Stroke
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The Brain


http://www.strokecenter.org/prof/
- Provides a review of pathophysiology of the brain and surrounding tissues, diagnostic tests, vocabulary, etc.

These will help you to understand deficits experienced by patients having various types of strokes or injuries.
- Hearing/association & Smell & taste
- Short term Memory

- Voluntary Motor
- Arms
- Head

- Sensations Pain & Touch Taste

- Balance, Coordination of each muscle group

- Mom: Bowel/bladder
  Reasoning/judgment
  Long term memory

- Vision & visual memory
  CN 5, 6, 7, 8
  P, R, B/P

- CN 9, 10, 11, 12
  Tracks cross over
  Coordinate movement, HR, B/P
Cerebral cortex functions

Swallowing

Careful, slow, & anxious

Deny deficits & impulsive, short attention span
Cerebral cortex functions
Vessels of the Brain

Figure 52-12 Branches of the right external carotid artery. The internal carotid artery ascends to the base of the brain. The right vertebral artery is also shown as it ascends through the transverse foramina of the cervical vertebrae.
Vessels of the Brain

Middle cerebral
Anterior cerebral
Anterior communicating
Internal carotid
Posterior communicating
Posterior cerebral
Basilar
Vertebral
Anterior spinal

Figure 52-13 The circle of Willis as seen at the base of a brain removed from the skull.

Right Side
Circle of Willis

- Internal carotid artery
- Middle cerebral artery
- Basilar artery

Bottom view of brain
Blood distribution to areas of the brain

<table>
<thead>
<tr>
<th>Artery</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERNAL CAROTID ARTERY BRANCHES</td>
<td></td>
</tr>
<tr>
<td>Hypophyseal</td>
<td>Posterior pituitary</td>
</tr>
<tr>
<td>Ophthalmic</td>
<td>Eye, frontal scalp, frontal and ethmoid sinuses</td>
</tr>
<tr>
<td>Anterior choroidal</td>
<td>Choroid plexus (lateral), optic tract, uncus, amygdaloide body, hippocampus, globus pallidus, lateral geniculate nucleus, internal capsule</td>
</tr>
<tr>
<td>Middle cerebral</td>
<td>Insula; lateral frontal, parietal, occipital, and temporal lobes (major motor and sensory areas)</td>
</tr>
<tr>
<td>Lenticulostriate</td>
<td>Putamen, caudate nucleus, globus pallidus, internal capsule, corona radiata</td>
</tr>
<tr>
<td>Other</td>
<td>Choroid plexus (lateral ventricles), hippocampus, globus pallidus</td>
</tr>
<tr>
<td>Anterior cerebral</td>
<td>Medial surface of frontal and parietal lobes, corpus callosum, superior or lateral strip of frontal and parietal lobes</td>
</tr>
<tr>
<td>VERTEBRAL ARTERY BRANCHES</td>
<td></td>
</tr>
<tr>
<td>Posterior cerebellar</td>
<td>Medulla</td>
</tr>
<tr>
<td></td>
<td>Posterior cerebellum, inferior vermis, cerebellar nuclei, choroid plexus (fourth ventricle), posterolateral medulla</td>
</tr>
<tr>
<td>BASILAR ARTERY BRANCHES</td>
<td></td>
</tr>
<tr>
<td>Anterior inferior cerebellar</td>
<td>Cortex and inferior surface cerebellum, cerebellar nuclei, upper medulla, lower pons</td>
</tr>
<tr>
<td>Internal auditory</td>
<td>Inner ear</td>
</tr>
<tr>
<td>Pontine</td>
<td>Pons</td>
</tr>
<tr>
<td>Superior cerebellar</td>
<td>Cortex, white matter and nuclei of cerebellum, pons, superior cerebellar peduncle, inferior peduncle, inferior colliculus</td>
</tr>
<tr>
<td>POSTERIOR CEREBRAL ARTERY BRANCHES</td>
<td></td>
</tr>
<tr>
<td>Posterior cerebral</td>
<td>Medial, inferior temporal, and occipital lobes</td>
</tr>
<tr>
<td>Calcarine</td>
<td>Visual cortex</td>
</tr>
<tr>
<td>Other</td>
<td>Posterior and lateral thalamus, subthalamus, pituitary, mammillary bodies, and midbrain; choroid plexus of lateral and third ventricle, dorsal thalamus</td>
</tr>
<tr>
<td>Circle of Willis</td>
<td>Hypothalamus, caudate nucleus, putamen, globus pallidus, internal capsule, external capsule thalamus, subthalamus, cerebral peduncles</td>
</tr>
</tbody>
</table>
Incidence & Prevalence

