

Candidate Performance Measure Profile

Performance Measure Name: ASR-1 Thrombolytic Therapy

Description: Acute ischemic stroke patients who arrive at this hospital within 2 hours of time last known well and for whom IV t-PA was initiated at this hospital within 3 hours of time last known well.

Setting: Emergency Department

Rationale: The administration of thrombolytic agents to carefully screened, eligible patients with acute ischemic stroke has been shown to be beneficial in several clinical trials. These included two positive randomized controlled trials in the United States: The National Institute of Neurological Disorders and Stroke (NINDS) Studies, Part I and Part II. Based on the results of these studies, the Food and Drug Administration (FDA) approved the use of intravenous recombinant tissue plasminogen activator (IV r-TPA or t-PA) for the treatment of acute ischemic stroke when given within 3 hours of stroke symptom onset. A large meta-analysis controlling for factors associated with stroke outcome confirmed the benefit of IV t-PA in patients treated within 3 hours of symptom onset. While controversy still exists among some specialists, the major society practice guidelines developed in the United States all recommend the use of IV t-PA for eligible patients. Physicians with experience and skill in stroke management and the interpretation of CT scans should supervise treatment.

The European Cooperative Acute Stroke Study (ECASS) III trial indicated that intravenous rTPA can be given safely to, and can improve outcomes for, carefully selected patients treated 3 to 4.5 hours after stroke; however, as the NINDS investigators concluded, the earlier that IV thrombolytic therapy is initiated, the better the patient outcome. Therefore, the target for IV t-PA initiation remains within 3 hours of time last known well. The administration of IV thrombolytic therapy beyond 3 hours of stroke symptom onset has not been FDA approved.

Type of Measure: Process **Risk Adjustment:** No **Data reported as:** Proportion

Numerator Statement: Acute ischemic stroke patients for whom IV thrombolytic (t-PA) therapy was initiated at this hospital within 3 hours (≤ 180 min.) of time last known well

Included Populations: As above

Excluded Populations: None

Denominator Statement: Acute ischemic stroke patients whose time of arrival is within 2 hours (≤ 120 min.) of time last known well

Included Populations: As above

Excluded Populations:

- Patients less than 18 years of age
- Time Last Known Well to arrival in ED > 2 hours
- Patients with a documented Reason for Extending the Initiation of IV Thrombolytic
- Patients with a documented Reason for Not Initiating IV Thrombolytic

Selected References:

• H., R. Adams, G. Del Zoppo, L. B. Goldstein, Association Stroke Council of the American Heart, and Association American Stroke. "Guidelines for the Early Management of Patients with

Candidate Performance Measure Profile

Ischemic Stroke: 2005 Guidelines Update a Scientific Statement from the Stroke Council of the American Heart Association/American Stroke Association." [In eng]. *Stroke* 36, no. 4 (Apr 2005): 916-23.

- Adams, H. P., Jr., G. del Zoppo, M. J. Alberts, D. L. Bhatt, L. Brass, A. Furlan, R. L. Grubb, *et al.* "Guidelines for the Early Management of Adults with Ischemic Stroke: A Guideline from the American Heart Association/American Stroke Association Stroke Council, Clinical Cardiology Council, Cardiovascular Radiology and Intervention Council, and the Atherosclerotic Peripheral Vascular Disease and Quality of Care Outcomes in Research Interdisciplinary Working Groups: The American Academy of Neurology Affirms the Value of This Guideline as an Educational Tool for Neurologists." [In eng]. *Stroke* 38, no. 5 (May 2007): 1655-711.
 - Albers, G. W., P. Amarenco, J. D. Easton, R. L. Sacco, and P. Teal. "Antithrombotic and Thrombolytic Therapy for Ischemic Stroke: The Seventh Accp Conference on Antithrombotic and Thrombolytic Therapy." [In eng]. *Chest* 126, no. 3 Suppl (Sep 2004): 483S-512S.
 - Brott, T. G., W. M. Clark, S. C. Fagan, J. C. Grotta, L. N. Hopkins, E. C. Jauch, R. E. Latchaw, and S. Starkman. "Stroke: The First Hours. Guidelines for Acute Treatment." *National Stroke Association (NSA)* (2000).
 - Centers for Disease Control and Prevention. "Prevalence and Most Common Causes of Disability among Adults--United States, 2005." [In eng]. *MMWR Morb Mortal Wkly Rep* 58, no. 16 (May 1 2009): 421-6.
 - Del Zoppo, G. J., J. L. Saver, E. C. Jauch, H. P. Adams, Jr., and Council American Heart Association Stroke. "Expansion of the Time Window for Treatment of Acute Ischemic Stroke with Intravenous Tissue Plasminogen Activator: A Science Advisory from the American Heart Association/American Stroke Association." [In eng]. *Stroke* 40, no. 8 (Aug 2009): 2945-8.
 - "Diagnosis and Initial Treatment of Ischemic Stroke." *Institute for Clinical Systems Improvement* (2001).
 - Fagan, S. C., L. B. Morgenstern, A. Petitta, R. E. Ward, B. C. Tilley, J. R. Marler, S. R. Levine, *et al.* "Cost-Effectiveness of Tissue Plasminogen Activator for Acute Ischemic Stroke. Ninds Rt-Pa Stroke Study Group." [In eng]. *Neurology* 50, no. 4 (Apr 1998): 883-90.
 - Guyatt, G. H., E. A. Akl, M. Crowther, D. D. Gutterman, H. J. Schuunemann, Therapy American College of Chest Physicians Antithrombotic, and Panel Prevention of Thrombosis. "Executive Summary: Antithrombotic Therapy and Prevention of Thrombosis, 9th Ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines." [In eng]. *Chest* 141, no. 2 Suppl (Feb 2012): 7S-47S.
 - Hacke, W., G. Donnan, C. Fieschi, M. Kaste, R. von Kummer, J. P. Broderick, T. Brott, *et al.* "Association of Outcome with Early Stroke Treatment: Pooled Analysis of Atlantis, Ecass, and Ninds Rt-Pa Stroke Trials." [In eng]. *Lancet* 363, no. 9411 (Mar 6 2004): 768-74.
 - Hacke, W., M. Kaste, E. Bluhmki, M. Brozman, A. Davalos, D. Guidetti, V. Larrue, *et al.* "Thrombolysis with Alteplase 3 to 4.5 Hours after Acute Ischemic Stroke." [In eng]. *N Engl J Med* 359, no. 13 (Sep 25 2008): 1317-29.
 - Hacke, W., M. Kaste, C. Fieschi, D. Toni, E. Lesaffre, R. von Kummer, G. Boysen, *et al.* "Intravenous Thrombolysis with Recombinant Tissue Plasminogen Activator for Acute Hemispheric Stroke. The European Cooperative Acute Stroke Study (Ecass)." [In eng]. *JAMA* 274, no. 13 (Oct 4 1995): 1017-25.
 - Jauch, E. C., J. L. Saver, H. P. Adams, Jr., A. Bruno, J. J. Connors, B. M. Demaerschalk, P. Khatri, *et al.* "Guidelines for the Early Management of Patients with Acute Ischemic Stroke: A Guideline for Healthcare Professionals from the American Heart Association/American Stroke Association." [In Eng]. *Stroke* (Jan 31 2013).
 - Kwiatkowski, T. G., R. B. Libman, M. Frankel, B. C. Tilley, L. B. Morgenstern, M. Lu, J. P. Broderick, *et al.* "Effects of Tissue Plasminogen Activator for Acute Ischemic Stroke at One Year. National Institute of Neurological Disorders and Stroke Recombinant Tissue Plasminogen Activator Stroke Study Group." [In eng]. *N Engl J Med* 340, no. 23 (Jun 10 1999): 1781-7.
 - "Management of Patients with Stroke: Rehabilitation, Prevention and Management of Complications, and Discharge Planning. A National Clinical Guideline.".
- <http://www.sign.ac.uk/guidelines/fulltext/118/>.

