Acknowledgments

RN.com acknowledges the valuable contributions of...

Shelley Lynch, MSN, RN, CCRN, author of Activase Therapy for Acute Ischemic Stroke Management. Shelley has over 10 years of critical care nursing experience. She completed her Bachelors of Science in Nursing from Hartwick College and her Master’s of Science in Nursing with a concentration in education from Grand Canyon University. Shelley has worked in a variety of intensive care units. She worked in trauma intensive care, medical intensive care, surgical intensive care, cardiovascular intensive care, cardiothoracic intensive care, neurosurgical intensive care, and coronary care unit in some of the top hospitals in the United States including: Johns Hopkins Medical Center, Massachusetts General Hospital, New York University Medical Center, Tulane Medical Center, and Beth Israel Deaconess Medical Center. She is the author of RN.com’s: Diabetes Overview, Thrombolytic Therapy for Acute Ischemic Stroke: t-PA/Alteplase, ICP Monitoring, Abdominal Compartment Syndrome, Chest Tube Management, Acute Coronary Syndrome: A Spectrum of Conditions and Emerging Therapies.

Shelley is a member of the American Association of Critical Care Nurses (AACN) and National League of Nursing (NLN). She was inducted in Sigma Theta Tau International Honor Society. She is currently an Advance Cardiac Life Support (ACLS) and Basic Life Support (BLS) Instructor. She has her Critical Care Registered Nurse (CCRN) and her Trauma Nurse Core Curriculum (TNCC) certifications.
Disclaimer

RN.com strives to keep its content fair and unbiased. The author, planning committee, and reviewers have no conflicts of interest in relation to this course. Conflict of Interest is defined as circumstances a conflict of interest that an individual may have, which could possibly affect Education content about products or services of a commercial interest with which he/she has a financial relationship.

There is no commercial support being used for this course. Participants are advised that the accredited status of RN.com does not imply endorsement by the provider or ANCC of any commercial products mentioned in this course.

There is no "off label" usage of drugs or products discussed in this course.

You may find that both generic and trade names are used in courses produced by RN.com. The use of trade names does not indicate any preference of one trade named agent or company over another. Trade names are provided to enhance recognition of agents described in the course.

Note: All dosages given are for adults unless otherwise stated. The information on medications contained in this course is not meant to be prescriptive or all-encompassing. You are encouraged to consult with physicians and pharmacists about all medication issues for your patients.

Purpose

The purpose of Activase® Therapy for Acute Ischemic Stroke Management is to inform the healthcare provider about stroke and the use of Activase® in treating stroke patients.

As the public becomes more informed about the signs and symptoms of stroke, people are recognizing the signs and symptoms of a stroke earlier and arriving to the hospital where they are quickly being evaluated to receive Activase® for acute ischemic stroke.

With an increased use of this drug, nursing professionals need to develop their knowledge of how to properly care for a patient before, during, and after the administration of Activase®.
Learning Objectives

After successful completion of this course, you will be able to:

1. Identify stroke statistics.
2. Define stroke, state risk factors (both modifiable and non-modifiable), and signs and symptoms of acute ischemic stroke.
3. Define the mechanism of action, patient eligibility, dosage, administration, and adverse side effects of Activase®.
4. Identify the nursing issues to consider when taking care of someone before, during, and after administration of Activase®.

Introduction

The introduction and use of Activase® reduces the sometimes-debilitating effects of an ischemic stroke. As the public’s awareness of stroke increases, so does the use of t-PA. t-PA is currently the only drug used for the treatment of ischemic stroke.

Emergency nurses and intensive care nurses are most often the nurses involved with the administration of Activase®. Since stroke can happen at any time, medical floor nurses should also familiarize themselves with the nursing considerations of Activase®.

Note!
Activase® can be referred as Recombinant Tissue Plasminogen Activator, rt-PA, t-PA, Activase®, or alteplase in the hospital setting.
Incidence of Stroke

According to the American Heart Association, 795,000 strokes occur in the United States every year. Eighty-seven percent of these strokes are ischemic. In 2007, the overall mortality rate from stroke was 273,000 which makes stroke the third leading cause of death in the United States (Roger et al., 2011).

From 1998 to 2008, the stroke rate fell 34.8% and the actual number of stroke deaths declined 19.4% (Roger et al., 2011). This is possibly due to improved control of risk factors over the past 10 years (American Stroke Association, 2011).

Types of Stroke: Ischemic Strokes

When the blood flow to the brain is obstructed, a stroke can occur. Two types of strokes have been identified: ischemic and hemorrhagic.

An ischemic stroke is caused by a blood clot that occludes a blood vessel to the brain or from a narrowing in an artery that reduces blood flow. The obstruction prevents oxygen going to a certain part of the brain that can result in brain ischemia. Ischemia will lead to cell death if the clot does not dissolve or break free. When cell ischemia occurs, the patient will begin to exhibit certain signs and symptoms.

Types of Stroke: Hemorrhagic Strokes

The second type of stroke is a hemorrhagic stroke. A hemorrhagic stroke develops when an artery in the brain leaks or bursts. The bleeding can occur inside the brain tissue or near the surface of the brain. Depending on where a hemorrhagic or ischemic stroke happens in the brain, the patient will have different symptoms. For instance, if it happens in the occipital region, the patient may have vision disturbances.

This course will focus on the ischemic stroke. For more information on strokes, refer to the RN.com course titled Stroke Prevention & Recognition.
Acute Ischemic Stroke

Acute ischemic stroke has devastating effects on an individual and on the healthcare system of this country. According to the National Stroke Association (2011), the estimated direct and indirect costs of stroke for 2010 is 73.7 billion dollars.