4th leading cause of death in the USA
- 750,000+ people/year have a stroke
- Of those 175,000 die within one year (25%)

Leading cause of long-term disabilities
- Estimated 5.5 million survivors of stroke in the USA
- 15 to 30 % live with permanent disability
Risk Factors
Non-modifiable

Age
- 2/3 over 65, any age possible

Gender
- Equal for men and women - women dying more often

Race
- African-Americans are more at risk for ischemic strokes than Hispanics, Native Americans
- Asians more at risk for hemorrhagic strokes

Heredity: Family history or previous TIA/CVA
Risk Factors
Modifiable

- Hypertension
- Diabetes mellitus
- Heart disease
- A-fib
- Asymptomatic carotid stenosis
- Hyperlipidemia
- Obesity
- Oral contraceptive use
- Heavy alcohol use
- Physical inactivity
- Sickle cell disease
- Smoking
- Procedure precautions

In a recent study of 15,693 people age 60 years old or above and with systolic blood pressures of 160 or more and diastolic pressures of 95 or more, without treatment each 10 mmHg rise in systolic blood pressure increased the risk of stroke by 26%
Physiology

Normal Cerebral Blood Flow

- Requires oxygen and glucose to function
- 20% of Cardiac Output / oxygen
- Arterial supply to the brain:
  - Internal carotid (anteriorly)
  - Vertebral arteries (posteriorly)
- Venous drainage
  - 2 sets of veins - venous plexuses
    - Dural sinuses to internal jugular veins
    - Sagittal sinus to vertebral veins
  - No valves, depend on gravity and venous pressure gradient for flow
Venous plexuses –
- Internal jugular veins
- Vertebral veins
No valves, depend on gravity and venous pressure gradient for flow
**Physiology**

**Normal Cerebral Blood Flow**

- **Cerebral Autoregulation of blood flow**
  - Autoregulation allows brain to keep constant blood flow regardless of systemic pressures
  - MAP must be between 50 - 150 mmHg
    - $\text{MAP} = \frac{(2 \times \text{diastolic B/P}) + \text{systolic B/P}}{3}$
    - Normal is 70 to 110 mm Hg
  - Flow of venous blood is dependent on gravity and pressure differences between venous sinuses and extracranial veins
  - Will autoregulation be altered by:
    - ↑ ICP?
    - Valsalva’s maneuver?
    - Flexion of the neck?
Physiology
Altered Cerebral Blood Flow

What happens with HTN?
- ↑ flow, distention of vessels

What else can affect blood flow?
- CO2
  - ↑ CO2 causes ↑ blood flow

- O2
  - ↓ O2 causes ↑ blood flow

- H+ ions
  - ↑ H+ causes ↑ blood flow
Pathophysiology
Altered Cerebral Blood Flow

When cerebral blood flow is interrupted:
- 30 sec.: Neurological metabolism altered
- 2 min: Neurological metabolism stops
- 5 min: Cellular death occurs
Pathophysiology
Altered Cerebral Blood Flow

Penumbra

- A band of minimally perfused cells that surround a core of dead or dying cells
  - These cells can survive if:
    - Return of adequate circulation
    - Minimal toxic products from adjacent dying cells
  - Low degree of edema
Types of Stroke

- Ischemic and Hemorrhagic
Types of Stroke

- Ischemic Stroke (85%)
  - TIA
  - Thrombotic Stroke
    - Lacunar Stroke
  - Embolic Stroke
Transient Ischemic Attack

- Warning sign for stroke
- Brief localized ischemia
- Common manifestations:
  - Contralateral numbness/weakness of hand, forearm, corner of mouth
  - Aphasia
  - Visual disturbances-blurring
- Deficits last less than 24 hours (usually less than 1 or 2 hrs)
- Can occur due to:
  - Inflammatory artery disorders
  - Sickle cell anemia
  - Atherosclerotic changes
Act F.A.S.T

- **FACE** Ask the person to smile.

  Does one side of the face droop? **ARMS** Ask the person to raise both arms.

  Does one arm drift downward? **SPEECH** Ask the person to repeat a simple sentence.