Candidate Performance Measure Profile

- Marler, J. R., B. C. Tilley, M. Lu, T. G. Brott, P. C. Lyden, J. C. Grotta, J. P. Broderick, *et al.* "Early Stroke Treatment Associated with Better Outcome: The Ninds Rt-Pa Stroke Study." [In eng]. *Neurology* 55, no. 11 (Dec 12 2000): 1649-55.
- Roger, V. L., A. S. Go, D. M. Lloyd-Jones, E. J. Benjamin, J. D. Berry, W. B. Borden, D. M. Bravata, *et al.* "Heart Disease and Stroke Statistics--2012 Update: A Report from the American Heart Association." [In eng]. *Circulation* 125, no. 1 (Jan 3 2012): e2-e220.
- Sacco, R. L., R. Adams, G. Albers, M. J. Alberts, O. Benavente, K. Furie, L. B. Goldstein, *et al.* "Guidelines for Prevention of Stroke in Patients with Ischemic Stroke or Transient Ischemic Attack: A Statement for Healthcare Professionals from the American Heart Association/American Stroke Association Council on Stroke: Co-Sponsored by the Council on Cardiovascular Radiology and Intervention: The American Academy of Neurology Affirms the Value of This Guideline." [In eng]. *Stroke* 37, no. 2 (Feb 2006): 577-617.
- Saposnik, G., J. Fang, M. K. Kapral, J. V. Tu, M. Mamdani, P. Austin, S. C. Johnston, Network Investigators of the Registry of the Canadian Stroke, and Group Stroke Outcomes Research Canada Working. "The Iscore Predicts Effectiveness of Thrombolytic Therapy for Acute Ischemic Stroke." [In eng]. *Stroke* 43, no. 5 (May 2012): 1315-22.
- "Tissue Plasminogen Activator for Acute Ischemic Stroke. The National Institute of Neurological Disorders and Stroke Rt-Pa Stroke Study Group." [In eng]. *N Engl J Med* 333, no. 24 (Dec 14 1995): 1581-7.
- Wardlaw, J. M., V. Murray, E. Berge, and G. J. Del Zoppo. "Thrombolysis for Acute Ischaemic Stroke." [In eng]. *Cochrane Database Syst Rev*, no. 4 (2009): CD000213.
- U.S. Drug and Food Administration. (2015). "Label-Alteplase-Food and Drug."

Original Performance Measure Source: STK-4

Candidate Performance Measure Profile

Performance Measure Name: ASR-2 Antithrombotic Therapy

Description: Ischemic stroke patients administered antithrombotic therapy prior to transfer / discharge from the emergency department, OR by the end of hospital day 2 if admitted to the hospital for inpatient care.

Setting: Emergency Department

Rationale: The effectiveness of antithrombotic agents in reducing stroke mortality, stroke-related morbidity and recurrence rates has been studied in several large clinical trials. While the use of these agents for patients with acute ischemic stroke and transient ischemic attacks continues to be the subject of study, substantial evidence is available from completed studies. Data at this time suggest that antithrombotic therapy should be administered within 2 days of symptom onset in acute ischemic stroke patients to reduce stroke mortality and morbidity as long as no contraindications exist.

Anticoagulants at doses to prevent venous thromboembolism are insufficient antithrombotic therapy to prevent recurrent ischemic stroke or TIA.