Like an acute myocardial infarction, stroke is classified as a medical emergency. When a patient arrives at a hospital exhibiting the signs and symptoms of a stroke, most facilities initiate a “code stroke” or a “stroke team” that activates a team of healthcare professionals to initiate a detailed plan of care.

Causes of Ischemic Stroke

Brain cells die when their blood supply is suddenly cut off by a clot. In a major stroke this area of damage, the infarction, is surrounded by a wider ring of cells that linger in a dysfunctional state for several hours and that will then either die or recover. The magnitude of stroke damage depends on how large the affected artery is, and the size and location of the brain area it supplies.

Causes of blood clots in ischemic stroke:
- Hardening of the arteries; atherosclerosis
- Atrial fibrillation
- Valve problems
- Infection of the heart muscle, endocarditis
- Congenital heart defects; patent foramen ovale
- Blood clotting disorders
- Inflammation of blood vessels; vasculitis
- Heart attack
Risk Factors

According to the American Stroke Association (ASA, 2011), there are 6 major risk factors of stroke. Some risk factors can be changed or modified, while others are part of the genetic make-up or the environment. Risk factors include:

- Most strokes occur in people older than 55.
- African-Americans and Hispanics have a higher risk than other races.
- Strokes are more common in women than men in the later years, but more common in men in the younger years.
- Family history affects one’s risk of stroke.
- Most of the risk factors for strokes, particularly ischemic stroke, are those that contribute to atherosclerosis, hypertension, and coronary artery disease. There is a compounding effect of major disease processes that puts many people at high risk for both heart disease and stroke.
- Hypertension, heart disease, obesity, high cholesterol, carotid artery disease, drug abuse, smoking, and high alcohol consumptions are all risk factors for the development of ischemic stroke.

Modifiable vs. Non-Modifiable Risks

<table>
<thead>
<tr>
<th>Non-Modifiable Risks</th>
<th>Modifiable Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing age</td>
<td>High blood pressure</td>
</tr>
<tr>
<td>Race</td>
<td>Smoking</td>
</tr>
<tr>
<td>Gender</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Family history</td>
<td>High cholesterol</td>
</tr>
<tr>
<td>Prior history of stroke or transient ischemic attack (ITA)</td>
<td>Heart conditions such as atrial fibrillation</td>
</tr>
<tr>
<td></td>
<td>Physical inactivity</td>
</tr>
<tr>
<td></td>
<td>Obesity</td>
</tr>
<tr>
<td></td>
<td>Heavy use of alcohol or street drugs</td>
</tr>
<tr>
<td></td>
<td>Certain medications</td>
</tr>
</tbody>
</table>

National Stroke Association, 2011
Educate Patients to Call 9-1-1

Common stroke symptoms include:

- Sudden numbness or weakness of the face, arm or leg – especially on one side of the body
- Sudden confusion, trouble speaking or understanding
- Sudden trouble seeing in one or both eyes
- Sudden trouble walking, dizziness, loss of balance or coordination
- Sudden severe headache with no known cause

(American Stroke Association, 2010)

FAST Test

Use the FAST test for recognizing and responding to stroke symptoms.

**Facial Droop:**
- Ask the person to smile. Does one side of the face droop?

**Arm Drift:**
- Ask the person to raise both arms. Does one arm drift downward?

**Slurred Speech:**
- Ask the person to repeat a simple sentence. Does the speech sound slurred or strange?

**Time:**
- If you observe any of these signs, it’s time to call 9-1-1 or get to the nearest stroke center or hospital.
Use the FAST Test for Recognizing & Responding to Stroke Symptoms

Facial droop

Slurred speech

Arm droop

https://www.activase.com/resource/resource_materials.jsp?s=yes#image
The Golden Hour: Door to Treatment <60 Minutes

The first hour after admission is the most critical time for the stroke patient:
- 0 min: Suspected stroke patient arrives at ED
- <10 min: Complete initial MD evaluation, including patient history and time last known well/symptom onset. Initiate lab work and assess using the National Institute of Health Stroke Scale (NIHSS).
- <15 min: Notify stroke team (including neurologic expertise)
- <25 min: Initiate CT scan
- <45 min: Interpret CT scan and labs, and review patient eligibility for Activase®.
- <60 min: Give Activase® bolus and initiate infusion in eligible patients*

Linear Timeline

![Linear Timeline Diagram]

Door to treatment ≤60 min

0 min
Suspected stroke patient arrives at ED

≤10 min
Complete initial MD evaluation, including patient history and time last known well/symptom onset. Initiate lab work. Assess using NIHSS

≤15 min
Notify stroke team (including neurologic expertise)

≤25 min
Initiate CT scan

≤45 min
Interpret CT scan and labs. Review patient eligibility for Activase

≤60 min
Give Activase bolus and initiate infusion in eligible patients

History of t-PA/Activase®

On June 18, 1996, the Food and Drug Administration approved the use of recombinant tissue plasminogen activator (t-PA) or Activase® for acute ischemic stroke, after an article published in the New England Journal of Medicine reported that there were improved clinical outcomes following treatment with intravenous Activase® when it was administered within three hours of the onset of ischemic stroke (National Institute of Neurological Disorders and Stroke, 1995).

Prior to Activase®, there was no effective treatment following an ischemic stroke to dissolve the clot(s) and restore blood flow to the damaged brain tissues that resulted in more benefit than risk to the patient.