  Are the words slurred? Can he/she repeat the sentence correctly?

- **TIME** If the person shows any of these symptoms, time is important.

  Call 911 or get to the hospital fast. Brain cells are dying.
Stroke Symptoms include:

- SUDDEN numbness or weakness of 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.

Call 9-1-1 immediately if you have any of these symptoms.

Note the time you experienced your first symptom. This information is important to your healthcare provider and can affect treatment decisions.

If you have experienced any of these symptoms, you may have had a TIA or mini-stroke.
Thrombotic Stroke

- Occlusion of large cerebral vessel
  - Lacunar strokes affect smaller cerebral vessels
- Occur in older population, while sleeping/resting
- Rapid event, but slow progression (usually reach max deficit in 3 days)

Thrombotic stroke. Cerebral thrombosis is a narrowing of the artery by fatty deposits called plaque. Plaque can cause a clot to form, which blocks the passage of blood through the artery.
Lacunar Strokes - 20% of all strokes

- The small areas of cells distal to the occlusion die usually causing only minor deficits
  - If the infarction is critically located, paralysis and sensory loss may result.

- Within a few months of the infarction, the necrotic brain cells are reabsorbed by macrophage activity, leaving a very small cavity a lake or lacune in French.

- Common sites are occlusions of small, deep penetrating arteries from:
  - middle cerebral artery
  - penetrating branches of the circle of Willis
  - vertebral or basilar arteries

- High incidence:
  - Chronic hypertension
  - Elderly
  - DIC
Embolic Stroke

- Embolus becomes lodged in vessel and causes occlusion
- Bifurcations are most common site
- Sudden onset with immediate deficits
  - If clot is “busted” and body reabsorbs, symptoms can disappear
  - Vessel wall is weakened where clot lodges which increases risk for hemorrhage
Types of Stroke (con’t)

- Hemorrhagic Stroke (15%)
  - Intracerebral Hemorrhage
  - Subarachnoid Hemorrhage
Hemorrhagic Stroke

- Rupture of vessel
- Occurs suddenly, usually when active, most often fatal
- Occurs most often in clients with sustained HTN, or trauma
- Rapid onset, varied manifestations
<table>
<thead>
<tr>
<th>Type</th>
<th>Gender/Age</th>
<th>Warning</th>
<th>Time of Onset</th>
<th>Course/Prognosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischemic: Thrombotic</td>
<td>Men more than women; oldest median age</td>
<td>TIA in 30-50% of cases</td>
<td>During or after sleep</td>
<td>Stepwise progression, signs and symptoms develop slowly, usually some improvement, recurrence in 20-25% of survivors</td>
</tr>
<tr>
<td>Ischemic: Embolic</td>
<td>Men more than women</td>
<td>TIA (uncommon)</td>
<td>May or may not be related to activity depending on source of embolus, sudden onset</td>
<td>Single event, signs and symptoms develop quickly, usually some improvement, recurrence common without aggressive treatment of underlying disease</td>
</tr>
<tr>
<td>Hemorrhagic: Intracerebral</td>
<td>Slightly higher in women</td>
<td>Headache (25% of cases)</td>
<td>Activity (often)</td>
<td>Progression over 24 hr; poor prognosis, fatality more likely with presence of coma</td>
</tr>
<tr>
<td>Hemorrhagic: Subarachnoid</td>
<td>Slightly higher in women, youngest median age</td>
<td>Headache (common)</td>
<td>Activity (often), sudden onset; Most commonly related to head trauma</td>
<td>Single sudden event usually, fatality more likely with presence of coma</td>
</tr>
</tbody>
</table>
Manifestations by Vessel

Internal carotid artery

- Contralateral paralysis (arm, leg, face)
- Contralateral sensory deficits
- Aphasia (dominant hemisphere involvement)
- Apraxia (motor task)
- Agnosia (obj. recognition)
- Unilateral neglect (non-dominant hemisphere involvement)
- Homonymous hemianopia
Manifestations by Vessel

- **Middle Cerebral Artery Involvement**
  - Contralateral weakness or paralysis
  - Contralateral hemianesthesia
  - Loss of proprioception, fine touch, localization
  - Aphasia (dominant hemisphere involvement)
  - Anosognosia - neglect of paralyzed side
    (non-dominant hemisphere involvement)
  - Homonymous hemianopia
  - Primary motor and sensory areas of the face, throat, hand and arm and in the dominant hemisphere, the areas for speech. The *middle cerebral artery* is the artery most often occluded in stroke.
Manifestations by Vessel