Type of Measure: Process **Risk Adjustment:** No **Data reported as:** Proportion

Numerator Statement: Ischemic stroke patients who had antithrombotic therapy administered prior to transfer / discharge from the emergency department, OR by end of hospital day 2 if admitted to the hospital

Included Populations: As above

Excluded Populations: None

Denominator Statement: Ischemic stroke patients

Included Populations: As above

Excluded Populations:

- Patients less than 18 years of age
- Patients with Comfort Measures Only documented on day of or day after arrival
- Patients with IV OR IA Thrombolytic Therapy Administered at This Hospital or Within 24 Hours Prior to Arrival
- Patients with a documented Reason for Not Administering Antithrombotic Therapy By End of Hospital Day 2

Selected References:

- Adams, H., R. Adams, G. Del Zoppo, L. B. Goldstein, Association Stroke Council of the American Heart, and Association American Stroke. "Guidelines for the Early Management of Patients with Ischemic Stroke: 2005 Guidelines Update a Scientific Statement from the Stroke Council of the American Heart Association/American Stroke Association." [In eng]. Stroke 36, no. 4 (Apr 2005): 916-23.
- Adams, H. P., Jr., G. del Zoppo, M. J. Alberts, D. L. Bhatt, L. Brass, A. Furlan, R. L. Grubb, et al. "Guidelines for the Early Management of Adults with Ischemic Stroke: A Guideline from the American Heart Association/American Stroke Association Stroke Council, Clinical Cardiology Council, Cardiovascular Radiology and Intervention Council, and the Atherosclerotic Peripheral Vascular Disease and Quality of Care Outcomes in Research Interdisciplinary Working Groups:

Candidate Performance Measure Profile

- The American Academy of Neurology Affirms the Value of This Guideline as an Educational Tool for Neurologists." [In eng]. *Stroke* 38, no. 5 (May 2007): 1655-711.
- Albers, G. W., P. Amarenco, J. D. Easton, R. L. Sacco, and P. Teal. "Antithrombotic and Thrombolytic Therapy for Ischemic Stroke." *Chest* 119 (2001): 300-20.
 - Antithrombotic Trialists, Collaboration. "Collaborative Meta-Analysis of Randomised Trials of Antiplatelet Therapy for Prevention of Death, Myocardial Infarction, and Stroke in High Risk Patients." [In eng]. *BMJ* 324, no. 7329 (Jan 12 2002): 71-86.
 - Brott, T. G., W. M. Clark, S. C. Fagan, J. C. Grotta, L. N. Hopkins, E. C. Jauch, R. E. Latchaw, and S. Starkman. "Stroke: The First Hours. Guidelines for Acute Treatment." National Stroke Association (NSA) (2000).
 - Centers for Disease Control and Prevention. "Prevalence and Most Common Causes of Disability among Adults--United States, 2005." [In eng]. *MMWR Morb Mortal Wkly Rep* 58, no. 16 (May 1 2009): 421-6.
 - Chen, Z. M., P. Sandercock, H. C. Pan, C. Counsell, R. Collins, L. S. Liu, J. X. Xie, C. Warlow, and R. Peto. "Indications for Early Aspirin Use in Acute Ischemic Stroke : A Combined Analysis of 40 000 Randomized Patients from the Chinese Acute Stroke Trial and the International Stroke Trial. On Behalf of the Cast and Ist Collaborative Groups." [In eng]. *Stroke* 31, no. 6 (Jun 2000): 1240-9.
 - Coull, B. M., L. S. Williams, L. B. Goldstein, J. F. Meschia, D. Heitzman, S. Chaturvedi, K. C. Johnston, et al. "Anticoagulants and Antiplatelet Agents in Acute Ischemic Stroke: Report of the Joint Stroke Guideline Development Committee of the American Academy of Neurology and the American Stroke Association (a Division of the American Heart Association)." [In eng]. *Stroke* 33, no. 7 (Jul 2002): 1934-42.
 - Eccles, M., N. Freemantle, and J. Mason. "North of England Evidence Based Guideline Development Project: Guideline on the Use of Aspirin as Secondary Prophylaxis for Vascular Disease in Primary Care. North of England Aspirin Guideline Development Group." [In eng]. *BMJ* 316, no. 7140 (Apr 25 1998): 1303-9.
 - "The European Stroke Prevention Study (Esp). Principal End-Points. The Esps Group." [In eng]. *Lancet* 2, no. 8572 (Dec 12 1987): 1351-4.
 - Furie, K. L., S. E. Kasner, R. J. Adams, G. W. Albers, R. L. Bush, S. C. Fagan, J. L. Halperin, et al. "Guidelines for the Prevention of Stroke in Patients with Stroke or Transient Ischemic Attack: A Guideline for Healthcare Professionals from the American Heart Association/American Stroke Association." [In eng]. *Stroke* 42, no. 1 (Jan 2011): 227-76.
 - Gaspoz, J. M., P. G. Coxson, P. A. Goldman, L. W. Williams, K. M. Kuntz, M. G. Hunink, and L. Goldman. "Cost Effectiveness of Aspirin, Clopidogrel, or Both for Secondary Prevention of Coronary Heart Disease." [In eng]. *N Engl J Med* 346, no. 23 (Jun 6 2002): 1800-6.
 - Guyatt, G. H., E. A. Akl, M. Crowther, D. D. Gutterman, H. J. Schunemann, Therapy American College of Chest Physicians Antithrombotic, and Panel Prevention of Thrombosis. "Executive Summary: Antithrombotic Therapy and Prevention of Thrombosis, 9th Ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines." [In eng]. *Chest* 141, no. 2 Suppl (Feb 2012): 7S-47S.
 - "The International Stroke Trial (Ist): A Randomised Trial of Aspirin, Subcutaneous Heparin, Both, or Neither among 19435 Patients with Acute Ischaemic Stroke. International Stroke Trial Collaborative Group." [In eng]. *Lancet* 349, no. 9065 (May 31 1997): 1569-81.
 - Jauch, E. C., J. L. Saver, H. P. Adams, Jr., A. Bruno, J. J. Connors, B. M. Demaerschalk, P. Khatri, et al. "Guidelines for the Early Management of Patients with Acute Ischemic Stroke: A Guideline for Healthcare Professionals from the American Heart Association/American Stroke Association." [In Eng]. *Stroke* (Jan 31 2013).
 - Johnson, E. S., S. F. Lanes, C. E. Wentworth, 3rd, M. H. Satterfield, B. L. Abebe, and L. W. Dicker. "A Metaregression Analysis of the Dose-Response Effect of Aspirin on Stroke." [In eng]. *Arch Intern Med* 159, no. 11 (Jun 14 1999): 1248-53.

