Disclosures

- We have no relevant financial or non-financial relationships to disclose

Goals and Objectives

- Become familiar with the etiology (causes) of stroke and patient risk factors
- Learn the early warning signs of stroke
- Review possible long term impairments caused by strokes and how to address these deficits in both nursing homes and assisted living facilities
Brain Attack

• Each year >690,000 adults experience ischemic stroke
• 240,000 experience TIA's
• Stroke is treatable
• Early recognition of signs and symptoms
• Time = brain cell death
• 911

What does a stroke look like?

https://www.youtube.com/watch?v=1i3nMJHXk5A

Act FAST

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 phrase. Is their speech slurred or strange?
TIME: If you observe any of these signs, call 9-1-1 immediately.
Stroke: Etiologies

https://www.youtube.com/watch?v=BDkJ9wRBW40Q

- Hemorrhagic
- Ischemic
  - Thrombotic
  - Embolic

Functional areas of the brain:
This illustration shows the brain's functional areas. After a stroke, deficits in function depend on which cerebral artery is affected.

- Voluntary eye movement
- Motor and speech production
- Motor skills development
- Visual
- Language comprehension
- Auditory
- Apperception and tactile coordination
Stroke: Motor Sequelae
- Hemiplegia vs. Hemiparesis
- Dysphagia
- Ataxia
- Spasticity
- Vision Problems

Hemiplegia & Hemiparesis
- One sided paralysis
- One sided weakness
- Damage to the motor cortex on the side of the brain opposite to the side of the body affected
- Can affect the face, an arm, a leg, or the entire side of the body
- Usually creates difficulty with walking or grasping objects

Dysphagia
- Difficulty swallowing
- Damage to the part of the brain that controls the muscles for swallowing
Ataxia
- Presence of abnormal, uncoordinated movements; failure of muscle coordination during voluntary movements
- Damage to the cerebellum
- Problems with body posture, walking, and balance

https://www.youtube.com/watch?v=rfgJ2PbKrYA

Spasticity
- Muscle stiffness
- Painful muscle spasms

Vision Problems
- Central vision loss
- Visual field loss
- Eye Movement Disorders
- Visual Processing Problems or Visual Neglect
- Visual agnosia
Treatment: Long term care

- Physical Medicine & Rehabilitation
- Physical Therapy: Treat problems with movement, balance, and coordination; orthoses; TENS units; canes and walkers
- Occupational Therapy: provide exercises and practice to help patients perform activities of daily living; modified utensils
- Speech-Language Pathology: evaluate a person’s swallowing function and make recommendations that involve positioning issues, feeding techniques, diet consistency changes, and education

Treatment: Long term care

- Therapeutic recreation specialists: help patients return to activities they had enjoyed prior to the stroke
- Ophthalmology: prism lenses, computer-based visual training, scanning techniques

Treatment: Pharmacological

- Oral:
  - Baclofen
  - Benzodiazepines
  - Gabapentin
  - Tizanidine
  - Dandroline sodium
- Injectable:
  - Phenol and alcohol
  - Botox
- Surgery
Stroke: Sensory Sequelae

- Central pain syndrome
- Complex regional pain syndrome

CRPS/CPS

- Usually occurs within 4-6 weeks of the inciting event
- Stroke is not only etiology
- Results in pain as well as sensory, motor, autonomic and trophic changes
Pain
- Most prominent and debilitating symptom
- Burning, stinging, tearing sensation
- Continuous or paroxysmal
- Exacerbated by movement, contact, temperature variation, stress

Pain
- Exaggerated inflammatory response
- Chemical mediators
- “soup” surrounding primary afferent fibers
  - Induces hyper-excitability of afferent fibers
    - Cause peripheral sensitization
- Feedback loop
  - Discharging C fibers cause increased central sensitization
  - Reorganization of somatosensory cortex

Sensory
- Hyperalgesia: increased sensitivity to pain
- Alldynia: central pain sensitization—can lead to triggering of pain response to non-painful stimuli
- Hypoesthesia: reduced sense of touch
Motor

- Almost all patients have functional motor impairments due to PAIN
- Some develop central motor manifestations
  - Tremor
  - Myoclonus
  - Dystonic postures

Autonomic

- Differences in skin temperature, color, sweat or edema between affected and unaffected side