**Anterior Cerebral Artery** (if occlusion is distal to anterior communicating artery)

- Contralateral sensory/motor deficits of foot and leg
- Contralateral weakness of proximal upper extremity
- Urinary incontinence
- Sensory loss
- Apraxia (purposeful motor tasks)
- Personality change
  - Flat affect, loss of spontaneity, loss of interest in surroundings, distractibility, slow responses
- Possible cognitive impairment supplies the frontal lobes, the parts of the brain that control logical thought, personality, and voluntary movement, especially the legs. Stroke in the anterior cerebral artery results in opposite leg weakness. If both anterior cerebral territories are affected, profound mental symptoms may result (akinetic mutism).
Manifestations by Vessel

- Vertebral Artery
  - Pain in face, nose, or eye
  - Numbness and weakness of face (involved side)
  - Gait disturbances
  - Dysphagia
  - Dysarthria (motor speech)
Additional Site Related Deficits

- **Brain Stem / Cerebellum / Posterior Hemisphere Stroke:**
  - Common Patterns
  - Motor or sensory loss in all four limbs
  - Crossed signs
  - Limb or gait ataxia
  - Dysarthria
  - Dysconjugate gaze
  - Nystagmus
  - Amnesia
  - Bilateral visual field defects

- **Small Subcortical Hemisphere or Brain Stem (Pure Motor) Stroke:**
  - Common Pattern
  - Weakness of face and limbs on one side of the body without abnormalities of higher brain function, sensation, or vision

- **Small Subcortical Hemisphere or Brain Stem (Pure Sensory) Stroke:**
  - Common Pattern
  - Decreased sensation of face and limbs on one side of the body without abnormalities of higher brain function, motor function, or vision
Initial Stroke Assessment/Interventions

- Neurological assessment & NIH assessment
- Call “Stroke Alert” Code
- Ensure patient airway
  - Remove dental devices
- Get VS, including pulse ox & Oxygen if needed
- IV access, maintain BP within parameters
- Position head midline
- ↑HOB 30 (if no shock/injury)
- CT, blood work, data collection/NIH Stroke Scale
- Anticipate thrombolytic therapy for ischemic stroke
Initial Stroke
Assessment/Interventions

Tests for the Emergent Evaluation of the Patient with Acute Ischemic Stroke
- CT of the brain without contrast
- Electrocardiogram
- Chest x-ray
- Hematologic studies (complete blood count, platelet count, prothrombin time, partial thromboplastin time)
- Serum electrolytes
- Blood glucose
- Renal and hepatic chemical analyses
- National Institute of Health Scale (NIHSS) score
Be sure to review administration of this scale.

Interval: [ ] Baseline
[ ] 2 hours post treatment
[ ] 24 hours post onset of symptoms  20 minutes
[ ] 7-10 days
[ ] 3 months
[ ] Other _________
NIH Stroke Scale Score

- Standardized method to measure degree of stroke related impairment and change in a patient over time.

- Helps determine if degree of disability merits treatment with tPA.
  - As of 2008 stroke patients scoring greater than 4 points can be treated with tPA.

- Standardized research tool to compare efficacy stroke treatments and rehabilitation interventions.

- Measures several aspects of brain function, including consciousness, vision, sensation, movement, speech, and language not measured by Glasgow coma scale.

- Current NIH Stroke Score guidelines for measuring stroke severity:
  Points are given for each impairment.
  - 0= no stroke
  - 1-4= minor stroke
  - 5-15= moderate stroke
  - 15-20= moderate/severe stroke
  - 21-42= severe stroke
  - A maximal score of 42 represents the most severe and devastating stroke.
<table>
<thead>
<tr>
<th>Category</th>
<th>Score/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Level of Familiarity</td>
<td>(Aware, knowing, etc.)</td>
</tr>
<tr>
<td>2. COD</td>
<td>(Confusion)</td>
</tr>
<tr>
<td>3. Communication</td>
<td>(Unable, cannot)</td>
</tr>
<tr>
<td>4. Physical&amp;Medical</td>
<td>(Analyse, assess)</td>
</tr>
<tr>
<td>5. Visual&amp;Speech</td>
<td>(Assess, evaluate)</td>
</tr>
<tr>
<td>6. Motor&amp;Gait</td>
<td>(Assess, evaluate)</td>
</tr>
<tr>
<td>7. Memory</td>
<td>(Assess, evaluate)</td>
</tr>
<tr>
<td>8. Swallowing</td>
<td>(Assess, evaluate)</td>
</tr>
<tr>
<td>9. Leisure</td>
<td>(Assess, evaluate)</td>
</tr>
<tr>
<td>10. N=1</td>
<td>(N=1, no)</td>
</tr>
<tr>
<td>11. N=2</td>
<td>(N=2, yes)</td>
</tr>
</tbody>
</table>