Candidate Performance Measure Profile

- Roger, V. L., A. S. Go, D. M. Lloyd-Jones, E. J. Benjamin, J. D. Berry, W. B. Borden, D. M. Bravata, et al. "Heart Disease and Stroke Statistics--2012 Update: A Report from the American Heart Association." [In eng]. *Circulation* 125, no. 1 (Jan 3 2012): e2-e220.
- Sacco, R. L., R. Adams, G. Albers, M. J. Alberts, O. Benavente, K. Furie, L. B. Goldstein, et al. "Guidelines for Prevention of Stroke in Patients with Ischemic Stroke or Transient Ischemic Attack: A Statement for Healthcare Professionals from the American Heart Association/American Stroke Association Council on Stroke: Co-Sponsored by the Council on Cardiovascular Radiology and Intervention: The American Academy of Neurology Affirms the Value of This Guideline." [In eng]. *Stroke* 37, no. 2 (Feb 2006): 577-617.

Original Performance Measure Source: STK-5

DRAFT

Candidate Performance Measure Profile

Performance Measure Name: ASR-3 CT Initiation

Description: Ischemic or hemorrhagic stroke patients for whom a Head CT or MRI Scan was initiated within 25 minutes of arrival in the hospital emergency department.

Setting: Emergency Department

Rationale: Improved access to diagnostic imaging assists clinicians in the decision making process and treatment plans. Stroke is the fourth leading cause of death in the United States. Each year, about 795,000 people suffer a stroke. About 600,000 of these are first attacks, and 185,000 are recurrent attacks (AHA, 2015). Decreasing radiology turnaround times will enhance decision making capabilities for patients with ischemic or hemorrhagic stroke. The Food and Drug Administration (FDA) approved the use of tissue plasminogen activator (t-PA) for treatment of acute ischemic stroke when given within three hours of stroke symptom onset (NSA, 2000). Of all strokes, 87 percent are ischemic, 10 percent are intracerebral hemorrhage, and 3 percent are subarachnoid hemorrhage (NINDS, 2004). Because of the therapeutic time window for treatment possibilities, timely initiation of the CT or MRI scan are imperative and will directly impact the quality of care a patient receives (Jauch, 2013).

Type of Measure: Process **Risk Adjustment:** No **Data reported as:** Proportion

Numerator Statement: Ischemic or hemorrhagic stroke patients for whom a Head CT or MRI Scan was initiated within 25 minutes of arrival in the hospital emergency department.

Included Populations: As above

Excluded Populations: None

Denominator Statement: Ischemic or hemorrhagic stroke patients

Included Populations: As above

Excluded Populations:

- Patients less than 18 years of age
- Patients who expired
- Patients who left the ED against medical advice
- Patients with *Comfort Measures Only* documented in the emergency department

Selected References:

- American Heart Association. Heart Disease and Stroke statistics, 2015.
- Jauch, E. C., J. L. Saver, H. P. Adams, Jr., A. Bruno, J. J. Connors, B. M. Demaerschalk, P. Khatri, et al. "Guidelines for the Early Management of Patients with Acute Ischemic Stroke: A Guideline for Healthcare Professionals from the American Heart Association/American Stroke Association." [In Eng]. *Stroke* (Jan 31 2013).
- Stroke Center. Stroke Statistics 2009.
- STROKE the First Hours Guidelines for Acute Treatment, *National Stroke Association*, 2000.
- The ATLANTIS, ECASS, and NINDS rt-PA Study Group Investigators. Association of Outcome with early stroke treatment: pooled analysis of ATLANTIS, ECASS, and NINDS rt-PA stroke Trials. *Lancet* 2004;363:768-774.

Original Performance Measure Source: OP-23

Candidate Performance Measure Profile

Performance Measure Name: ASR-4a Door to Transfer / Discharge
ASR-4b Door to Transfer / Discharge for Ischemic Stroke Patients
ASR-4c Door to Transfer / Discharge for Hemorrhagic Stroke Patients

Description: Median time from hospital arrival in the emergency department to transfer or discharge of an ischemic or hemorrhagic stroke patient from the emergency department

Setting: Emergency Department

Rationale: For the past ten years, the organization of acute stroke care in the United States has moved in the direction of stroke centers; however, many patients with an acute stroke live in areas without ready access to a Primary (PSC) or Comprehensive Stroke Center (CSC). A third designation of stroke center, the Acute Stroke Ready Hospital (ASRH), has emerged for hospitals that can provide timely, evidence-based care, i.e., initial diagnostic services, initial stroke diagnosis, stabilization, emergent care and therapies, to patients with an acute stroke who are seen in their emergency department.