Activase® acts as a catalyst in the conversion of plasminogen into plasmin. This increased enzymatic activity causes hyperfibrinolysis, which dissolves clots. Tissue plasminogen activator also plays a role in cell migration and tissue remodeling.

Uses of Activase®

According to the manufacturer of Activase® (Genetic):

- Intravenous administration of Activase®/t-PA (Tissue Plasminogen Activator) within 3 hours of symptom onset is the current FDA-approved thrombolytic therapy for the treatment of patients with acute ischemic stroke (Activase®, 2012).
- Activase® is also approved for treating acute myocardial infarction (AMI), acute pulmonary embolism, and central venous catheter functional restoration.
Indication for Use for Activase®

Activase® is indicated for the management of acute ischemic stroke in adults for improving neurological recovery and reducing the incidence of disability.

Treatment should only be initiated within 3 hours after the onset of stroke symptoms, and after exclusion of intracranial hemorrhage by a cranial computerized tomography (CT) scan or other diagnostic imaging method sensitive for the presence of hemorrhage (Activase®, 2012).
Clinical Presentation in Relation to Stroke Location

Stroke can affect each patient differently exposing varying signs and symptoms depending on the location in which the stroke occurs in the brain.

If the stroke is located in the left (dominant hemisphere), signs and symptoms may include:
- Left gaze preference
- Right visual field deficit
- Right hemiparesis
- Right hemisensory loss

If the stroke originates in the right (nondominant hemisphere), signs and symptoms may include:
- Right gaze preference
- Left visual field deficit
- Left hemiparesis
- Left hemisensory loss neglect

If the stroke originates in the brainstem, signs and symptoms may include:
- Nausea
- Vomiting
- Ddiplopia
- Dysconjugate gaze
- Palsy
- Dysarthria and dysphagia
- Vertigo and tinnitus
- Hemiparesis or quadriplegia
- Sensory loss in hemibody or all 4 limbs
- Decreased consciousness
- Hiccups and abnormal respirations

If the Stroke originates in the Cerebellus, signs and symptoms may include:
- Truncal gait ataxia
- Limb ataxia
- Neck stiffness and neck pain
- Hemorrhage
- Focal neurological deficits as in acute ischemic stroke
- Headache especially in subarachnoid hemorrhage
- Light intolerance
- Nausea, vomiting, decreased level of consciousness

Summers, et al., 2009
Conditions Which Mimic Stroke

There are other conditions that may mimic a stroke in clinical presentation. These conditions include:

- Hypoglycemia
- Seizures
- Complicated migraine
- Hypertensive encephalopathy
- Bell’s Palsy

(Adams, et al., 2007)

Stroke Assessment Scales

There are several different stroke assessment scales available to use for the assessment of stroke severity. Some scales used today include:

- National Institutes of Health Stroke Scale (NIHSS)
- Bethel Index
- Modified Rankin Scale
- Glasgow Outcome Scale

Most Commonly Used Scale: NIHSS

The NIH stroke scale measures several aspects of brain function: consciousness, vision, sensation, movement, speech, and language.

The scale is a serial measure of neurologic deficits on a 42 point scale across 11 categories (see Appendix). The lower the overall score, the better the outcome.
NIHSS Scores

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No stroke. Typically normal function without neurologic deficit.</td>
</tr>
<tr>
<td>1 – 4</td>
<td>Minor stroke</td>
</tr>
<tr>
<td>5 – 15</td>
<td>Moderate stroke</td>
</tr>
<tr>
<td>15 – 20</td>
<td>Moderate/severe stroke</td>
</tr>
<tr>
<td>21 – 42</td>
<td>Severe stroke</td>
</tr>
</tbody>
</table>

The NIHSS & Current Guidelines

Current guidelines allow stroke to be treated with Activase® for a score >4. Summers et al. (2009), stated that patients with a NIHSS score of <10 have a much more favorable outcome at 1 year than patients with a NIHSS score of >20.

Also, the higher the NIHSS score, the higher the risk of intracranial hemorrhage (ICH) after thrombolytic therapy. (NIHSS score>22 having a 17% risk of ICH compared to NIHSS score <10 having a 3% risk of ICH).
Expansion of the Time Window for Treatment of Activase®

In 2009, the American Stroke Association published a journal article about the expansion of the time window for treatment of Activase®.

“rtPA should be administered to eligible patients who can be treated in the time period of 3 to 4.5 hours after stroke for patients within Class I Recommendation, Level of Evidence B. 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 ratio >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” (del Zoppo, Saver, Jaunch, & Adams, 2009).

Because Activase® indications for use still state 3 hours, we will use this number in the article. But it is important to understand the clinician’s decision to give Activase® within the 4.5 hour window.
Safety Risks of Activase®

The most common complication during Activase® therapy is bleeding. Should serious bleeding in a critical location (intracranial, gastrointestinal, retroperitoneal, pericardial) occur, Activase® therapy should be discontinued immediately.

Death and permanent disability are not uncommonly reported in patients who have experienced stroke (including intracranial bleeding) and other serious bleeding episodes.

Patients with severe neurological deficit (e.g., NIHSS >22) at presentation, have an increased risk of intracranial hemorrhage.

The risks of Activase® therapy may be increased in patients with major early infarction, and should be carefully weighed against the anticipated benefits. This includes patients with major early infarction confirmed by computerized cranial tomography (CT) scan, showing substantial edema, mass effect, or midline shift.