**TOTAL SCORE**

<table>
<thead>
<tr>
<th>Item</th>
<th>Score</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>
Diagnostic Tests

CT = computed tomography - bleed, defects, ischemia, tumors, edema

CTA = computed tomography angiography – spasms, stenosis, vessel structure damage

MRI = magnetic resonance imaging – bleed or edema

MRA = magnetic resonance angiography - clot

http://www.strokecenter.org/prof
Diagnostic Tests

- **MRS** = magnetic resonance spectroscopy – determines ATP, lactate levels and pH to locate penumbra
- **PET** = positron emission tomography – blood flow & metabolism
- **SPECT** = single photon emission computed tomography – dye/planes cause of CVA, assess TIA not seen with CT, blood flow
- **EEG** = electroencephalogram – seizures, injury
- **CSF fluid analysis** *(avoid if ↑ ICP suspected – with thrombic CVA)*
Diagnostic Tests

Blood Flow Measurements
- rSO2 Cerebral Oximetry (Pulse Ox of brain)
- Cerebral angiography
- Doppler ultrasonography
- Transcranial doppler
- Carotid duplex
- Carotid angiography
Diagnostic Tests

Cardiac Assessment

- Electrocardiogram
- Chest X-ray
- Cardiac enzymes
- Echocardiography
  - Transthoracic (TTE), Transesophageal (TEE)
- Holter monitor (arrhythmia evaluation)

Why is a cardiac assessment important?
Additional Studies

- CBC
- PT, INR, aPTT
- Electrolytes, blood glucose
- Renal studies
- Hepatic studies
- Lipid profile
- ABG (possible hypoxia)
Medications

**Prevention** - anti-platelet for TIA due to atherosclerosis
- ASA (*acetylsalicylic acid*)
- Plavix (*Clopidogrel*)
- Aggrenox (Persantine & Aspirin)

**Acute treatment**
- Anti-coagulants – A fib & TIA
- Antithrombotics
- Calcium channel blockers – Nimotop (nimodipine)
- Fibrinolytics - tPA (recombinant tissue plasminogen activator)
- Diuretics – Mannitol, Lasix (Furosemide)
- Anticonvulsants – Dilantin (phenytoin) or *Cerebyx* (Fosphenytoin Sodium Injection)
Medications

- Thrombolytics Recombinant Alteplase (rtPA) Activase, Tissue plasminogen activator
  - Treatment must be initiated promptly after CT to R/O bleed
    - Systemic within 3-4.5 hours of onset of symptoms
    - Intra-arterial within 6 hours of symptoms
  - Some exclusions:
    - Seizure at onset
    - Subarachnoid hemorrhage
    - Trauma within 3 months
    - History of prior intracranial hemorrhage
    - AV malformation or aneurysm
    - Surgery 14 days, pregnancy,
    - Cardiac cath. 7 days
Treatment

- Surgical
  - Carotid endarterectomy
  - http://www.youtube.com/watch?v=P2TNz-TnI1A
  - Extracranial-intracranial bypass
  - Decompression /ventriculostomy

- Physical therapy
- Occupational therapy
- Speech therapy
Endovascular Treatment

- Intrarterial fibrinolysis

- Mechanical thrombectomy
  - MERCI clot retriever
  - Penumbra suction

- Carotid stent
Stroke Assessment

- Neurological assessment & NIH assessment

**Left (Dominant) Hemisphere Stroke: Common Pattern**
- Aphasia and/or Dysarthria
- Difficulty reading, writing, or calculating
- Right hemiparesis and/or Right-sided sensory loss
- Right visual field defect
- Poor right conjugate gaze
- Aware of deficits, cautious, slow, anxious