Most patients with an acute stroke seen initially at an ASRH will require emergent transfer to a PSC or CSC. The Brain Attack Coalition recommends that such transfers occur within 2 hours of the patient presenting to the ASRH (Alberts, 2013). Additionally, written transfer agreements between the ASRH and at least one PSC or CSC and a transportation vendor with both ground and air ambulance transfer options are recommended. One in four patients are transferred while receiving intravenous (IV) thrombolytic therapy (t-PA) (Sheth, 2015); others transferred after initiation of coagulopathy reversal treatment. Reducing the time stroke patients remain in the emergency department (ED) can improve access to a higher-level of stroke care and advanced intra-arterial or endovascular treatments, and increase quality of care. For those stroke patients who are not transferred to a PSC or CSC, inpatient admission within 3 hours, preferably to a formal stroke unit, is recommended (Jauch, 2013).

Type of Measure: Process **Risk Adjustment:** No **Data reported as:** Continuous Variable

Continuous Variable Statement:

ASR-4a Time (in minutes) from ED arrival to transfer or discharge of an ischemic or hemorrhagic stroke patient from the emergency department

ASR-4b Time (in minutes) from ED arrival to transfer or discharge of an ischemic stroke patient from the emergency department

ASR-4c Time (in minutes) from ED arrival to transfer or discharge of a hemorrhagic stroke patient from the emergency department

Included Populations: As above

Excluded Populations:

- Patients less than 18 years of age
- Patients who expired in the emergency department
- Discharges to dispositions other than an acute care facility
- Ischemic stroke patients who arrive in the hospital emergency department greater than 6 hours from *Time Last Known Well*

Candidate Performance Measure Profile

Selected References:

- Alberts MJ, Wechsler LR, Jensen MEL, Lachta RE, Crocco TJ, George MG, Baranski J, Bass RR, et al. "Formation and Function of Acute Stroke-Ready Hospitals Within a Stroke System of Care Recommendations From the Brain Attack Coalition" [In Eng]. *Stroke* (Nov 12 2013).
- Albright KC, Branas CC, Meyer BC, Matherne-Meyer DE, Zivin JA, Lyden PD, Carr BG. "Acute Cerebrovascular Care in Emergency Stroke Systems." [In Eng]. *Arch Neurol* (Oct 2010).
- American Heart Association. *Acute Stroke Ready Hospital*, 2015.
- Jauch, E. C., J. L. Saver, H. P. Adams, Jr., A. Bruno, J. J. Connors, B. M. Demaerschalk, P. Khatri, et al. "Guidelines for the Early Management of Patients with Acute Ischemic Stroke: A Guideline for Healthcare Professionals from the American Heart Association/American Stroke Association." [In Eng]. *Stroke* (Jan 31 2013).
- Lyerly MJ, Albright KC, Boehme AK, Shahripour RB, Donnelly JP, Houston JT, Rawal PV, Kapoor N, Alvi M, Sisson A, Alexandrov AW, Alexandrov AV. "Patient Selection for Drip and Ship Thrombolysis in Acute Ischemic Stroke". [In Eng]. *South Med J* (Jul 2015).
- Sheth KN, Smith EE, Grau-Sepulveda MV, Kleindorfer D, Fonarow GC, Schwamm LH. "Drip and Ship Thrombolytic Therapy for Acute Ischemic Stroke: Use, Temporal Trends, and Outcomes." [In Eng]. *Stroke* (Mar 2015).

Original Performance Measure Source: OP-18

Candidate Performance Measure Profile

Performance Measure Name: ASR-5a Timeliness of Transfer/ Discharge
ASR-5b Transfer/Discharge Within 1 hour
ASR-5c Transfer/Discharge 1-2 Hours
ASR-5d Transfer/Discharge 2-3 Hours
ASR-5e Transfer/Discharge Beyond 3 Hours

Description: Percentage of ischemic or hemorrhagic stroke patients transferred or discharged from the emergency department within 3 hours (≤ 180 min.) of hospital arrival

Setting: Emergency Department

Rationale: For the past ten years, the organization of acute stroke care in the United States has moved in the direction of stroke centers; however, many patients with an acute stroke live in areas without ready access to a Primary (PSC) or Comprehensive Stroke Center (CSC). A third designation of stroke center, the Acute Stroke Ready Hospital (ASRH), has emerged for hospitals that can provide timely, evidence-based care, i.e., initial diagnostic services, initial stroke diagnosis, stabilization, emergent care and therapies to patients with an acute stroke who are seen in their emergency department.

Most patients with an acute stroke seen initially at an ASRH will require emergent transfer to a PSC or CSC. The Brain Attack Coalition recommends that such transfers occur within 2 hours of the patient presenting to the ASRH (Alberts, 2013). Additionally, written transfer agreements between the ASRH and at least one PSC or CSC and a transportation vendor with both ground and air ambulance transfer options are recommended. One in four patients are transferred while receiving intravenous (IV) thrombolytic therapy (t-PA) (Sheth, 2015); others transferred after initiation of coagulopathy reversal treatment. Reducing the time stroke patients remain in the emergency department (ED) can improve access to a higher-level of stroke care and advanced intra-arterial or endovascular treatments, and increase quality of care. For those stroke patients who are not transferred to a PSC or CSC, inpatient admission within 3 hours, preferably to a formal stroke unit, is recommended (Jauch, 2013).

