### AHA/ASA Ischemic Stroke Performance Measures

#### 1. Venous thromboembolism prophylaxis

Percentage of patients with ischemic stroke who receive venous thromboembolism prophylaxis

<table>
<thead>
<tr>
<th>Numerator</th>
<th>Ischemic stroke patients prescribed venous thromboembolism (VTE) prophylaxis on the day of admission (day 0) or the day following admission (day 1), or who have documentation why no VTE prophylaxis was given.</th>
</tr>
</thead>
</table>
| Denominator | **Included patients**  
- All patients with ischemic stroke  
  **Excluded patients**  
- Less than 18 years of age  
- Length of stay <2 days  
- Length of stay >120 days  
- ‘Comfort Measures Only’ documented on hospital day 0 or 1.  
- Enrolled in clinical trials related to stroke  
- Admitted for ‘Elective Carotid Intervention’ |
| Period of Assessment | Hospital day 0 or 1 |
| Sources of Data | Prospective flow sheet, retrospective medical record review, electronic medical record |

**Rationale**

Pulmonary embolism from deep venous thrombosis accounts for nearly 10% of deaths following stroke. For non-ambulatory patients, administration of antithrombotic agents and external compression devices reduce the risk of deep venous thrombosis.

**Source for Recommendation**


1. Subcutaneous administration of anticoagulants is recommended for treatment of immobilized patients to prevent DVT *(Class I; Level of Evidence A).*
2. The use of intermittent external compression devices is reasonable for treatment of patients who cannot receive anticoagulants *(Class IIA; Level of Evidence B).*

**Method of Reporting**

- Per patient: Documentation of whether venous thromboembolism prophylaxis was prescribed on hospital day 0 or 1.
- Per patient population: Percentage of patients prescribed venous thromboembolism prophylaxis was prescribed on hospital day 0 or 1.

**Challenges to Implementation**

- Expanding numbers of antithrombotics and anticoagulants will necessitate frequent updates to the measure.

**Analogous Measures Endorsed by Other Organizations**

- Analogous measures endorsed or used by: NQF (STK-01, NQF #0434), TJC, AHA GWTG-Stroke, CDC PCNASR, AMA PCPI, CMS Hospital IQR

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1 Venous thromboembolism prophylaxis may include intermittent pneumatic compression devices or medications. Medications for VTE prophylaxis include: heparin, low molecular weight heparin, apixaban, rivaroxaban, and fondaparinux.
Reasons could include that the patient is ambulatory or the patient is on full-dose anticoagulation for other reasons.
### 2. Discharged on antithrombotic therapy

Percentage of patients with ischemic stroke who are discharged on antithrombotic therapy

<table>
<thead>
<tr>
<th>Numerator</th>
<th>Ischemic stroke patients prescribed antithrombotic therapy(^1) at hospital discharge.</th>
</tr>
</thead>
</table>
| Denominator | Included patients  
- All patients with ischemic stroke |
| **Excluded patients** |  
- Less than 18 years of age  
- Length of stay >120 days  
- ‘Comfort Measures Only’ documented  
- Enrolled in clinical trials related to stroke  
- Admitted for ‘Elective Carotid Intervention’  
- Discharged to another hospital  
- Left against medical advice  
- Died  
- Discharged to home for hospice care  
- Discharged to a health care facility for hospice care  
- With a documented reason for not prescribing antithrombotic therapy at discharge |

**Period of Assessment**  
Hospital discharge

**Sources of Data**  
Prospective flow sheet, retrospective medical record review, electronic medical record

**Rationale**

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

**Source for Recommendation**


1. 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).

2. 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 200 mg twice daily (Class I; Level of Evidence B), and clopidogrel 75 mg monotherapy (Class IIa; Level of Evidence B) are all acceptable options for initial therapy. The selection of an antiplatelet agent should be individualized on the basis of patient risk factor profiles, cost, tolerance, and other clinical characteristics.

3. For patients with ischemic stroke or TIA with paroxysmal (intermittent) or permanent 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). For patients unable to take oral anticoagulants, aspirin alone (Class I; Level of Evidence A) is recommended. The combination of clopidogrel plus aspirin carries a risk of bleeding similar to that of warfarin and therefore is not recommended for patients with a hemorrhagic contraindication to warfarin (Class III; Level of Evidence B).