Treatment of patients with minor neurological deficit or with rapidly improving symptoms is not recommended.

Orolingual angioedema has been observed in post-marketing experience in patients treated with Activase® for AIS. Patients should be monitored during and for several hours after infusion for signs of orolingual angioedema.

(Activase®, 2012)

Did You Know?

According to the American Stroke Association, treating patients early with Activase® reduces disability, which will save money. A cost-benefit analysis estimates that for every patient treated with Activase®, $4,000 can be saved (American Stroke Association, 2005).
Diagnostic Tests for Suspected Stroke

- Diagnostic tests for suspected stroke may include:
- Non-contrast brain CT or brain magnetic resonance imaging (MRI)
- Blood glucose
- Serum electrolytes/renal function tests
- Electrocardiogram (ECG)
- Markers of cardiac ischemia
- Complete CBC
- PT/INR
- aPTT
- Oxygen saturation

(Summers et al., 2009)

Understanding the Importance of Rapid Reperfusion

Rapid reperfusion of the penumbra (the area surrounding the ischemic event) will limit the extent of injury to the brain. Since brain cells are rapidly lost, timing is of the utmost importance in diagnosing and managing strokes.

Mechanisms of Action of Activase®

Activase® is a “clot-buster” that works by binding to the fibrin in a thrombus (clot), converting plasminogen to plasmin, and initiating local fibrinolysis which results in the lysis of the clot and restoration of cerebral blood flow (Activase®, 2012).

The desired end result of re-establishing blood flow is to rescue the ischemic brain tissues, thereby decreasing morbidity and mortality and improving outcomes.

Since Activase® has a high affinity to the fibrin in a clot, it is less likely to convert circulating plasminogen to plasmin, which reduces the potential for systemic bleeding (Activase®, 2012).

The AHA/ASA guidelines give Activase® its strongest recommendation. It is Class 1, Level of Evidence A (Adams, et al., 2007).

The American Academy of Neurology (AAN) and the American College of Emergency Physicians also support the use of Activase® if given within the established guidelines of the NINDS.

Eligibility for Treatment of Acute Ischemic Stroke with Activase®

In order to be considered for treatment, the patient should have a clinical diagnosis of stroke but also have a clinically measurable neurological defect. The patient should:

- Be of age 18 years old or older.
- Have had a clinical diagnosis of ischemic stroke causing a measureable neurological deficit.

Doses must be given within the first three hours of onset of symptoms per Activase® indications of use. The time window for rescuing compromised but still viable brain tissue is brief; therefore, the sooner Activase® is administered the better possibility of a favorable outcome.
Exclusion Criteria of Patient Selection

• Evidence of intracranial hemorrhage on pretreatment CT
• Only minor or rapidly improving stroke symptoms
• Clinical presentation suggestive of subarachnoid hemorrhage, even with normal CT
• Active internal bleeding
• Known bleeding diathesis, including but not limited to:
  ▪ Platelet count <100,000/mm
  ▪ Patient received heparin within 48 hours and has an elevated aPTT (greater than upper limit of normal for laboratory)
  ▪ Current use of oral anticoagulants (e.g., warfarin sodium) or recent use with an elevated prothrombin time >15 seconds
• Patient has had major surgery or serious trauma (excluding head trauma) in the previous 14 days
• Within 3 months any intracranial surgery, serious head trauma, or previous stroke
• History of gastrointestinal or urinary tract hemorrhage within 21 days
• Recent arterial puncture at a non-compressible site
• Recent lumbar puncture
• On repeated measurements:
  ▪ Systolic blood pressure greater than 185 mm Hg or diastolic blood pressure greater than 110 mm Hg at the time treatment is to begin
  ▪ Patient requires aggressive treatment to reduce blood pressure to within these limits.
• History of intracranial hemorrhage
• Abnormal blood glucose (<50 or >400 mg/dL)
• Post myocardial infarction pericarditis
• Patient was observed to have seizure at the same time the onset of stroke symptoms were observed
• Known arteriovenous malformation, or aneurysm
(Brain Attack Coalition, 2012; Activase®, 2012)
Side Effects of Activase® Administration

Since there is a 6.4% chance of developing an intracerebral hemorrhage with the use of Activase® (Summers, 2009), the best method for reducing the potential of bleeding is the careful selection of eligible patients, followed by detailed observation and thorough monitoring after administration of the therapy.

In patients with a suspected intracerebral hemorrhage, the Activase® infusion should be immediately discontinued.

Nursing Considerations

The nursing considerations discussed below are a summary of common practices for healthcare professionals to follow when administering Activase®. It is imperative for you to check with your hospital procedures and policies manual for specifics to your facility.

- The administration of Activase® is usually in the emergency department.
- Prior to administering Activase® there are specific interventions that a nurse should perform that can potentially decrease patient complications.
- Specifically, the nurse should be aware that any patient that receives Activase® will be at an increased risk of bleeding after receiving the medication.
- All invasive procedures should be done before Activase® is administered.

Manage the BP Prior to Activase®

The patient’s elevated BP must be controlled (SBP ≤185 mmHg and DBP ≤110 mm HG), otherwise Activase® should not be given.

The physician may order Labetalol 10-20mg IVP or Nitroglycerin Paste 1-2 inches.
**Nursing Interventions Prior to Activase® Therapy**

Usually facility procedure will indicate that the patient should have two to three large bore (at least an 18 gauge) intravenous catheters and/or a central line. A central line is desirable if the patient has exhibited blood pressure or heart rate problems that may require treatment with IV medications and vasopressors, such as nipride, nitroglycerin, or esmolol.