Type of Measure: Process **Risk Adjustment:** No **Data reported as:** Proportion

Numerator Statement:

ASR-5a Ischemic or hemorrhagic stroke patients transferred or discharged from the emergency department within 3 hours (≤ 180 min.) of hospital arrival

ASR-5b Ischemic or hemorrhagic stroke patients transferred or discharged from the emergency department within 1 hour (≥ 0 min. and ≤ 60 min.) of hospital arrival

ASR-5c Ischemic or hemorrhagic stroke patients transferred or discharged from the emergency department between 1 and 2 hours (> 60 min. and ≤ 120 min.) of hospital arrival

ASR-5d Ischemic or hemorrhagic stroke patients transferred or discharged from the emergency department between 2 and 3 hours (> 120 min. and ≤ 180 min.) of hospital arrival

ASR-5e Ischemic or hemorrhagic stroke patients transferred or discharged from the emergency department greater than 3 hours (≥ 180 min.) of hospital arrival

Included Populations: As above

Excluded Populations: None

Candidate Performance Measure Profile

Denominator Statement: Ischemic or hemorrhagic stroke patients

Included Populations: As above

Excluded Populations:

- Patients less than 18 years of age
- Patients who expired in the emergency department
- Discharges to dispositions other than an acute care facility
- Ischemic stroke patients who arrive in the hospital emergency department greater than 6 hours from *Time Last Known Well*

Selected References:

- Alberts MJ, Wechsler LR, Jensen MEL, Lachtaw RE, Crocco TJ, George MG, Baranski J, Bass RR, et al. "Formation and Function of Acute Stroke-Ready Hospitals Within a Stroke System of Care Recommendations From the Brain Attack Coalition" [In Eng]. *Stroke* (Nov 12 2013).
- Albright KC, Branas CC, Meyer BC, Matherne-Meyer DE, Zivin JA, Lyden PD, Carr BG. "Acute Cerebrovascular Care in Emergency Stroke Systems." [In Eng]. *Arch Neurol* (Oct 2010).
- American Heart Association. *Acute Stroke Ready Hospital*, 2015.
- Jauch, E. C., J. L. Saver, H. P. Adams, Jr., A. Bruno, J. J. Connors, B. M. Demaerschalk, P. Khatri, et al. "Guidelines for the Early Management of Patients with Acute Ischemic Stroke: A Guideline for Healthcare Professionals from the American Heart Association/American Stroke Association." [In Eng]. *Stroke* (Jan 31 2013).
- Lyerly MJ, Albright KC, Boehme AK, Shahripour RB, Donnelly JP, Houston JT, Rawal PV, Kapoor N, Alvi M, Sisson A, Alexandrov AW, Alexandrov AV. "Patient Selection for Drip and Ship Thrombolysis in Acute Ischemic Stroke". [In Eng]. *South Med J* (Jul 2015).
- Sheth KN, Smith EE, Grau-Sepulveda MV, Kleindorfer D, Fonarow GC, Schwamm LH. "Drip and Ship Thrombolytic Therapy for Acute Ischemic Stroke: Use, Temporal Trends, and Outcomes." [In Eng]. *Stroke* (Mar 2015).

Original Performance Measure Source: N/A

Candidate Performance Measure Profile

Performance Measure Name: ASR-6a Door to Contact with a Stroke Expert – Overall Time
ASR-6b Door to Contact with a Stroke Expert – In-Person
ASR-6c Door to Contact with a Stroke Expert – Telephone
ASR-6d Door to Contact with a Stroke Expert – Telestroke

Description: Median time from ED arrival to contact (i.e., in person, telephone or via telestroke consultation) with the physician, ED MD, i.e., neurologist, hospitalist/ internist, making the decision to treat ischemic or hemorrhagic stroke patients

Setting: Emergency Department

Rationale: The response time of an acute stroke team (AST) is an independent predictor of the ability to administer intravenous t-PA and reduced mortality. At minimum, the AST at an Acute Stroke Ready Hospital should include a nurse (or advanced practice nurse or physician assistant) and a physician who have some basic training in acute stroke care, (i.e., prior experience in the neuroscience intensive care unit, continuing education courses or attendance at regional/national conferences dealing with acute stroke care) (Alberts, 2013). AST response may be in-person, via telephone, or telemedicine stroke consultation.

The use of telemedicine to deliver care at a distance is rapidly growing and can potentially expand access for patients, enhance patient-physician collaboration, improve health outcomes, and reduce medical costs (ACP 2015). Telestroke systems can provide wider access to stroke expertise and facilitate rates of intravenous (IV) thrombolysis 3.4%-5.2% higher than the national average rate for eligible patients who have had a stroke in community hospitals. The mean interval from consultation request to telestroke response was 12.0 minutes in a study from Thomas Jefferson University of 1643 telemedicine stroke consultations provided between January 2011 and June 2012 (Chalouhi, 2013).

Type of Measure: Process **Risk Adjustment:** Yes **Data reported as:** Continuous Variable

Continuous Variable Statement:

ASR-6a Time (in minutes) from ED arrival to contact (i.e., in person, telephone or via telestroke consultation) with the physician, ED MD, i.e., neurologist, hospitalist/ internist, making the decision to treat ischemic or hemorrhagic stroke patients

ASR-6b Time (in minutes) from ED arrival to in-person contact with the physician, i.e., ED MD, neurologist, hospitalist/ internist making the decision to treat ischemic or hemorrhagic stroke patients

ASR-6c Time (in minutes) from ED arrival to contact via telephone with the physician, i.e., ED MD, neurologist, hospitalist/ internist making the decision to treat ischemic or hemorrhagic stroke patients

ASR-6d Time (in minutes) from ED arrival to contact via telestroke consultation with the physician, i.e., ED MD, neurologist, hospitalist/ internist making the decision to treat ischemic or hemorrhagic stroke patients

Included Populations: As above

Excluded Populations:

- Patients less than 18 years of age
- Patients who expired in the emergency department
- Patients who left the ED against medical advice

Candidate Performance Measure Profile

Selected References:

- Alberts MJ, Wechsler LR, Jensen MEL, Lachta RE, Crocco TJ, George MG, Baranski J, Bass RR, et al. "Formation and Function of Acute Stroke-Ready Hospitals Within a Stroke System of Care Recommendations From the Brain Attack Coalition" [In Eng]. *Stroke* (Nov 12 2013).
- Chalouhi N, Dressler JA, Kunkel E, Dalyai R, Jabbout P, Gonzalez LF, Starke RM, Dumont A, Rosenwasser R, Tjoumakaris S. "Intravenous Tissue Plasminogen Activator Administration in Community Hospitals Facilitated by Telestroke." *Neurosurgery* (October 2013).
- Daniel H, Sulmasy LS. "Policy Recommendations to Guide the Use of Telemedicine in Primary Care Settings: An American College of Physicians Position Paper." *Ann Intern Med* (Sept 8 2015).
- Douglas VC, Tong DC, Gillum LA, Zhao S, Brass LM, Dostal H, et al. "Do the Brain Attack Coalition's Criteria for Stroke Centers Improve Care for Ischemic Stroke?" *Neurology*. 2005.
- Nazir FS, Petre I, Dewey HM. "Introduction of an Acute Stroke Team: An Effective Approach to Hasten Assessment and Management of Stroke in the Emergency Department." *J Clin Neurosci*. 2009.
- Saposnik G, Hill MD, O'Donnell M, Fang J, Hachinski V, Kapral MK. "Registry of the Canadian Stroke Network for the Stroke Outcome Research Canada (SORCan) Working Group. Variables Associated With 7-Day, 30-Day, and 1-year Fatality After Ischemic Stroke." *Stroke* (2008).

Original Performance Measure Source: OP-20

Candidate Performance Measure Profile

Performance Measure Name: ASR-7 Procoagulant Reversal Agent Initiation for Intracerebral Hemorrhage (ICH)

Description: ICH stroke patients with an international normalized ratio (INR) > 1.4 at hospital arrival who are treated with a procoagulant reversal agent (e.g., fresh frozen plasma, recombinant factor VIIa, prothrombin complex concentrates)

Setting: Emergency Department

Rationale: Intracerebral hemorrhage (ICH) is a life-threatening disorder. Patients receiving oral anticoagulants (OACs), as well as those with an acquired or congenital coagulopathy, are at increased risk for ICH and hemorrhagic expansion with warfarin-associated bleeds comprising 12% to 15% of all spontaneous hemorrhages. Prompt INR reversal with intravenous infusions of vitamin K and fresh-frozen plasma (FFP) has been historically recommended; however, normalization with prothrombin complex concentrates (PCCs) are increasingly recommended because several studies have shown that these agents can rapidly normalize the INR within minutes. According to the European Union Stroke Initiative (EUSI), patients with oral anticoagulation treatment (OAT) associated ICH and INR above 1.4, should have OAT discontinued and the INR normalized with PCCs or FFP in addition to intravenous infusion of vitamin K.

Type of Measure: Process **Risk Adjustment:** No **Data reported as:** Proportion

Numerator Statement: ICH patients treated with a procoagulant reversal agent

Included Populations: As above

Excluded Populations: None

Denominator Statement: ICH stroke patients with INR value > 1.4 at hospital arrival

Included Populations: As above

Excluded Populations:

- Patients less than 18 years of age
- Patients who expired in the emergency department
- Patients who left the ED against medical advice
- Patients with *Comfort Measures Only* documented on day of or day after arrival

Selected References

- Ansell J, Hirsch J, Hylek E, Jacobson A, Crowther M, Palareti G; American College of Chest Physicians. Pharmacology and management of the vitamin K antagonists: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines (8th Edition). *Chest*. 3008;133(suppl):160S-198S.
- Fredriksson K, Norrving B, Strömbad, LG. Emergency reversal of anticoagulation after intracerebral hemorrhage. *Stroke*. 1992;23:972-977.
- Goldstein JN, Thomas SH, Frontiero V, Joseph A, Engel C, Snider R, Smith EE, Greenberg SM, Rosand J. Timing of fresh frozen plasma administration and rapid correction of coagulopathy in warfarin-related intracerebral hemorrhage. *Stroke*. 2006;37:151-155.
- Hanley JP. Warfarin reversal. *J Clin Pathol*. 2004;57:1132-1139.

Candidate Performance Measure Profile

- Leifer D, Bravata DM, Connors JJ III, Hinchey JA, Jauch EC, Johnston SC, Latchaw R, Likosky W, Ogilvy C, Qureshi AI, Summers D, Sung GY, Williams LS, Zorowitz R, on behalf of the American Heart Association Special Writing Group of the Stroke Council, Atherosclerotic Peripheral Vascular Disease Working Group and Council on Cardiovascular Surgery and Anesthesia, and Council on Cardiovascular Nursing. Metrics for measuring quality of care in comprehensive stroke centers: detailed follow-up to Brain Attack Coalition comprehensive stroke center recommendations: a statement for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2011;42:865-866.
- Leissing CA, Blatt PM, Hoots WK, Ewenstein B. Role of prothrombin complex concentrates in reversing warfarin anticoagulation: a review of the literature. *Am J Hematol*. 2008;83:137-143.
- Morgenstern LB, Hemphill JC III, Anderson C, Becker K, Broderick JP, Connolly ES Jr, Greenberg SM, Huang JN, Macdonald RL, Messé SR, Mitchell PH, Selim M, Tamargo RJ; and on behalf of the American Heart Association Stroke council and Council on Cardiovascular Nursing. Guidelines for the management of spontaneous intracerebral hemorrhage: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2010;41:2111-2114.
- Nilsson OG, Lindgren A, Ståhl N, Brandt L, Säveland H. Incidence of intracerebral and subarachnoid hemorrhage in southern Swed. *J Neurol Neurosurg Psychiatry*. 2000;69:601-607.
- Pabinger I, Brenner B, Kalina U, Knaub S, Nagy A, Ostermann H; Beriplex P/N Reversal Study Group. Prothrombin complex concentrate (Beriplex P/N) for emergency anticoagulation reversal: a prospective multinational clinical trial. *J Thromb Haemost*. 2008;6:622-631.
- Rådberg JA, Olsson JE, Rådberg CT. Prognostic parameters in spontaneous intracerebral hematomas with special reference to anticoagulant treatment. *Stroke*. 1991;22:571-576.
- Reiss H, Meier-Hellman A, Motsch J, Elias M, Kusten FW, Dempfle CE. Prothrombin complex concentrate (Octaplex) in patients requiring immediate reversal of oral anticoagulation. *Thromb Res*. 2007;121:9-16.
- Rosovsky RP, Crowther, MA. What is the evidence for the off-label use of recombinant factor VII (rFVIIa) in the acute reversal of warfarin? *Hematology Am Soc Hematol Educ Program*. 2008:36-38.
- Sjöblom L, Hårdemark HG, Lindgren A, Norrving B, Fahlén M, Samuelsson M, Stigendal L, Stockelberg D, Taghavi A, Wallrup L, Wallvik J. Management and prognostic features of intracerebral hemorrhage during anticoagulant therapy: a Swedish multicenter study. *Stroke*. 2001;32:2567-2574.
- Watson HG, Baglin T, Laidlaw SL, Makris M, Preston FE. A comparison of the efficacy and rate of response to oral and intravenous vitamin K in reversal of over-anticoagulation with warfarin. *Haematol*. 2001;115:145-149.