**Method of Reporting**

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

### Challenges to Implementation
- Expanding numbers of antithrombotics and anticoagulants will necessitate frequent updates to the measure.

### Analogous Measures Endorsed by Other Organizations
- Analogous measures endorsed or used by: NQF (STK-02, NQF #0435), TJC, AHA GWTG-Stroke, CDC PCNASR, AMA PCPI, and CMS Hospital IQR

1 Antithrombotics may include aspirin (acetylsalicylic acid), clopidogrel, combination aspirin+dipyridamole, warfarin, heparin, low molecular weight heparins, dabigatran, rivaroxaban, apixaban or others, prescribed at doses intended to prevent arterial thrombosis or embolism. The numerator should not include patients prescribed only lower doses of these drugs intended to prevent deep vein thrombosis, rather than recurrent ischemic stroke.
### 3. Discharge on anticoagulation for patients with atrial fibrillation or flutter

#### Percentage of patients with ischemic stroke who are discharged on antithrombotic therapy

<table>
<thead>
<tr>
<th>Numerator</th>
<th>Ischemic stroke patients prescribed anticoagulation therapy(^1) at hospital discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denominator</td>
<td><strong>Included patients</strong>&lt;br&gt;● Ischemic stroke patients with documented atrial fibrillation or atrial flutter</td>
</tr>
<tr>
<td></td>
<td><strong>Excluded patients</strong>&lt;br&gt;● Less than 18 years of age&lt;br&gt;● Length of stay &gt;120 days&lt;br&gt;● ‘Comfort Measures Only’ documented&lt;br&gt;● Enrolled in clinical trials related to stroke&lt;br&gt;● Admitted for ‘Elective Carotid Intervention’&lt;br&gt;● Discharged to another hospital&lt;br&gt;● Left against medical advice&lt;br&gt;● Died&lt;br&gt;● Discharged to home for hospice care&lt;br&gt;● Discharged to a health care facility for hospice care&lt;br&gt;● With a documented reason for not prescribing anticoagulation therapy at discharge</td>
</tr>
<tr>
<td>Period of Assessment</td>
<td>Hospital discharge</td>
</tr>
<tr>
<td>Sources of Data</td>
<td>Prospective flow sheet, retrospective medical record review, electronic medical record</td>
</tr>
</tbody>
</table>

#### Rationale

Anticoagulant medications have been shown to reduce stroke recurrence rates in ischemic stroke patients with atrial fibrillation.

#### Source for Recommendation


1. For patients with ischemic stroke or TIA with paroxysmal (intermittent) or permanent atrial fibrillation, anticoagulation with a vitamin K antagonist (target INR 2.5; range, 2.0 to 3.0) is recommended (Class I; Level of Evidence A).

#### Method of Reporting

- Per patient: Documentation of whether anticoagulation was prescribed at discharge.
- Per patient population: Percentage of patients prescribed anticoagulation at discharge.

#### Challenges to Implementation

- Expanding numbers of antithrombotics and anticoagulants will necessitate frequent updates to the measure.

#### Analogous Measures Endorsed by Other Organizations

- Analogous measures endorsed or used by: NQF(STK-03, NQF #0436), TJC, AHA GWTG-Stroke, CDC PCNASR, AMA PCPI, and CMS Hospital IQR

\(^1\)Anticoagulant medications include warfarin, apixaban, dabigatran, rivaroxaban, intravenous heparin, and subcutaneous low molecular weight heparin. The numerator should not include patients prescribed only lower doses of these drugs intended to prevent deep vein thrombosis, rather than recurrent ischemic stroke.
### 4. Thrombolytic therapy

**Percentage of patients with acute ischemic stroke who arrive at this hospital within 2 hours of time last known well for whom IV t-PA was initiated at this hospital within 3 hours of time last known well**