If a nasogastric tube will be needed, place the tube before Activase administration to avoid the potential for bleeding. The emergency room nurse should apply critical thinking and problem solving skills to ensure the patients safety.

The nurse should confirm that the physician has ordered a full work up of blood tests including blood for type and cross-match. Whole blood, packed RBCs, cryoprecipitate, and/or fresh frozen plasma should be available to treat serious bleeding.

The nurse should also insert a foley catheter. If the foley is not inserted prior to Activase® administration, it should not be inserted for at least 24 hours, as the risk of hemorrhage is greatest during this time.

Many facilities require signage at the patient bedside that indicates “Activase® given” with patients that receive Activase®.

In summary, all invasive procedures should be performed before administering Activase®.

**Dosage of Activase®**

The recommended total adult dose is 0.9 mg/kg infused over 60 minutes. Maximum doses should not exceed 90 mg.

Recommended administration is to load with 0.09 mg/kg (10% of the 0.9 mg/kg dose) as an I.V. bolus over 1 minute, followed by 0.81 mg/kg (90% of the 0.9 mg/kg dose) as a continuous infusion over 60 minutes.

Activase®, 2012
Steps for Administration of Activase®

• The indication for use according to the FDA is that Activase® should only be initiated within 3 hours after the onset of stroke symptoms, and after exclusion of intracranial hemorrhage by a cranial computerized tomography (CT) scan or other diagnostic imaging method sensitive for the presence of hemorrhage.
• The FDA-approved dose of Activase® is 0.9 mg/kg (not to exceed 90 mg total dose). 10% of the total dose is administered as an intravenous (IV) bolus dose over 1 minute. The remainder of the dose should be infused over 60 minutes.
• Follow the manufacturer’s instructions when reconstituting the 100 mg vial with 100ml of sterile water for injection. Discard excess medication from the 100 mg/100 ml Activase® vial. Then either remove the bolus from the vial or program pump to deliver the bolus at the infusion initiation.
• Administer bolus over 1 minute.
• Administer the remaining 90% of dose over 1 hour.
• After the completion of medication, a common practice is to spike a 50 ml normal saline bag with the infusion set of the empty Activase® vial. The 50 ml normal saline bag should be infused at the same rate to ensure that the patient received the entire prescribed medication dose.

During Administration of Medication

• During the administration of Activase®, full neurological checks should be done at least every 15 minutes or as needed while the medication is infusing. This includes the full National Institute of Health Stroke Scale (Summers, 2009).
• The nurse should be monitoring blood pressure and pulse every 5-15 minutes and as needed (Adams, 2007).
• The nurse should check for major or minor signs of bleeding (Activase®, 2012).
• Discontinue infusion and obtain an emergency CT scan if the patient develops changes in level of consciousness, deterioration of neurologic status, severe headache, pupillary changes, nausea/vomiting, or acute hypertension (Adams, 2007).
• If any complication occurs, immediately inform attending physician or neurologists.
• The patient will need to be closely monitored for a minimum of one day in an intensive care unit.
Nursing Assessments During & After Activase®

Nursing interventions should include:
- Neurological assessment and vital signs every 15 minutes for the first 2 hours from the start of the Activase® infusion
  - Then every 30 minutes for 6 hours, then every 60 minutes for 16 hours
- BP may be assessed more frequently for hypertension (SBP>180mmHg or DBP >105mmHg)
- Temperature q 4h
- O2 saturation <92%, administer oxygen by NC at 2-3 L/min

Additional Nursing Interventions During & After Activase®

- Monitor patient for major and minor signs of bleeding
- Continuous cardiac monitoring up to 72 hours or more
- Measure intake & output
- Bed rest, HOB >30 degrees if aspiration risk
- IV Fluids at 75-100ml/hr
- No heparin, warfarin, aspirin, clopidogrel or dipryridamole for 24 hours, then start anti-thrombotic as ordered
  - Persons should not be given anti-thrombotic or antiplatelet aggregating drugs within 24 hours
- Brain CT or MRI after Activase® therapy
- NPO until dysphagia screening completed

(Summers, et al., 2009)
The First 24 Hours After Activase® is Administered

- Monitor for neurologic deterioration: every 15 minutes for the first hour after the infusion is stopped, every 30 minutes for the next 6 hours, and hourly from the eighth post-infusion hour until 24 hours after the infusion was stopped.
- Continue to check for major or minor signs of bleeding.
- Continue to monitor and control blood pressure: every 15 minutes for the first hour after the infusion is stopped, every 30 minutes for the next 6 hours, and hourly from the eighth post-infusion hour until 24 hours after the infusion was stopped.
- Obtain a follow-up CT scan or MRI at 24 hours before starting anticoagulants or antiplatelet.

These guidelines were adopted from the American Association of Neuroscience Nurses (AANN) and American Heart Association (Activase®, 2012).

Other Treatment Options for Acute Ischemic Stroke

Two other options are being reviewed by the FDA that expands the window of opportunity for acute ischemic stroke patients who arrive after the three hour limit. This was previously reviewed (del Zoppo, et al., 2009):

1. One option is using intra-arterial Activase® instead of intravenous Activase®. This can be given up to six hours after the onset of a stroke (Summers, 2009).
2. The other option is a mini-corkscrew threaded by catheter up from the groin to the brain to physically retrieve and remove a clot. In August 2004, the FDA approved the use of the Merci Retriever to remove blood clots in the brain. This procedure can also be done within six hours after stroke onset (Becker & Brott, 2005).
**Research Update**

Research is ongoing, as doctors and scientists try to improve outcomes for stroke survivors.