Trophic changes

- Increased hair growth
- Increased or decreased nail growth
- Contraction and fibrosis of joints
- Skin atrophy
Treatment: Non-Pharmacological

- Avoid triggers
  - Hot baths
  - Easily bunched clothing
- Careful positioning of affected limb; support while sitting or lying down
- Exercises
- Monitor and protect the skin

Treatment: Pharmacological

- AEDS
  - Carbamazepine
  - Gabapentin
  - Pregabalin
  - Lamotrigine
- Regional anesthesia
- Sympathectomy
- Botulin
Stroke: Communication Sequelae

- Aphasia
- Dysarthria
- Apraxia of speech

Aphasia

- Impairment of language, affecting the production or comprehension of speech and the ability to read or write, sometimes called dysphasia
- Types: Global, Broca’s, Mixed non-fluent, Wernicke’s, anomic, other

Global Aphasia

- Produce only a few recognizable words and understand little or no spoken language
- Cannot read or write
**Broca’s Aphasia**

- Speech output severely reduced and limited to short utterances of <4 words
- Vocabulary access is limited and the formation of sounds is often laborious and clumsy
- Likely understand speech well and reads well, but is limited in writing
- “non-fluent aphasia” or “expressive aphasia”

---

**Speech Areas**

- Wernicke’s Area: Sensory in nature
  - Involved in speech comprehension
    - Damage results in receptive aphasia
- Broca’s Area: Involved in speech production.
  - Coordinates respiratory and oral movements
    - Damage results in expressive aphasia

---

**Mixed non-fluent aphasia**

- Speech output severely reduced and limited as in Broca’s aphasia
- Also have limited comprehension of speech and do not read or write beyond an elementary level
**Wernicke’s aphasia**
- Ability to grasp meaning of spoken words is impaired
- Ease of producing connected speech is not affected
- “fluent aphasia” or “receptive aphasia”
- Sentences do not make sense together and irrelevant words intrude
- Reading and writing often severely impaired

**Speech Areas**
- Wernicke’s Area: Sensory in nature
- Involved in speech comprehension
  - Damage results in receptive aphasia
- Broca’s Area: involved in speech production.
- Coordinates respiratory and oral movements
  - Damage results in expressive aphasia

**Anomic aphasia**
- Persistent inability to supply the words for the very things which they want to talk about—particularly the significant nouns and verbs
- Speech is fluent in grammatical form and output, but is full of vague circumlocutions and expressions of frustration
- Understand speech and read well
- Difficulty finding words is as evident in writing as in speech
Other aphasia

- Other combinations or isolation of deficits that do not fit the above categories
- Examples: Alexia, alexia and agraphia together, impairments in calculation

Dysarthria

- Motor speech disorder resulting from impaired movement of the muscles used for speech production including lips, tongue, vocal folds, and/or diaphragm
- Types: spastic, hyperkinetic, hypokinetic, ataxic, flaccid, mixed
**Spastic Dysarthria**
- Increased muscle tone and incoordination
- Difficulty with fine motor movements
- Harsh, low pitch, bursts of loudness

**Hyperkinetic Dysarthria**
- No control over involuntary movement
- Super-imposition of involuntary movements over voluntary speech movements
- Harsh, voice stoppages, hypernasality, mild to total lack of intelligibility

**Hypokinetic Dysarthria**
- Reduced speed of muscles
- Difficulty in the initiation of voluntary speech
- Delay in starting to talk as well as very slow speech
- Hoarseness, low volume, monotone
- Pallilalia can occur
- Festinating speech can occur
Ataxic Dysarthria

- Increased effort is evident
- Explosive speech
- Equal and excessive stress on all syllables
- Slurred

Flaccid Dysarthria

- Breathiness with low volume
- Monotone
- Muscles may begin to atrophy or lose mass – fasciculations or twitching of muscle fibers
- Mouth may sag, cause drooling
- Jaw will deviate to weakened side while tongue moves to stronger side

Apraxia of speech

- Difficulty initiating and executing voluntary movement patterns necessary to produce speech when there is no paralysis or weakness of speech muscles
Treatment: Long term care

- Speech-Language Pathology: Hallmark of rehabilitation for communication disorders
  - **Aphasias**: Melodic intonation therapy, Computer-based treatment, Verb network strengthening, Word finding, Augmentative & Alternative Communication (AAC)
  - **Dysarthria**: slowing rate of speech, improving breath support, strengthening muscles, increasing tongue and lip movement, AAC
  - **Apraxia**: Articulatory, Sensory cueing, Rate & Rhythm control, AAC