**Right (Non-dominant) Hemisphere Stroke: Common Pattern**
- Neglect of left visual field and/or Left visual field defect
- Extinction of left-sided stimuli and/or Left-sided sensory loss -neglect
- Left hemiparesis
- Poor left conjugate gaze
- Dysarthria
- Spatial – perceptual disorientation
- Denies deficits, Impulsive, Poor judgment, Short attention span
Manifestations & Complications by Body System

- **Integument**
  - Pressure ulcers

- **Respiratory**
  - Respiratory center damage
  - Airway obstruction
  - Decreased gag/cough ability

- **GI**
  - Constipation
  - Stool impaction
Manifestations & Complications by Body System

- **Musculoskeletal**
  - Hemiplegia or hemiparesis
  - Contractures
  - Bony ankylosis
  - Disuse atrophy
  - Dysarthria - word formation
  - Dysphagia – swallow
  - Apraxia – complex movements
  - Flaccidity/spasticity

- **GU**
  - Incontinence
  - Frequency
  - Urgency
  - Urinary retention
  - Renal calculi
Manifestations & Complications by Body System

- Neurological
  - Hyperthermia
  - Inattention syndrome
  - Seizures
  - Agnosias (familiar obj)

- Communication deficits
  - Aphasia (expressive, receptive, global)
  - Agraphia

- Visual deficits
  - Homonymous hemianopia
  - Diplopia
  - Decreased acuity
  - Decreased blink reflex
Manifestations & Complications by Body System

- **Neurological (cont.)**
  - Cognitive changes
    - Memory loss
    - Short attention span
    - Poor judgment
    - Disorientation
    - Poor problem-solving ability

- **Behavioral changes**
  - Emotional lability
  - Loss of inhibitions
  - Fear
  - Hostility
Ineffective Tissue Perfusion

- Goal is to maintain cerebral perfusion

- Monitor respiratory status
- Auscultate, monitor lung sounds
- Suction as needed – caution: increases ICP
- Place in side-lying position (secretions)
- $O_2$ as needed/prescribed
- Assess LOC, other neuro vital signs
- NIH Stroke Scale
- Glasgow Coma Scale – Eyes, Verbal, & Motor
Nursing Diagnoses/Interventions

Ineffective Tissue Perfusion (cont)

- Monitor strength/reflexes
- Assess for HA, sluggish pupils, posturing
- Monitor cardiac status
- Monitor I&O’s
  - Can get DI as result of pituitary gland damage
- Monitor seizure activity
Nursing Diagnoses/Interventions

- Impaired Physical Mobility
  - Goal is to maintain and improve functioning
    - Active ROM for unaffected extremities
    - Passive ROM for affected extremities
    - Q2 hr turns
    - Assess for thrombophlebitis/DVT: prevention
    - Collaborate with PT/OT for movement and positioning techniques for rehab
Nursing Diagnoses/Interventions

- **Impaired Physical Mobility**
  - Flaccidity & spasticity
  
  **Meds used to treat spasticity:**
  
  - Lioresal (baclofen)
  - Valium (diazepam)
  - Dantrium (dantrolene sodium)
  - Zanaflex (tizanidine hydrochloride)

- **Drugs for Neuropathic pain** –
  
  - Neurontin (*Gabapentin*) & **Botox** (botulinum toxin)
Nursing Diagnoses/Interventions

Self-Care Deficit

- Goals are to promote functional ability, increase independence, improve self-esteem
  - Encourage use of unaffected arm in ADLs (forced use)
  - Self-dressing (using unaffected side to dress affected side first)
  - Sling or support for affected arm (avoid subluxation)
  - Collaborate with PT/OT for techniques to promote return to independence
Nursing Diagnoses/Interventions

Impaired Verbal Communication

- Goal is to increase communication
  - Speak in normal tones unless there is a documented hearing impairment
  - Allow adequate time for responses
  - Face center client when speaking, speak simply and enunciate words
  - If you don’t understand what the client is saying, let them know, and have them try again
  - Collaborate with Speech Language Pathologist (SLP)
Nursing Diagnoses/Interventions

- Impaired Verbal Communication (cont)
  - Try alternate method of communication if needed
    - Writing, computerized boards, etc
  - Allow client anger and frustration at loss of previous functioning
  - Allow client to touch (hands, arms), may be the only way of expressing (comfort, etc)
  - If client has visual disturbances:
    - During initial phase of recovery, position where client can easily see you; in later stages, client can be directed to adjust position for visual contact
Nursing
Diagnoses/Interventions