<table>
<thead>
<tr>
<th>Numerator</th>
<th>Ischemic stroke patients for whom an IV thrombolytic therapy was initiated at this hospital within 3 hours (≤180 minutes) of time last known well</th>
</tr>
</thead>
</table>
| Denominator | **Included patients**  
- Acute ischemic stroke patients whose time of arrival is within 2 hours (≤120 minutes) of time last known well |
| **Excluded patients** |  
- Less than 18 years of age  
- Length of stay <2 days  
- Length of stay >120 days  
- ‘Comfort Measures Only’ documented on hospital day 0 or 1.  
- Enrolled in clinical trials related to stroke  
- Admitted for ‘Elective Carotid Intervention’  
- Time last known well to arrival in the emergency department greater than 2 hours  
- Documented reason for not starting an IV thrombolytic |

<table>
<thead>
<tr>
<th>Period of Assessment</th>
<th>First 3 hours after arrival</th>
</tr>
</thead>
</table>

**Sources of Data**

Prospective flow sheet, retrospective medical record review, electronic medical record

**Rationale**

Intravenous tPA is proven to reduce disability from ischemic stroke when administered within 3 hours of time last known well.

**Source for Recommendation**


1. 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).
2. Intravenous rtPA is reasonable in patients whose blood pressure can be lowered safely (to below 185/110 mm Hg) with antihypertensive agents, with the physician assessing the stability of the blood pressure before starting intravenous rtPA (Class I; Level of Evidence B).
3. Intravenous fibrinolytic therapy is recommended in the setting of early ischemic changes (other than frank hypodensity) on CT, regardless of their extent (Class I; Level of Evidence A).
4. Intravenous rtPA is reasonable in patients with a seizure at the time of onset of stroke if evidence suggests that residual impairments are secondary to stroke and not a postictal phenomenon (Class IIa; Level of Evidence C). Use of intravenous fibrinolysis in patients with conditions of mild stroke deficits, rapidly improving stroke symptoms, major surgery in the preceding 3 months, and recent myocardial infarction may be considered, and potential increased risk should be weighed against the anticipated benefits (Class IIb; Level of Evidence C). These circumstances require further study.
5. Intravenous fibrinolytic therapy is recommended in the setting of early ischemic changes (other than frank hypodensity) on CT, regardless of their extent (Class I; Level of Evidence A).
6. Frank hypodensity on NECT may increase the risk of hemorrhage with fibrinolysis and should be considered in treatment decisions. If frank hypodensity involves more than one third of the MCA territory, intravenous rtPA treatment should be withheld (Class III; Level of Evidence A).
- Per patient: Documentation of whether IV thrombolysis was given within three hours of last known well.
- Per patient population: Percentage of patients treated with IV thrombolysis within three hours of last known well.

<table>
<thead>
<tr>
<th>Challenges to Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of documentation or ambiguity regarding medical or patient reasons for not receiving IV thrombolysis.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analogous Measures Endorsed by Other Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analogous measures endorsed or used by: NQF (STK-04, NQF #0437), TJC, AHA GWTG-Stroke, CDC PCNASR, AMA PCPI, and CMS Hospital IQR</td>
</tr>
</tbody>
</table>
### 5. Antithrombotic Therapy by End of Day Two

Percentage of patients with ischemic stroke who had antithrombotic therapy\(^1\) administered by end of hospital day two

<table>
<thead>
<tr>
<th>Numerator</th>
<th>Ischemic stroke patients who had antithrombotic therapy administered by end of hospital day two</th>
</tr>
</thead>
</table>
| Denominator | **Included patients**  
- All patients with ischemic stroke  

**Excluded patients**  
- Less than 18 years of age  
- Length of stay >120 days  
- ‘Comfort Measures Only’ documented  
- Enrolled in clinical trials related to stroke  
- Admitted for elective carotid intervention  
- IV or IA thrombolytic administered at this hospital or within 24 hours prior to arrival  
- Documented reason for not prescribing antithrombotic therapy by end of hospital day 2 |

**Period of Assessment**  
Hospital discharge

**Sources of Data**  
Prospective flow sheet, retrospective medical record review, electronic medical record

**Rationale**
Two large trials each demonstrated a non-significant trend in reduction in death or disability when treatment with aspirin was begun within 48 hours of stroke; when data from the trials were combined, a modest but statistically significant benefit was seen.

**Source for Recommendation**
1. Oral administration of aspirin (initial dose is 325 mg) within 24 to 48 hours after stroke onset is recommended for treatment of most patients (Class I, Level of Evidence A).