Treatment: Pharmacological

- Medications:
  - Piracetam
  - Bromocriptine
  - Stimulants
  - Baclofen
  - Botox
- Transcranial direct current stimulation
- Oral prostheses
- Surgery

Stroke: Cognitive Changes

**Left sided infarct**
- Short term memory problems
- Difficulty in learning new information
- Long term memory usually intact
- Need repetition
- Intellectual impairment—reading, writing, math
- Slow and cautious behavior
- The aphasias

**Right sided infarct**
- May misinterpret or confuse information
- Get things out of sequence
- Can recall events but can be confused about particulars
- Difficulty with problem solving
- Impulsive, distractible
- Poor judgment
Treatment

- Intensive speech/language therapy
- Cognitive retraining
- Computer software
- Computer games
- Thinking games

Treatment

- Memory notebook
- Treatment of depression
- Awareness/avoidance of
  - Medications
  - Alcohol
  - Sleep disturbance
  - Poor nutrition

Treatment: Compensatory Strategies

- Establish a routine
- Have a place for everything
- Write things down
- Use memory cues
- Keep it simple
- Repetition
Treatment: Pharmacological

- Cholinesterase inhibitors
- Memantine
- Small in any benefit
- Data insufficient to recommend use

Stroke: Psychological Sequelae

- Depression
- Anxiety
- Pseudobulbar Affect
- Common—18-61% of stroke survivors
- Predictors
  - Disability, severity of stroke
  - Pre-stroke depression
  - Cognitive impairment
  - Anxiety

Depression: Manifestations

- Feeling sad or empty
- Loss of interest
- Fatigue; “slowed down”
- Sleep/appetite disturbance
- Concentration
- Feeling worthless or helpless
- Guilt
- Irritability
- Death wishes
Anxiety Manifestations

• Overwhelming sense of worry, fear
• Low energy
• Poor concentration
• Muscle tension
• Shortness of breath
• Palpitations
• Tremors
• Nausea
• Headaches
• ANGER

Pseudobulbar Affect

• Uncontrollable emotions
• Pathological liability
• NOT depression
• “Emotional incontinence”
• Estimated prevalence in stroke victims 11-52%

https://www.youtube.com/watch?v=U_ESoZmT2eQ

Treatment

• Best: multi-disciplinary team approach
• Psychological, behavioral and pharmacological
• Counseling
• For PBA especially
  – Be open/explain
  – Distraction
  – Note posture
Treatment: Pharmacological

- SSRIs not just for mood
- FLAME trial 2011
  - Putative neuro-restorative effects
  - Double blind placebo controlled study. Fluoxetine started within 5-10 days of event
  - Resulted in less motor disability at 90 days
  - Question remains: antidepressant vs neuroplasticity
- Cochrane Review
  - SSRIs improve dependence, neurological impairment, depression and anxiety
  - Class effect

---

Treatment: Pharmacological

- Pseudobulbar Affect
  - SSRIs
  - Levodopa
  - Amantadine
  - Dextromethorphan/quinidine (Nuedexta)

---

Nuedexta

- Only FDA approved medication (2010)
- Shown to be effective in decreasing frequency of events
- Cardiac, GI and hematological side effects
Prevention: Primary

• Healthy diet
• Regular physical activity
• Weight loss in overweight and obese individuals
• Smoking avoidance and cessation
• Control hypertension
• Treat dyslipidemia
• Manage Type 1 and Type 2 Diabetes
• +/- Aspirin
• +/- Alcohol

Prevention: Secondary

• Guidelines published in 2014
• Aim—provide comprehensive and evidence based guidelines on the prevention of recurrent stroke

EBM

Levels of Evidence
• IA: meta-analysis of RCT
• IB: at least one RCT
• IIA: at least one controlled study without randomization
• IIB: at least one other type of quasi-experimental study
• III: from non-experimental descriptive studies such as case controlled studies
• IV: expert committee reports

Grades of Recommendations
• A: directly based on Level I evidence
• B: directly based on Level II evidence or extrapolated recommendations from Level I evidence
• C: extrapolated recommendations from Level I or Level II
• D: directly based on Level IV evidence or extrapolated recommendations from Levels I, II or III.
**Hypertension**