- Impaired Urinary Elimination & Risk for Constipation
  - Goal is to return to normal functioning if possible or to increase/achieve independence in maintaining bodily functions.
    - Bladder training program
    - Kegel exercises
    - Encourage fluids, high fiber diet
    - Increase physical activities as tolerated
    - Assist client to use toilet at same time each day (toileting schedule)
Nursing Diagnoses/Interventions

Impaired Swallowing

- Goal is safety, adequate nutrition, hydration
- Position client upright, using **pureed** – less often **or finely chopped soft foods**
- Hot or cold food or thickened liquids
- Teach client to put food behind teeth on unaffected side and tilt head backwards
- Check for food pockets, especially on affected side
- Have suctioning equipment at bedside
- Minimize distractions while eating
- Never leave client with food etc. in mouth
- SLP consult; possible PEG placement
Does the patient exhibit any of these risk factors?
(check all that apply)

DIAGNOSIS

☐ CVA
☐ Parkinson's
☐ Dementia
☐ Head Injury
☐ Neck Surgery
☐ Craniotomy

☐ Debilitation
☐ Tracheotomy
☐ Neurogenic Disease
☐ Recent Extubation
☐ Right Lower Lobe Pneumonia
☐ History of Aspiration Pneumonia

☐ High risk diagnosis present. Assess for symptoms of dysphagia.

SYMPTOMS

☐ Drooling
☐ Wet Respirations / Gurgly Voice
☐ Difficulty Chewing
☐ Pocketing / Oral Residue
☐ Coughing / Throat Clearing
☐ Multiple Swallow
☐ Complains of Food Sticking in Throat
☐ Patient/Family Report of Difficulty Swallowing
☐ Requires Suctioning
☐ Vocal Quality Deteriorates After Meal
☐ Unexplained Temperature Spikes

☐ Patient DOES exhibit symptoms, may need swallow evaluation.
☐ Severe coughing or multiple symptoms, consider NPO until swallow evaluation.
☐ Patient DOES NOT exhibit symptoms of dysphagia.

MENTAL STATUS

☐ Lethargic
☐ Inconsistently Alert

☐ Confused
☐ Other:

☐ Mental status may decrease safety with P.O. intake.
Consider supervision/assistance with meals.

☐ SLP Consult Recommended
☐ SLP Consult Not Indicated At This Time

Evaluated by: ___________________________ RN Dr. ___________________________ Notified - Date: ___________________________

StDavid's
Austin, TX

HOSPITAL

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Place under tab:
PROGRESS NOTES
Dysphagia Screening Tool
Hemorrhagic Stroke: Aneurysm
Aneurysm

Incidence & Prevalence
- 5 million North Americans
- ~30,000/year will have aneurysm rupture
- Most common in 30-60 yr olds

Etiology
- Unknown
- Theories:
  - Developmental defect in vessel wall
  - Degeneration of wall from vessel disease/damage
  - Chronic untreated hypertension
Aneurysm

Pathophysiology
- Circle of Willis, bifurcations and branches
- 85% located anteriorly
- Tend to enlarge with time
- Tend to rupture from dome, which forces blood into subarachnoid space; or tissue, ventricles, subdural space

Types
- Berry
- Saccular
- Fusiform
- Dissecting
"saccular" aneurysm is a formation of a sac or pouch on one side of the blood vessel wall.

"fusiform" aneurysm is an outward bulging of the blood vessel wall in all directions.

Giant
Aneurysm

Until rupture, asymptomatic
- Unless large which can cause pressure on adjacent tissues
- Can have prodromal symptoms

Once ruptures
- Sudden explosive HA
- LoC
- N/V
- Stiff neck
- Photophobia
- Cranial nerve deficits
- Stroke symptoms
- Pituitary malfunctions (changes in ADH)
Aneurysm

Complications

- Rebleeding
  - First day (first 2 hours most common)
  - 7-10 days after clot breakdown
  - Will have similar manifestations as initial rupture, but may have new neurologic symptoms

- Vasospasm
  - 3-10 days (with most between 3 to 5 days)
  - Narrows lumen of vessels leading to ischemia and infarction
  - May have focal deficits or LOC
  - Tx: angioplasty, IA cardene

- Hydrocephalus
  - May be result of obstruction of CSF reabsorption
  - Causes ↑ ICP
  - Will have decreasing LOC
  - Tx: ventriculostomy, possible VP shunt
Aneurysm