The National Institute of Neurological Disorders and Stroke (NINDS) conducts stroke research and clinical trials at its laboratories and clinics at the National Institutes of Health (NIH).

Currently, NINDS researchers are studying the mechanisms of stroke risk factors and the process of brain damage that results from stroke. Basic research has also focused on the genetics of stroke and stroke risk factors.

Scientists are working to develop new and better ways to help the brain repair itself to restore important functions. New advances in imaging and rehabilitation have shown that the brain can compensate for function lost as a result of stroke (NINDS, 2012).

**Case Study One**

A 65-year-old woman, Martha, is shopping at Grocery Mart when she starts to feel dizzy. She shouts out for help saying that she is having trouble seeing. EMS is called and they bring her to the nearest hospital while treating her high blood pressure. The hospital activates the stroke team. Upon evaluation from the physician, she finds out that Martha was admitted in the hospital one month ago for head trauma that resulted in the intracranial hemorrhage. The CT of Martha's head is positive for a bleed.

**Is Martha eligible for Activase®?**

No! The patient did not meet the criteria for Activase since the patient had a hemorrhagic stroke and not an ischemic stroke. She also had a history of an intracranial hemorrhage one month ago from a head trauma.
Case Study Two

An 85-year-old male, Joshua, arrives in the ER with family members. His family stated that he was having slurred speech and trouble walking. The stroke team was called. Upon evaluation the stroke team physician found out that the family watched Joshua for a few hours before they brought him into the ER. When asked when symptoms occurred, they had no idea. It was definitely over five hours, but it might have been days ago. The CT of his head showed an ischemic stroke. Is Joshua eligible for Activase®?

No! Patient has had symptoms of a stroke for over three hours.

Case Study Three

A 55-year-old male, Matthew, was in his executive office when he started having right-sided numbness and weakness. He told his secretary who immediately called EMS. Within twenty minutes, Matthew was in the ER with no movement of his right side. Code stroke was called and within ten minutes, the stroke team physician evaluated him. He had no contraindications for Activase®. Fifteen minutes later he received a CT scan of his head and it was interpreted forty-five minutes later. Head CT was negative for hemorrhagic stroke. Is Matthew eligible for Activase®?

Yes! Patient has met all the guidelines to receive Activase®. He made it to the emergency room within 3 hours. The patients did not have a hemorrhagic stroke. Matthew was a perfect candidate for Activase®.
Conclusion

Vigorous scientific investigation has demonstrated that intravenous administration of Activase® is an effective interventional therapy for impending ischemic stroke.

The healthcare provider should understand all the implications of stroke. They should know the risk factors and sign and symptoms.

Currently, the only drug used for acute stroke is Activase®. The healthcare provider should understand who is a candidate for Activase® and what tests and procedures are needed before administration of the thrombolytic. They should understand and follow the strict guidelines.

Healthcare providers should also understand how to properly take care of a patient before, during, and after administration of Activase® in the ER, ICU, and on the medical floors.
Resources

American Stroke Association: A Division of American Heart Association
7272 Greenville Avenue
Dallas, TX 75231-4596
strokeassociation@heart.org
http://www.strokeassociation.org
1-888-4STROKE

National Stroke Association
9707 East Easter Lane
Englewood, CO 80112-3747
info@stroke.org
http://www.stroke.org
1-800-STROKES

National Institute of Neurological Disorders and Stroke
P.O. Box 5801
Bethesda, MD 20824
1-800-352-9424
http://ninds.nih.gov
Appendix: The NIHSS

Administer stroke scale items in the order listed. Record performance in each category after each subscale exam. Do not go back and change scores. Follow directions for each exam technique. Scores should reflect what the patient does, not what the clinician thinks the patient can do. The clinician should record answers while administering the exam and work quickly. Except where indicated, the patient should not be coached (i.e., repeated requests to patient to make a special effort).


<table>
<thead>
<tr>
<th>Instructions</th>
<th>Scale Definition</th>
<th>Score</th>
</tr>
</thead>
</table>
| **1a. Level of Consciousness:** The investigator must choose a response if a full evaluations if prevented by such obstacles as an endotracheal tube, language barrier, orotracheal trauma/bandages. A 3 is scored only if the patient makes no movement (other than reflexive posturing) in response to noxious stimulation. | 0 = Alert; keenly responsive.  
1 = Not alert, but arousable by minor stimulation to obey, answer, or respond.  
2 = Not alert; requires repeated stimulation to attend, or is obtunded and requires strong or painful stimulation to make movements (not stereotyped).  
3 = Responds only with reflex motor or autonomic effects or totally unresponsive, flaccid, and are flexic. | –     |
| **1b. LOC Questions:** The patient is asked the month and his/her age. The answer must be correct – there is no partial credit for being close. Aphasic and stuporous patients who do not comprehend the questions will score 2. Patients unable to speak because of endotracheal intubation, orotracheal trauma, severe dysarthria from any cause, language barrier, or any other problem not secondary to aphasia are given a 1. It is important that only the initial answer be graded and that the examiner not “help” the patient with verbal or non-verbal cue. | 0 = Answers both questions correctly.  
1 = Answers one question correctly.  
2 = Answers neither question correctly. | –     |
### Appendix: The NIHSS (cont.)