**Method of Reporting**
- Per patient: Documentation of whether antithrombotic therapy was administered by end of hospital day two  
- Per patient population: Percentage of patients administered antithrombotic therapy by end of hospital day two

**Challenges to Implementation**
Expanding numbers of antithrombotics and anticoagulants will necessitate frequent updates to the measure.

**Analogous Measures Endorsed by Other Organizations**
- Analogous measures endorsed or used by: NQF (STK-05, NQF #0438), TJC, AHA GWTG-Stroke, CDC PCNASR, AMA PCPI, and CMS Hospital IQR

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\(^1\)Antithrombotics may include aspirin (acetylsalicylic acid), clopidogrel, combination aspirin+dipyridamole, warfarin, heparin, low molecular weight heparins, dabigatran, rivaroxaban, apixaban or others, prescribed at doses intended to prevent arterial thrombosis or embolism. The numerator should not include patients prescribed only lower doses of these drugs intended to prevent deep vein thrombosis, rather than recurrent ischemic stroke.
6. Discharged on Statin Medication

Percentage of patients with ischemic stroke who are discharged on statin medication

**Numerator**
Ischemic stroke patients prescribed statin medication at hospital discharge

**Denominator**
Included patients
- Ischemic stroke patients with a low-density lipoprotein (LDL) greater than or equal to 100 mg/dL, OR LDL not measured, OR who were on a lipid-lowering medication prior to hospital arrival

Excluded patients
- Less than 18 years of age
- Length of stay >120 days
- ‘Comfort Measures Only’ documented
- Enrolled in clinical trials related to stroke
- Admitted for ‘Elective Carotid Intervention’
- Discharged to another hospital
- Left against medical advice
- Died
- Discharged to home for hospice care
- Discharged to a health care facility for hospice care
- Documented reason for not prescribing statin therapy at discharge

**Period of Assessment**
Hospital discharge

**Sources of Data**
Prospective flow sheet, retrospective medical record review, electronic medical record

**Rationale**
Randomized controlled trials show that statin therapy in stroke survivors reduces the risk of subsequent cardiovascular events and recurrent fatal or nonfatal stroke.

**Source for Recommendation**

1. Statin therapy with intensive lipid-lowering effects is recommended to reduce risk of stroke and cardiovascular events among patients with ischemic stroke or TIA who have evidence of atherosclerosis, an LDL-C level ≥100 mg/dL, and who are without known CHD (Class I; Level of Evidence B).
2. For patients with atherosclerotic ischemic stroke or TIA and without known CHD, it is reasonable to target a reduction of at least 50% in LDL-C or a target LDL-C level of 70 mg/dL to obtain maximum benefit (Class Ia; Level of Evidence B).
3. Patients with ischemic stroke or TIA with elevated cholesterol or comorbid coronary artery disease should be otherwise managed according to NCEP III guidelines, which include lifestyle modification, dietary guidelines, and medication recommendations (Class I; Level of Evidence A).

**Method of Reporting**
- Per patient: Documentation of whether statin was prescribed at discharge.
- Per patient population: Percentage of patients prescribed statin at discharge.

**Challenges to Implementation**
- None anticipated.

**Analogous Measures Endorsed by Other Organizations**
- Analogous measures endorsed or used by: NQF (STK-06, #0439), TJC, AHA GWTG-Stroke, and CDC PCNASR, and CMS Hospital IQR
7. Stroke Education

Percentage of patients with ischemic stroke who receive stroke education prior to hospital discharge.

<table>
<thead>
<tr>
<th>Numerator</th>
<th>Ischemic stroke patients who receive, or whose caregivers receive, educational materials addressing all of the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Activation of emergency medical system – to call 911 when a stroke is suspected</td>
</tr>
<tr>
<td></td>
<td>• Need for follow-up after discharge</td>
</tr>
<tr>
<td></td>
<td>• Medications prescribed at discharge – informed regarding purpose, correct dose, and major side effects and precautions associated with each prescribed medication</td>
</tr>
<tr>
<td></td>
<td>• Risk factors for stroke</td>
</tr>
<tr>
<td></td>
<td>• Warning signs and symptoms of stroke</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Denominator</th>
<th>Included patients</th>
<th>Excluded patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>• All patients with ischemic stroke</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Less than 18 years of age</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Length of stay &gt;120 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ‘Comfort Measures Only’ documented</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Enrolled in clinical trials related to stroke</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Admitted for ‘Elective Carotid Intervention’</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Discharged to another hospital</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Left against medical advice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Died</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Discharged to home for hospice care</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Discharged to a health care facility for hospice care</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Documented reason for not providing stroke education at discharge</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Period of Assessment</th>
<th>Hospital discharge</th>
</tr>
</thead>
</table>

| Sources of Data | Prospective flow sheet, retrospective medical record review, electronic medical record |