- Initiate therapy for previously untreated patients after the first few days with established pressures $\geq 140/90$ (Class 1, Evidence B)
- Resume therapy for previously treated patients (Class 1, Level A)
- Goals are uncertain and must be individualized

**Dyslipidemia**

- Intensive statin therapy in patients with ischemic stroke or TIA presumed to be due to atherosclerosis if LDL-C $>100$ mg/dl (Class I, Level B)
- Lifestyle recommendations (Class I, Level A)

**Glucose Disorders**

- After TIA or Ischemic stroke screen for Diabetes (Class IIA, Level C)
Obesity

• All patients should be screened with measurement of BMI (Class I; Level C)

Physical Inactivity

• For patients who are able and willing to initiate increased physical activity, referral to a comprehensive, behaviorally oriented program is probably recommended (Class IIA, Level C)

Nutrition

• Reduce sodium intake to < 2.4 g/d and further reduction to < 1.5 g/d is beneficial (Class IIA, Level C)
• Reasonable to counsel patients to follow a Mediterranean-type diet emphasizing vegetables, fruits, whole grains, low fat dairy products, poultry, fish, legumes, olive oil and nuts. (Class IIA, Level C)
Sleep Apnea

- Sleep study should be considered on the basis of very high prevalence of sleep apnea in this population (Class IIB, Level B)
- Emerging evidence supports improved outcomes in patients with sleep apnea treated with CPAP (Class IIB, Level B)

Carotid Disease

- Carotid artery angioplasty and stenting (CAS) as alternative to endarterectomy (CEA) if diameter > 70% occluded (downgraded from Class I to Class IIA based on meta-analysis)
- For patients > 70 yrs. CEA associated with improved outcomes (Class IIA, Level B)
- Routine, long term follow-up imaging is not recommended (Class III, Level B)

Intracranial Atherosclerosis

- For patients with recent stroke or TIA attributed to severe (70-99%) stenosis of a major intracranial artery, the addition of clopidogrel 75 mg/day to aspirin for 90 days might be reasonable (Class IIB, Level B)
- For patients with recent stroke or TIA attributable to 50-99% stenosis, maintenance of systolic BP below 140 mm Hg and high intensity statin therapy are recommended (Class I, Level B)
Atrial Fibrillation

• For patients with no apparent cause, prolonged rhythm monitoring (30 days) for AFIB is reasonable (Class IIA, Level C)
• Vitamin K agonists apixaban (Eliquis) and dabigatran (Pradaxa) are indicated in patients with non-valvular AFIB (Class I, Levels A and B)
• The combination of warfarin (or VKA) with antiplatelet therapy is not recommended unless CAD is present (Class IIb, Level C)

Atrial Fibrillation

• If patient is unable to take oral anticoagulants, aspirin alone is recommended Class I, Level A; the addition of clopidogrel might be reasonable Class IIb, Level B)
• It is reasonable to initiate oral anticoagulation within 14 days of the event (Class IIA, Level B) unless at risk for hemorrhagic conversion

Antiplatelet Therapy

• The combination of aspirin and clopidogrel might be considered for initiation within 24 hrs of a minor ischemic stroke or TIA and continued for 21 days (Class IIb, Level B)
• For patients with history of ischemic stroke or TIA, AFIB and CAD the usefulness of adding anti-platelet therapy to VKA is uncertain (Class IIb, Level C)
Importance

• Reinforces lifestyle modifications, active control of comorbidities such as hypertension and diabetes
• Heightens awareness – monitor for GI bleeds

Resources

• www.stroke.org
• Wisconsin Vocational Rehabilitation
Wisconsin Division of Vocational Rehabilitation
201 East Washington Avenue PO Box 7852 Madison, WI 53707-7852
Toll Free: (800)442-3477
Direct: (608)261-0050
TTY: (888)877-5939
Fax: (608)266-1133
dwddvr@dwd.wisconsin.gov
http://dwd.wisconsin.gov/dvr
• www.stroke.org/uk

Selected References

• Panitch, H et al. Randomized, Controlled Trial of Dextromethorphan/Quinidine for Pseudobulbar Affect in Multiple Sclerosis. Ann Neurol 2006; 59:78-878
• Schiffer, R and Pope, L. Review of Pseudobulbar Affect Including a Novel and Potential Therapy. Neuropsychiatry on line Nov 1 2005
Selected References