of ischemic stroke or TIA
No age or diagnostic criteria are specified for **Radiology: Stenosis Measurement in Carotid Imaging Reports**.
Radiology: Stenosis Measurement in Carotid Imaging Reports is therefore applicable to all carotid imaging studies performed on patients with a diagnosis of ischemic stroke or TIA
Accessed at: http://www.ama-assn.org/ama/pub/physician-resources/clinical-practice-improvement/clinical-quality/physician-consortium-performance-improvement/pcpi-measures.page?

EVIDENCE CLASSIFICATION/RATING SCHEMES

American Academy of Neurology (AAN) and the American Stroke Association (ASA) recommendation rating scale[6]

Grades of recommendation

Grade A: At least one convincing Class I study or at least two consistent, convincing Class II studies.
Grade B: At least one convincing Class II study or at least three convincing Class III studies.
Grade C: At least two convincing and consistent Class III studies.

Levels of evidence.

Class I: Evidence provided by a prospective, randomized, controlled clinical trial with masked outcome assessment, in a representative population. The following are required:

- Primary outcome(s) is/are clearly defined
- Exclusion/inclusion criteria are clearly defined
- Adequate accounting for dropouts and crossovers with numbers sufficiently low to have minimal potential for bias
- Relevant baseline characteristics are presented and substantially equivalent among treatment groups, or there is appropriate statistical adjustment for differences

Class II: Evidence provided by a prospective, matched cohort study in a representative population with masked outcome assessment that meets all the above, OR a randomized, controlled trial in a representative population that lacks one of the above criteria.
Class III: Evidence provided by all other controlled trials (including well defined natural history controls or patients serving as own controls) in a representative population, in which outcome assessment is independent of patient treatment.
Class IV: Evidence from uncontrolled studies, case series, case reports, or expert opinion.

American Stroke Association (ASA) recommendation rating scale[7,9,10,11,14,26]

American College of Chest Physicians (ACCP) – Guide to Grades of Recommendations**Error! Bookmark not defined.**

Grade of Recommendation	Clarity of Risk/Benefit	Methodologic Strength of Supporting Evidence	Implications
1A	Clear	Randomized trials without important limitations	Strong recommendation; can apply to most patients in most circumstances without reservation
1B	Clear	Randomized trials with important limitations (inconsistent results, methodologic flaws†)	Strong recommendations, likely to apply to most patients
1C+	Clear	No RCTs, but RCT results can be unequivocally extrapolated, or overwhelming evidence from observation studies	Strong recommendation; can apply to most patients in most circumstances
1C	Clear	Observation studies	Intermediate-strength recommendation; may change when stronger evidence available
2A	Unclear	Randomized trials without important limitations	Intermediate-strength recommendation; best action may differ depending on circumstances or patients' or societal values
2B	Unclear	Randomized trials with important limitations (inconsistent results, methodologic flaws)	Weak recommendation; alternative approaches likely to be better for some patients under some circumstances
2C	Unclear	Observation studies	Very weak recommendations; other alternatives may be equally reasonable

* Since studies in categories B and C are flawed, it is likely that most recommendations in these classes will be level 2. The following considerations will bear on whether the recommendation is grade 1 or grade 2: the magnitude and precision of the treatment effect, patients' risk of the target event being prevented, the nature of the benefit, the magnitude of the risk associated with treatment, variability in patient preferences, variability in regional resource availability and health-care delivery practices, and cost considerations. Inevitably, weighing these considerations involves subjective judgment.

†These situations include RCTs with both lack of blinding and subjective outcomes, where the risk of bias in measurement of outcomes is high, and with large loss to follow-up.

American College of Chest Physicians Grading Recommendation

Grade of Recommendation*	Benefit vs Risk and Burdens	Methodologic Quality of Supporting Evidence	Implications
Strong recommendation, high-quality evidence, Grade 1A	Desirable effects clearly outweigh undesirable effects, or *vice versa*	Consistent evidence from RCTs without important limitations or exceptionally strong evidence from observational studies	Recommendation can apply to most patients in most circumstances; further research is very unlikely to change our confidence in the estimate of effect
Strong recommendation, moderate-quality evidence, Grade 1B	Desirable effects clearly outweigh undesirable effects, or *vice versa*	Evidence from RCTs with important limitations (inconsistent results, methodologic flaws, indirect or imprecise), or very strong evidence from observational studies	Recommendation can apply to most patients in most circumstances; higher quality research may well have an important impact on our confidence in the estimate of effect and may change the estimate
Strong recommendation, low or very low-quality evidence, Grade 1C	Desirable effects clearly outweigh undesirable effects, or *vice versa*	Evidence for at least one critical outcome from observational studies, case series, or from RCTs with serious flaws or indirect evidence	Recommendation can apply to most patients in many circumstances; higher-quality research is likely to have an important impact on our confidence in the estimate of effect and may well change the estimate
Weak recommendation, high-quality evidence, Grade 2A	Desirable effects closely balanced with undesirable effects	Consistent evidence from RCTs without important limitations or exceptionally strong evidence from observational studies	The best action may differ depending on circumstances or patient or society values; further research is very unlikely to change our confidence in the estimate of effect
Weak recommendation, moderate-quality evidence, Grade 2B	Desirable effects closely balanced with undesirable effects	Evidence from RCTs with important limitations (inconsistent results, methodologic flaws, indirect or imprecise), or very strong evidence from observational studies	Best action may differ depending on circumstances or patient or society values; higher-quality research may well have an important impact on our confidence in the estimate of effect and may change the estimate
Weak recommendation, low or very low-quality evidence, Grade 2C	Desirable effects closely balanced with undesirable effects	Evidence for at least one critical outcome from observational studies, case series, or from RCTs with serious flaws or indirect evidence	Other alternatives may be equally reasonable; higher-quality research is likely to have an important impact on our confidence in the estimate of effect and may well change the estimate