<table>
<thead>
<tr>
<th>Rationale</th>
</tr>
</thead>
</table>
Stroke education provides stroke survivors and their families/caregivers with needed information on risk factors for stroke, how to reduce risk, how to manage their medications, how to recognize warning signs for stroke, and what to do in case of new acute stroke symptoms. This information should promote adherence to therapeutic recommendations for prevention of recurrent stroke, and increase the number of patients eligible for acute stroke therapies, thereby improving health outcomes.

<table>
<thead>
<tr>
<th>Source for Recommendation</th>
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</table>
From the 2010 AHA/ASA Scientific Statement: Comprehensive Overview of Nursing and Interdisciplinary Rehabilitation Care of the Stroke Patient (Miller et al, Stroke, 41:2402-2448):
1. Follow-up contacts with family caregivers should be arranged and performed after discharge by a designated healthcare provider (HCP) in inpatient and outpatient settings (Class I; Level of Evidence A)
2. A designated HCP should provide information in a variety of formats as appropriate (eg, written information, individual face-to-face education, family conferences, World Wide Web sites, stroke organizations) (Class I; Level of Evidence C)
3. Assessment and reinforcement of caregiver knowledge of stroke warning signs, lifestyle changes, and risk factors for secondary stroke prevention is recommended in inpatient and outpatient
4. Additional areas for caregiver education and training should include medication management, the survivor’s condition and treatment plans, and poststroke complications. *(Class I; Level of Evidence B)*


5. Activation of the 9-1-1 system by patients or other members of the public is strongly recommended *(Class I; Level of Evidence B)*

<table>
<thead>
<tr>
<th>Method of Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Per patient:</strong> Documentation of whether stroke education was provided prior to hospital discharge.</td>
</tr>
<tr>
<td><strong>Per patient population:</strong> Percentage of patients provided stroke education prior to hospital discharge.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Challenges to Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty in providing effective education in patients who do not speak English, who have low literacy skills and who lack caregiver support.</td>
</tr>
<tr>
<td>Potential lack of clarity in documentation of each required element of stroke education.</td>
</tr>
<tr>
<td>There is uncertainty regarding whether providing educational materials alone is sufficient to change health-related behaviours and improve outcomes. Additional research is needed on how to most effectively provide education that changes behaviour, suitable for reliable implementation at hospitals nationwide (see Discussion for details).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analogous Measures Endorsed by Other Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analogous measures endorsed or used by: TJC, AHA GWTG-Stroke, and CDC PCNASR, and CMS Hospital IQR.</td>
</tr>
</tbody>
</table>
8. Smoking Cessation Counseling

Percentage of patients with ischemic stroke with a history of smoking cigarettes, who are, or whose caregivers are, given smoking cessation advice or counseling during the hospital stay

<table>
<thead>
<tr>
<th>Numerator</th>
<th>Patients who were given, or whose caregivers were given, smoking cessation advice or counseling during the hospital stay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denominator</td>
<td>Included patients</td>
</tr>
<tr>
<td></td>
<td>• All patients with ischemic stroke</td>
</tr>
</tbody>
</table>

**Excluded patients**
- Less than 18 years of age
- Length of stay >120 days
- ‘Comfort Measures Only’ documented
- Enrolled in clinical trials related to stroke
- Admitted for ‘Elective Carotid Intervention’
- Discharged to another hospital
- Left against medical advice
- Died
- Discharged to home for hospice care
- Discharged to a health care facility for hospice care
- Patient did not smoke cigarettes during the past year
- Documented reason for not providing smoking cessation advice or counseling

**Period of Assessment**
Hospital stay

**Sources of Data**
Prospective flow sheet, retrospective medical record review, electronic medical record

**Rationale**
Cigarette smoking is a strong risk factor for ischemic stroke. Smoking cessation has been associated with a reduction in the tobacco-related risk of cardiovascular events and stroke.