<table>
<thead>
<tr>
<th>Instructions</th>
<th>Scale Definition</th>
<th>Score</th>
</tr>
</thead>
</table>
| **1c. LOC Commands:** The patient is asked to open and close the eyes and then to grip and release the non-paretic hand. Substitute another one step command if the hands cannot be used. Credit is given if an unequivocal attempt is made but not completed due to weakness. If the patient does not respond to command, the task should be demonstrated to him or her (pantomime), and the result scored (i.e., follows none, one or two commands). Patients with trauma, amputation, or other physical impediments should be given suitable one-step commands. Only the first attempt is scored. | 0 = Performs both tasks correctly.  
1 = Performs one task correctly.  
2 = Performs neither task correctly. | –     |
| **2. Best Gaze:** Only horizontal eye movements will be tested. Voluntary or reflexive (oculocephalic) eye movements will be scored, but caloric testing is not done. If the patient has a conjugate deciation of the eyes that can be overcome by voluntary or reflexive activity, the score will be 1. If a patients has an isolated peripheral nerve paresis (CN III, IV, or VI), score a 1. Gaze is testable in all aphasic patients. Patients with ocular trauma, bandages, pre-existing blindness, or other disorder of visual acuity or fields should be tested with reflexive movements, and a choice made by the investigator. Establishing eye contact and then moving about the patient from side to side will occasionally clarify the presence of a partial gaze palsy. | 0 = Normal.  
1 = Partial gaze palsy; gaze is abnormal in one or both eyes, but forced deviation or total gaze paresis is not present.  
2 = Forced deviation, or total gaze paresis not overcome by the oculocephalic maneuver. | –     |
| **3. Visual:** Visual fields (upper and lower quadrants) are tested by confrontation, using finger counting or visual threat, as appropriate. Patients may be encouraged, but if they look at the side of the moving fingers appropriately, this can be scored as normal. If there is unilateral blindness or enucleation, visual fields in the remaining eye are scored. Score 1 only if a clear-cut asymmetry, including quadrantanopia is found. If patient is blind from any cause, score 3. Double simultaneous stimulation is performed at this point. If there is extinction, patient receives a 1, and the results are used to respond to item 11. | 3. **Visual:** Visual fields (upper and lower quadrants) are tested by confrontation, using finger counting or visual threat, as appropriate. Patients may be encouraged, but if they look at the side of the moving fingers appropriately, this can be scored as normal. If there is unilateral blindness or enucleation, visual fields in the remaining eye are scored. Score 1 only if a clear-cut asymmetry, including quadrantanopia is found. If patient is blind from any cause, score 3. Double simultaneous stimulation is performed at this point. If there is extinction, patient receives a 1, and the results are confirmed. | –     |
### Appendix: The NIHSS (cont.)

<table>
<thead>
<tr>
<th>Instructions</th>
<th>Scale Definition</th>
<th>Score</th>
</tr>
</thead>
</table>
| **4. Facial Palsy:** Ask – or use pantomime to encourage – the patient to show teeth or raise eyebrows and close eyes. Score symmetry of grimace in response to noxious stimuli in the poorly responsive or non-comprehending patient. If facial trauma/bandages, orotracheal tube, tape or other physical barriers obscure the face, these should be removed to the extent possible. | 0 = Normal symmetrical movements.  
1 = Minor paralysis (flattened nasolabial fold, asymmetry on smiling).  
2 = Partial paralysis (total or near-total paralysis of lower face).  
3 = Complete paralysis of one or both sides (absence of facial movement in the upper and lower face). | – |
| **5. Motor Arm:** The limb is placed in the appropriate position: extend the arms (palms down) 90 degrees (if sitting) or 45 degrees (if supine). Drift is scored if the arm falls before 10 seconds. The aphasic patient is encouraged using urgency in the voice and pantomime with the non-paretic arm. Each limb is tested in turn, beginning with the non-paretic arm. Only in the case of amputation or joint fusion at the shoulder, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice. | 0 = No drift; limb holds 90 (or 45) degrees for full 10 seconds.  
1 = Drift; limb holds 90 (or 45) degrees, but drifts down before the full 10 seconds; does not hit bed or other support.  
2 = Some effort against gravity; limb cannot get to or maintain (if cued) 90 (or 45) degrees, drifts down to bed, but has some effort against gravity.  
3 = No effort against gravity; limb falls.  
4 = No movement.  
UN = Amputation or joint fusion, explain: | – |
| **5a. Left Arm**  
**5b. Right Arm** |                                                                                   |       |
| **6. Motor Leg:** The limb is placed in the appropriate position: hold the leg at 30 degrees (always tested supine). Drift is scored if the leg falls before 5 seconds. The aphasic patient is encouraged using urgency in the voice and pantomime, but not noxious stimulation. Each limb is tested in turn, beginning with the non-paretic leg. Only in the case of amputation or joint fusion at the hip, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice. | 0 = No drift; leg holds 30-degree position for full 5 seconds.  
1 = Drift; leg falls by the end of the 5 second period, but does not hit bed.  
2 = Some effort against gravity; leg falls to bed by 5 seconds, but has some effort against gravity.  
3 = No effort against gravity; leg falls to bed immediately.  
4 = No movement.  
UN = Amputation or joint fusion, explain: | – |
| **5a. Left Leg**  
**5b. Right Leg** |                                                                                   |       |
### Appendix: The NIHSS (cont.)