Diagnostic Tests

– CT
– LP
– Bilat carotid & vertebral cerebral angiography
Medications

- Calcium channel blockers - Nimotop (nimodipine) Q 4 hr. X 21 days
- Anticonvulsants
- Stool softeners
- Analgesics
Aneurysm: Treatment

- Surgery
  - Clipping
  - Wrapping
  - Coils
Coiling
Nursing Diagnoses/Interventions

- Ineffective Tissue Perfusion (Cerebral)
  - Quiet dark room
  - Monitor VS/neuro status
  - Limit visitors
  - Elevate HOB 30-45 degrees
  - Promote relaxation
  - Prevent constipation/straining
  - Avoid positions & activity that ↑ ICP
Aneurysm

Complications – post microsurgical clipping or endovascular coiling

- Early seizures
- Acute hydrocephalus
- Dilutional hyponatremia from inappropriate ADH or excess IV fluids
- Respiratory complications – pneumonia
- Cardiopulmonary with catecholamine surge:
  - IICP; elevated pulse, B/P, temp alterations; mildly elevated cardiac enzymes, decreased ejection fraction; altered pupils, excessive salivation, extension/decerebrate posturing
Arteriovenous Malformation (AVM)
Arteriovenous Malformation (AVM)

Incidence & Prevalence
- Account for 2% of all strokes
- Manifestations occur before 40 yrs of age
- Congenital lesion
  - 90% are in cerebral hemispheres
  - 10% are in cerebellum and brainstem
AVM

- Pathophysiology
  - Tangle of dilated arteries and veins
    - Blood flow bypasses capillary bed
    - Blood going directly from arteries into veins increases risk of bleeding or rupture of vessel

- Diagnostic Tests
  - Same as for intracranial aneurysm
This network of abnormal connections represents the "nidus". Arteriovenous malformation of the brain presents later in childhood or, more frequently, in adults in the second to third decade of life. AVMs present with seizures, hemorrhage, progressive neurological dysfunction or headaches. On occasion, these lesions are found incidentally during an MRI or CT scan of the brain obtained for other reasons.
AVMs can be difficult to treat and often require a multidisciplinary approach to therapy. At the Center for Endovascular Surgery, embolization is the first line of attack in the management of this condition. Embolization for arteriovenous malformation may be done as the sole form of treatment or in preparation for microsurgical resection or radiation therapy. For patients with AVMs that cannot be cured due to the size or location of their lesion, palliative embolization can improve the patient's quality of life and diminish symptoms such as headaches, seizures or other problems.
AVM

- **Treatment**
  - Surgery if accessible
  - Embolization (large AVMs)
  - Radiation or Laser therapy
  - Gamma Knife/Laser knife

- **Nursing Care**
  - If no hemorrhage: teaching should focus on ways to avoid ↑ ICP
  - If hemorrhage: same as client with hemorrhagic stroke
Non surgical Treatment

- Neurointerventional
  - embolization
    * coils
    * alcohol beads
    * liquid glue
Surgical Removal
Radio Surgery

Radio surgery (gamma knife)
- 201 cobalt gamma ray beam sources
- Uses a single radiation dose for patient treatment.

CyberKnife can use both single and multiple radiation doses for patient treatment
Gamma Knife to AVM

Pre

12 months post
Case Study

RB is an 80 yr old female. Upon awakening one morning, her husband noted she had slurred speech, R facial droop, and disorientation. A CT scan at the hospital confirmed intracranial hemorrhage. Because of bleed location, surgery was not possible. The R facial droop progressed to totally flaccid R side over the next few days.

10 days after initial symptoms, RB has been transferred to your rehab unit. She still has some confusion, memory difficulties, slurred speech, problems with swallowing, and R sided weakness.
Resources
www.stroke.org  -- National Stroke Association (800-787-6537)
www.ninds.nih.gov  -- National Institute of Neurological Disorders and Stroke (800-352-9424)
www.naric.com  -- National Rehabilitation Information Center (8003462742)
www.aphasia.org  -- National Aphasia Association (800-922-4622)
www.aan.com  -- American Academy of Neurology
www.dynamic-living.com  -- Daily living products
www.ninds.nih.gov/doctors/NIH_Stroke_Scale.pdf  -- NIH stroke scoring system
www.strokecenter.org/trials  -- Find a clinical trial on stroke