**Source for Recommendation**
1. Healthcare providers should strongly advise every patient with stroke or TIA who has smoked in the past year to quit (Class I; Level of Evidence C)
2. Counseling, nicotine products, and oral smoking cessation medications are effective for helping smokers quit (Class I; Level of Evidence A)

**Method of Reporting**
- Per patient: Documentation of whether stroke education at discharge.
- Per patient population: Percentage of patients provided stroke education at discharge.

**Challenges to Implementation**
None anticipated.

**Analogous Measures Endorsed by Other Organizations**
- Analogous measures endorsed or used by: NQF (#0027), TJC, AHA GWTG-Stroke, and CDC PCNASR
### 9. Assessed for Rehabilitation

Percentage of patients with ischemic stroke assessed for, or who received, rehabilitation services

| Numerator | | Patients who were assessed for, or who received, rehabilitation services during the hospital stay |
|---|---|
| Denominator | Included patients | All patients with ischemic stroke |
| | Excluded patients | | |
| | Less than 18 years of age | | |
| | Length of stay >120 days | | |
| | ‘Comfort Measures Only’ documented | | |
| | Enrolled in clinical trials related to stroke | | |
| | Admitted for ‘Elective Carotid Intervention’ | | |
| | Discharged to another hospital | | |
| | Left against medical advice | | |
| | Died | | |
| | Discharged to home for hospice care | | |
| | Discharged to a health care facility for hospice care | | |

**Period of Assessment**
Hospital stay

**Sources of Data**
Prospective flow sheet, retrospective medical record review, electronic medical record

**Rationale**
Stroke is a leading cause of serious, long-term disability. Stroke rehabilitation by an interdisciplinary team leads to reduced morbidity and improved functional outcomes.

**Source for Recommendation**
1. The use of comprehensive specialized stroke care (stroke units) that incorporates rehabilitation is recommended (Class I; Level of Evidence A).

**Method of Reporting**
- Per patient: Documentation of whether the patient was assessed for, or received, rehabilitation services during the hospital stay.
- Per patient population: Percentage of patients who were assessed for, or received, rehabilitation services during the hospital stay.

**Challenges to Implementation**
- None identified. However, compliance to the measure is already quite high, and the association between assessment and initiation of an appropriate rehabilitation plan is unmeasured, leaving uncertainty regarding the impact of the measure on improved outcomes. (See Discussion for details).

**Analogous Measures Endorsed by Other Organizations**
- Analogous measures endorsed or used by: NQF (STK-10, #0441), TJC, AHA GWTG-Stroke, CDC PCNASR, and CMS Hospital IQR.
### 10. National Institutes of Health Stroke Scale (NIHSS) Score on Arrival

Percentage of patients with ischemic stroke in whom the NIHSS was measured, and a total score recorded, as part of initial evaluation upon arrival at the hospital.

<table>
<thead>
<tr>
<th>Numerator</th>
<th>Include/Exclude</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients in whom the NIHSS was measured, and a total score recorded, within 24 hours of hospital arrival or, if given intravenous or intra-arterial reperfusion therapy, prior to therapy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Denominator</th>
<th>Included patients</th>
<th>Excluded patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ischemic stroke patients</td>
<td>Less than 18 years of age</td>
<td>Length of stay &gt;120 days</td>
</tr>
<tr>
<td></td>
<td>Enrolled in clinical trials related to stroke</td>
<td>Admitted for elective carotid intervention</td>
</tr>
</tbody>
</table>

**Period of Assessment**

First 24 hours after arrival

**Sources of Data**

Prospective flow sheet, retrospective medical record review, electronic medical record

**Rationale**

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

**Source for Recommendation**


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

**Method of Reporting**

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

**Challenges to Implementation**

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

**Analogous Measures Endorsed by Other Organizations**

- None. However, a similar measure is being piloted by TJC as part of Comprehensive Stroke Center certification.
### 11. Time to Intravenous Thrombolytic Therapy

Percentage of patients with ischemic stroke receiving intravenous tissue plasminogen activator (tPA) therapy during the hospital stay and having a time from hospital arrival to initiation of thrombolytic therapy administration (door-to-needle time) of 60 minutes or less.