*We use the wording *we recommend* for strong (Grade 1) recommendations and *we suggest* for weak (Grade 2) recommendations.

Summary of Non-Material Interest Disclosures

None of the members of the Stroke and Stroke Rehabilitation Work Group had any disqualifying material interests under the PCPI Conflict of Interest Policy. The following is a summary of non-disqualifying interests disclosed on Work Group members' Material Interest Disclosure Statements (not including information concerning family member interests). Completed Material Interest Disclosure Statements are available upon request.

Work Group Member	Disclosures
Carolyn Baum	Research or Other Grant Support: NIDRR Grants
Christopher T. Bever	Service on a Quality Committee: AAN Representative; Researcher whose Institution Receives Funding; Serves on Editorial board of peer-reviewed journal: Non Stroke Related
John Y. Choi	Service on a Quality Committee: ICACTL
Joseph P. Drozda	Salary Support: Sub-Investigator at Mercy Health Research Completed 12/09, Supported by the Following Companies: Abbott, Eli Lilly, GlaxoSmithKline, Johnson & Johnson, Merck, Novartis, Orexigen, Roche, Sanofi, Shionogi, Takeda, Pfizer Other: Medical Director, Correctional Medical Services from 4/08-12/09 Service on a Quality Committee: ACC Service on Editorial Board: American Journal of Medical Quality
Millie A. Hepburn-Smith	Other Work Group Membership: Annual Planning Committee Member Service on a Quality Committee: AANN
Judith A. Hinchey	Service on a Quality Committee: AHA
Robert G. Holloway	Payment for Consulting Services: American Academy of Neurology, Associate Editor, Neurology Today; Other Payments: Consultant to UCLA on Stroke Outcomes Project, Contract from California DoH; Other Activity: Consultant, Guideline Reviewer for Neurology, Milliman Inc. Service on a Quality Committee: AAN, Quality Standards Subcommittee
Adam Kelly	Other Activity: Sub-Investigator for NIH funded clinical trials and RESPECT trial; Service on a Quality Committee: American Heart Association, American Academy of Neurology
Rahul K. Khare	Research or Other Grant Support: AHRQ, Federal Research Grant Royalties: Textbook, Emergency Medicine QuickGlance

David J. Likosky	Other Work Group Participant: NQF Stroke Measure Work Group 2008
	Service on a Quality Committee: Practice CTTE, AAN; Service on Editorial Board: Frontiers in Neurohospitalist Medicine, The Neurohospitalist Journal
Robert C. Mullen	Salary Support: 100% of salary from American-Speech-Language Association
	Service on a Quality Committee: Various with ASHA; Institution receives funding from NIH; Reviewer for peer reviewed journal
Charles J. Prestigiacomo	Stock Ownership: Micrus (Shared)
	Receipt of Speaking Honoraria: Boston Scientific
	Payment for Consulting Services:Thermopeutix, Edge Thermopeutix
	Other Work Group Member: Executive Committee Society NeuroInterventional Surgery; Other: Board Member of International Brain Research Foundation
Eric Russell	Researcher whose institution receives funding; Service on Editorial Board: Radiology, AJNR
David J. Seidenwurm	Direct or Indirect five (5) percent or greater ownership interest in an entity and/or activity that relates to the activities of the PCPI: Sole proprietor med-legal practice, management consultant, payer consultant; Stock Ownership: Radiological Associates of Sacramento
	Salary Support: RAS; Research or Other Grant Support: Sutter Institute for Medical Research; Royalties: Book Chapter; Gifts: ACR, ASNR, BCBS; Payment for Consulting Services: BCBS, Medical; Officer and Director for RAS
	Committee Membership: ASNR Secretary, Member of ASNR Executive Committee, BCBS Panel
Daniel J. Triezenberg	Research or Other Grant Support: AAFP Foundation
Richard D. Zorowitz	Payment for Consulting Services: Medergy Medical Education; Other Activity: National Stroke Association, American Stroke Association
	Committee Participant: National Stroke Association
	Service on a Quality Committee: AAPM&R

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