Original Performance Measure Source: CSTK-04

Candidate Performance Measure Profile

Performance Measure Name: ASR-8 National Institutes of Health Stroke Scale (NIHSS) Score on Arrival

Description: Ischemic stroke patients for whom an initial NIHSS score is performed prior to IV thrombolytic (t-PA) initiation, OR documented prior to transfer / discharge from the emergency department if IV t-PA was not initiated

Setting: Emergency Department

Rationale: A neurological examination of all patients presenting to the hospital emergency department with warning signs and symptoms of stroke should be a top priority and performed in a timely fashion. Use of a standardized stroke scale or scoring tool ensures that the major components of the neurological examination are evaluated. Clinical practice guidelines from the American Heart Association/American Stroke Association recommend The National Institutes of Health Stroke Scale (NIHSS) as the preferred scoring tool for this purpose. Scores obtained aid in the initial diagnosis of the patient, facilitate communication between healthcare professionals, and identify patient eligibility for various interventions and the potential for complications.

Type of Measure: Process **Risk Adjustment:** No **Data reported as:** Proportion

Numerator Statement: Ischemic stroke patients for whom a NIHSS score is performed prior to IV thrombolytic (t-PA) initiation, OR documented prior to transfer / discharge from the emergency department if IV t-PA was not initiated

Included Populations: As above

Excluded Populations: None

Denominator Statement: Ischemic stroke patients who arrive at this hospital emergency department (ED)

Included Populations: As above

Excluded Populations:

- Patients less than 18 years of age
- Patients who expired in the emergency department
- Patients who left the ED against medical advice

Selected References:

- Adams HP, del Zoppo G, Alberts MJ, Bhatt DL, Brass L, Furlan A, Grubb RL, Higashida RT, Jauch EC, Kidwell C, Lyden PD, Morgenstern LB, Qureshi AI, Rosenwasser RH, Scott PA, Wijdicks E. Guidelines for the Early Management of Adults with Ischemic Stroke: A Guideline From the American Heart Association/American Stroke Association Stroke Council, Clinical Cardiology Council, Cardiovascular Radiology and Intervention Council, and the Atherosclerotic Peripheral Vascular Disease and Quality of Care Outcomes in Research Interdisciplinary Working Groups. *Stroke*. 2007;38:1664-1666.
- Cote R, Hachinski VC, Shurell BL, Norris JW, Wolfson C. The Canadian Neurological Scale: a preliminary study in acute stroke. *Stroke*. 1986; 17:731-737.
- Goldstein LB, Samsa GP. Reliability of the National Institutes of Health Stroke Scale: extension to non-neurologists in the context of a clinical trial. *Stroke*. 1997;28:307-310.

Candidate Performance Measure Profile

- Jauch, E. C., J. L. Saver, H. P. Adams, Jr., A. Bruno, J. J. Connors, B. M. Demaerschalk, P. Khatri, et al. "Guidelines for the Early Management of Patients with Acute Ischemic Stroke: A Guideline for Healthcare Professionals from the American Heart Association/American Stroke Association." [In Eng]. *Stroke* (Jan 31 2013).
- Kothari KU, Brott T, Broderick JP, Hamilton CA. Emergency physicians: accuracy in the diagnosis of stroke. *Stroke*. 1995;26:2238-2241.
- Leifer D, Bravata DM, Connors JJ III, Hinchey JA, Jauch EC, Johnston SC, Latchaw R, Likosky W, Ogilvy C, Qureshi AI, Summers D, Sung GY, Williams LS, Zorowitz R, on behalf of the American Heart Association Special Writing Group of the Stroke Council, Atherosclerotic Peripheral Vascular Disease Working Group and Council on Cardiovascular Surgery and Anesthesia, and Council on Cardiovascular Nursing. Metrics for measuring quality of care in comprehensive stroke centers: detailed follow-up to Brain Attack Coalition comprehensive stroke center recommendations: a statement for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2011;42:857.
- Morgenstern LB, Lisabeth LD, Mecozi AC, Smith MA, Longwell PJ, McFarling DA, Risser JM. A population-based study of acute stroke and TIA diagnosis. *Neurology*. 2004;62:895-900.

Original Performance Measure Source: CSTK-01