<table>
<thead>
<tr>
<th><strong>Numerator</strong></th>
<th><strong>Denominator</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Patients having a time from hospital arrival to initiation of thrombolytic therapy administration (door-to-needle time) of 60 minutes or less.</td>
<td><strong>Included patients</strong></td>
</tr>
<tr>
<td><strong>Excluded patients</strong></td>
<td>• Patients receiving intravenous tPA therapy within 4.5 hours (270 minutes) of last known well.</td>
</tr>
<tr>
<td>• Less than 18 years of age</td>
<td>• Less than 18 years of age</td>
</tr>
<tr>
<td>• Length of stay &gt;120 days</td>
<td>• Length of stay &gt;120 days</td>
</tr>
<tr>
<td>• Stroke occurred while in hospital</td>
<td>• Stroke occurred while in hospital</td>
</tr>
<tr>
<td>• Patients received in transfer from another inpatient or outpatient facility</td>
<td>• Patients received in transfer from another inpatient or outpatient facility</td>
</tr>
<tr>
<td>• Enrolled in clinical trials related to stroke</td>
<td>• Enrolled in clinical trials related to stroke</td>
</tr>
<tr>
<td>• Admitted for elective carotid intervention</td>
<td>• Admitted for elective carotid intervention</td>
</tr>
<tr>
<td>• Documented reason for delay in initiating tPA</td>
<td>• Documented reason for delay in initiating tPA</td>
</tr>
</tbody>
</table>

**Period of Assessment**
First 24 hours after arrival

**Sources of Data**
Prospective flow sheet, retrospective medical record review, electronic medical record

**Rationale**
Randomized controlled trials show that intravenous tPA reduces disability from stroke at 90 days

**Source for Recommendation**

1. In patients eligible for intravenous rtPA, benefit of therapy is time dependent, and treatment should be initiated as quickly as possible. The door-to-needle time (time of bolus administration) should be within 60 minutes from hospital arrival (Class I; Level of Evidence A).

**Method of Reporting**
- Per patient: Documentation of whether the time from hospital arrival to initiation of thrombolytic therapy administration was 60 minutes or less
- Per patient population: Percentage of patients in whom the time from hospital arrival to initiation of thrombolytic therapy administration was 60 minutes or less

**Challenges to Implementation**
- Timed data are usually less reliable than categorical data elements.
- However, feasibility is suggested based on initial use of the measure within AHA GWTG-Stroke, where it is the primary target for improvement in the AHA Target: Stroke quality improvement initiative.

**Analogous Measures Endorsed by Other Organizations**
- Similar measures have been endorsed or used by: NQF(#1952), AHA GWTG-Stroke.
## 12. Cardiac Monitoring

Percentage of patients with ischemic stroke who receive continuous cardiac rhythm monitoring during the first 24 hours of admission

| Numerator | Patients who receive continuous cardiac rhythm monitoring within 2 hours of arrival on a hospital unit, and for whom rhythm monitoring is continued through the first 24 hours of hospital admission.  
|           | Rhythm monitor should allow real-time review of rhythm  
|           | Monitoring may be temporarily discontinued for diagnostic testing |

| Denominator | Included patients |
|            | All ischemic stroke |

| Excluded patients | Less than 18 years of age  
|                   | Length of stay > 120 days  
|                   | Stroke occurred while in hospital  
|                   | ‘Comfort measures only’ documented on hospital day 0 or 1  
|                   | Enrolled in clinical trials related to stroke  
|                   | Admitted for elective carotid intervention  
|                   | Discharged before 24 hours |

| Period of Assessment | First 24 hours after admission |
| Sources of Data | Prospective flow sheet, retrospective medical record review, electronic medical record |

### Rationale

Cardiac disease is a frequent comorbid condition in patients presenting with acute stroke. Myocardial injury, as identified by elevations of serum troponin, occurs in approximately 18.1% of patients with acute stroke and 2-3% of patients hospitalized with acute stroke have an associated acute myocardial infarction during their hospitalization, putting them at risk for potentially dangerous cardiac arrhythmias. Stroke involving the insular cortex of the brain are associated with cardiac arrhythmias and sudden death. Prompt diagnosis and management of cardiac arrhythmias occurring in the setting of acute ischemic stroke is critical and is improved with the use of monitoring. In addition, atrial fibrillation, either continuous or paroxysmal, is a common cause of cardiac embolism leading to ischemic stroke. In many cases, atrial fibrillation was not previously diagnosed. Paroxysmal atrial fibrillation may be missed on an electrocardiogram. Expedient identification of presence of atrial fibrillation assists in determination of appropriate management for secondary stroke prevention.