<table>
<thead>
<tr>
<th>Instructions</th>
<th>Scale Definition</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7. Limb Ataxia:</strong> This item is aimed at finding evidence of a unilateral cerebellar lesion. Test with eyes open. In case of visual defect, ensure testing is done in intact visual field. The finger-nose-finger and heel-shin tests are performed on both sides, and ataxias is scored only if present out of proportion to weakness. Ataxia is absent in the patient who cannot understand or is paralyzed. Only in the case of amputation or joint fusion, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice. In case of blindness, test by having the patient touch nose from extended arm position.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>0</strong>  = Absent.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1</strong>  = Present in one limb.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2</strong>  = Present in two limbs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>UN</strong> = Amputation or joint fusion, explain:________________________</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **8. Sensory:** Sensation or grimace to pinprick when tested, or withdrawal from noxious stimulus in the obtunded or aphasic patient. Only sensory loss attributed to stroke is scored as abnormal and the examiner should test as many body areas (arms [not hands], legs, trunk, face) as needed to accurately check for hemisensory loss. A score of **2**, “severe or total sensory loss,” should only be given when a severe or total loss of sensation can be clearly demonstrated. Stuporous and aphasic patients will, therefore, probably score 1 or 0. The patient with brainstem stroke who has bilateral loss of sensation is scored 2. If the patient does not respond and is quadriplegic, score 2. Patients in a coma (item 1a=3) are automatically given a 2 on this item. | | |
| **0**  = Normal; no sensory loss. |
| **1**  = Mild-to-moderate sensory loss; patient feels pinprick is less sharp or is dull on the affected side; or there is a loss of superficial pain with pinprick, but patient is aware of being touched. |
| **2**  = Severe to total sensory loss; patient is not aware of being touched in the face, arm, and leg. | |
### Appendix: The NIHSS (cont.)

<table>
<thead>
<tr>
<th>Instructions</th>
<th>Scale Definition</th>
<th>Score</th>
</tr>
</thead>
</table>
| **9. Best Language:** A great deal of information about comprehension will be obtained during the preceding sections of the examination. For this scale item, the patient is asked to describe what is happening in the attached picture, to name the items on the attached naming sheet and to read from the attached list of sentences*. Comprehension is judged from responses given by the patient, as well as to all of the commands in the preceding general neurological exam. If visual loss interferes with the tests, ask the patient to identify objects placed in the hand, repeat, and produce speech. The intubated patient should be asked to write. The patient in a coma (item 1a=3) will automatically score a 3 on this item. The examiner must choose a score for the patient with stupor or limited cooperation, but a score of 3 should be used only if the patient is mute and follows no one-step commands. | 0 = No aphasia; normal.  
1 = Mild-to-moderate aphasia; some obvious loss of fluency or facility of comprehension, without significant limitation on ideas expressed or form of expression. Reduction of speech and/or comprehension, however, makes conversation about provided materials difficult or impossible. For example, in conversation about provided materials, examiner can identify picture or naming card content from patient’s response.  
2 = Severe aphasia; all communication is through fragmentary expression; great need for inference, questioning, and guessing by the listener. Range of information that can be exchanged is limited; listener carries burden on communication. Examiner cannot identify materials provided from patient response.  
3 = Mute, global aphasia; no usable speech or auditory comprehension. | _ |
| **10. Dysarthria:** If patient is thought to be normal, an adequate sample of speech must be obtained by asking patient to read or repeat words from the attached list*. If the patient has severe aphasia, the clarity of articulation of spontaneous speech can be rated. Only if the patient is intubated or has other physical barriers to producing speech, the examiner should record the score as untestable (UN), and clearly write an explanation for this choice. Do not tell the patient why he or she is being tested. | 0 = Normal.  
1 = Mild-to-moderate dysarthria; patient slurs at least some words and, at worst, can be understood with some difficulty.  
2 = Severe dysarthria; patient’s speech is so slurred as to be unintelligible in the absence of or out of proportion to any dysphasia, or is mute/anarthric.  
UN = Intubated or other physical barrier, explain: __________________ | _ |
| **11. Extinction and Inattention (formerly Neglect):** Sufficient information to identify neglect may be obtained during the prior testing. If the patient has a severe visual loss preventing double simultaneous stimulation, and the cutaneous stimuli are normal, the score is normal. If the patient has aphasia but does not appear to attend to both sides, the score is normal. The presence of visual spatial neglect or anosagnosia may also be taken as evidence of abnormality. Since the abnormality is scored only if present, the item is never untestable. | 0 = No abnormality.  
1 = Visual, tactile, auditory, spatial, or personal inattention or extinction to bilateral simultaneous stimulation in one of the sensory modalities.  
2 = Profound hemi-inattention or extinction to more than one modality; does not recognize own hand or orients to only one side of space. | _ |
References

At the time this course was constructed all URL's in the reference list were current and accessible. RN.com is committed to providing healthcare professionals with the most up to date information available.


References (cont.)


Please Read

This publication is intended solely for the use of healthcare professionals taking this course, for credit, from RN.com. It is designed to assist healthcare professionals, including nurses, in addressing many issues associated with healthcare. The guidance provided in this publication is general in nature, and is not designed to address any specific situation. This publication in no way absolves facilities of their responsibility for the appropriate orientation of healthcare professionals.

Hospitals or other organizations using this publication as a part of their own orientation processes should review the contents of this publication to ensure accuracy and compliance before using this publication. Hospitals and facilities that use this publication agree to defend and indemnify, and shall hold RN.com, including its parent(s), subsidiaries, affiliates, officers/directors, and employees from liability resulting from the use of this publication. The contents of this publication may not be reproduced without written permission from RN.com.