### Source for Recommendation


1. Cardiac monitoring is recommended to screen for atrial fibrillation and other potentially serious cardiac arrhythmias that would necessitate emergency cardiac interventions. Cardiac monitoring should be performed for at least the first 24 hours \((\text{Class I; Level of Evidence B)}\)

### Method of Reporting

- Per patient: Documentation of whether the patient received continuous cardiac rhythm monitoring within 2 hours of admission on a hospital unit, and for whom rhythm monitoring was continued through the first 24 hours of hospital admission.
- Per patient population: Percentage of patients who received continuous cardiac rhythm monitoring within 2 hours of admission on a hospital unit, and for whom rhythm monitoring was continued through the first 24 hours of hospital admission.

### Challenges to Implementation
- Establishing timing of initiation and discontinuation of continuous cardiac monitoring may be difficult.

<table>
<thead>
<tr>
<th>Analogous Measures Endorsed by Other Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>- None.</td>
</tr>
</tbody>
</table>
13. Early Carotid Imaging

Percentage of patients with transient ischemic attack (TIA) within the last 72 hours who receive carotid imaging within 24 hours of hospital admission

<table>
<thead>
<tr>
<th>Numerator</th>
<th>Patients with TIA within the last 72 hours who receive carotid imaging—by either ultrasound, CT angiography, MRI angiography or conventional angiograph—within 24 hours</th>
</tr>
</thead>
</table>
| Denominator | Included patients  
• All ischemic stroke |
| Excluded patients |  
• Less than 18 years of age  
• Length of stay >120 days  
• Stroke occurred while in hospital  
• ‘Comfort measures only’ documented on hospital day 0 or 1  
• Enrolled in clinical trials related to stroke  
• Admitted for elective carotid intervention  
• Documentation that the patient would not be eligible for carotid endarterectomy or stenting if a carotid stenosis was found  
• Documentation that the stroke location is not in the territory of a single carotid artery  
• Documentation that a previous carotid imaging study was obtained within the last month |

Period of Assessment  
First 24 hours after assessment in a hospital inpatient setting

Sources of Data  
Prospective flow sheet, retrospective medical record review, electronic medical record

Rationale  
Patients with symptomatic high grade carotid stenosis are at high risk for recurrent events and may benefit from early revascularization with CEA or CAS. Therefore, if symptoms/signs are referable to the carotid territory, early surveillance of the carotid arteries is critical for detecting a high risk population appropriate for intervention.

Source for Recommendation  
1. Noninvasive imaging of the cervicocephalic vessels should be performed routinely as part of the evaluation of patients with suspected TIAs (Class I, Level of Evidence A).  
2. Patients with transient ischemic neurological symptoms should undergo neuroimaging evaluation within 24 hours of symptom onset or as soon as possible in patients with delayed presentations (Class I, Level of Evidence B).

Method of Reporting  
• Per patient: Documentation of whether the patient received continuous cardiac rhythm monitoring within 2 hours of admission on a hospital unit, and for whom rhythm monitoring was continued through the first 24 hours of hospital admission.  
• Per patient population: Percentage of patients who received continuous cardiac rhythm monitoring within 2 hours of admission on a hospital unit, and for whom rhythm monitoring was continued through the first 24 hours of hospital admission.

Challenges to Implementation  
• The precise timing of symptom onset may be difficult to elicit, particularly if there is a stuttering course.  
• Clinicians evaluating the patient may have difficulty identifying the location of the ischemia, including whether the ischemia was in the carotid territory.
- Vascular imaging may not be available within 24 hours on weekends and holidays
- The specificity of administrative billing codes for TIA is lower than for ischemic stroke
- Care provision could span multiple settings—e.g. with initial evaluation in an emergency department and subsequent next-day outpatient carotid imaging assessment

**Analogous Measures Endorsed by Other Organizations**

- None.