Neurons have three parts

1. Cell body
2. Dendrites – branches of the cell body that receive impulses.
3. Axon – elongated projection of a neuron that transmits impulses away.

White matter – Bundles of parallel axons and the sheaths are white.

Gray matter – A group of nerve cells or the outer part of the brain tissue is gray.

Synapse – responds by neurotransmitters. Acetylcholine, nor-epi, epi, dopamine.

Ventricle – a space within the brain that fills with CSF.

Hallmark sign of a head injury is AMS.

Cerebral perfusion Pressure

- Determined: Mean (average) arterial pressure minus the ICP.

CNS disorders

- Structural lesions – Tumors and contusions depress consciousness by destroying or encroaching upon brain.
- Causes – Brain tumor.
- Degenerative disease.
- Intracranial hemorrhage.

- Parasites.
- Trauma.

Toxic metabolic states – circulating toxins or lack of metabolic structures (oxygen, glucose or thiamine).

- Causes – Anoxia.
- DKA
- Hepatic failure
- Hypoglycemia.
- Renal failure.
- Thiamine deficiency.
- Toxic exposure – cyanide, organophosphates.

When dealing with an AMS four categories

1. Drugs - depressants, hallucinogens, narcotics
2. Cardiovascular - Anaphylaxis, cardiac arrest, stroke, dysrhythmias, hypertensive encephalopathy, shock.
3. Respiratory - COPD, inhalated toxic gas, hypoxia.
4. Infections - AIDS, encephalitis, meningitis.

Cerebral homeostasis

- Autonomic nervous system maintains.
- Vitals, metabolism.
- It is affected by emotional influences ie blushing, palpitations, clammy skin.

Peripheral Nervous System Disorders

- Damage to the peripheral nerves.
- Affects sensation, reflexes, muscle activity. Fx bones, trauma, compression of nerve. Diabetes is a common affect of deterioration.

AMS is any abnormal behavior whether depressed or manic. You must describe the AMS in more detail.

Physical Findings

- Cranial nerve 7 Smile, frown, wrinkle forehead. Intact facial nerves.
- Cranial nerve 3 controls pupils.
- Cranial nerves 3, 4, 6 = cardinal position of gaze.
- Respiratory status.

Cheyne-stokes respirations range from 10 to 60 a second with periods of apnea

Kussmauls indicated metabolic disorders.

Central Neurogenic Hyperventilation – Hyperventilation caused by a lesion in the CNS – rapid, deep, noisy breathing.

Ataxic respirations – Poor respirations due to CNS damage – gasping/agonal.

With intracranial pressure you want to ventilate the patient at 20 to 24 breaths per minute to get PaCO2 to 30mmHg.

This will vasoconstriction the vessels and reduce swelling.

Posturing

- Decorticate arms flexed and legs extended.
- Decerebrate arms and legs extended.
- Both indicate brain stem injury.

Glasgow coma scale

Eyes

Verbal

Motor

- 8 or better – 94% favorable.
- 5,6,7 – 50% favorable.
- 3,4 – 10% favorable.
- 5,6,7 who drop – 0% favorable.
- 5,6,7 who rise – 80% favorable.

Cushing's Reflex.

1. Increased BP
2. Decreased pulse
3. Erratic respirations
4. Increased temperature
5. Projectile vomiting

- End-Tidal CO2 or capnography
- Pulse-Ox – Less than 90% not good.
- Blood glucose – see if diabetic emergency
- Mnemonic of common causes of AMS

1. A – Acidosis/alcohol
2. E - Epilepsy
3. I - Infection
4. O - Overdose
5. U – Uremia (kidney failure)
6. T – Trauma, tumor, toxin
7. I – Insulin
8. P – Psychosis/poisons
9. S – Stroke/seizure

AVPU is LOC and GCS is neurological status.

- Interferes with intake of use of thiamine.
- Thiamine is needed to convert pyruvic acid to acetyl-coenzyme.

- Wernick's Syndrome acute encephalopathy ataxia, eye muscle weakness, mental derangement
- Korsakoff's psychosis memory disorder.

Care for intracranial pressure

CO_2 hyperventilation

Mannitol – osmotic diuretic

Strokes

- Occlusive stroke – ischemic strokes falls into two categories
- 75 to 85% of Strokes are Blockage/Occlusive/Ischemic that will benefit with clot busters. Goal time 3 hours.

Three Types of Strokes

1. Embolic stroke – A-fib, carotid arthrosclerosis
2. Thrombotic Stroke - Gradual onset of plaque buildup.
3. Hemorrhagic Stroke - Bleeding within the brain. - Worse headache ever and came on fast.

Assessment:

- Eyes will be turned away for side that is paralyzed.

- Cincinnati stroke scale: 72% if at least one is present:

1. Arm drift
2. Speech
3. Facial droop

Causes: fats, diabetes, birth control, sickle cell, a-fib, hypertension

Distinguish between TIA and CVA

- TIA usually resolves within 24 hours.
- No evidence of residual brain damage.
- TIA is fast onset.
- Cause of TIA – most common carotid artery disease followed by decreased cardiac output, hypotension, and psychotic meds.

Management:

- Time is important 3 hour goal window.
- ABC
- Hyperventilate to 30 $PaCO_2$
- High flow O_2
- Blood sugar levels.
- IV ringers/NS avoided D5W

Seizures

- Temporary alteration of behavior due to electrical discharge in brain.
- Anyone can have a seizure
- Anything that affects/touches the brain can cause a seizure
- Most common cause of seizures are idiopathic.
- Epilepsy means nothing more than prone to seizures.

Types of Seizures

Tonic-clonic – grand mal.

- Aura – subjective sensation prior to seizures.
- Unconsciousness
- Tonic/clonic phase

- Postictal confusion/fatigued. Headache, vision problems, dazed.
- Incontinence

Absence – petit mal

- Brief day dreaming
- 10-30 seconds.
- Eye fluttering
- Younger aged more common.

Partial or focal seizures.

- Chaotic movement of one area of the body.
- Jacksonian Seizures

Assessment

- Other problems may mimic seizures

  Migraines, cardiac dysrhythmias, hypoglycemia, drugs, hyperventilation, meningitis, ICP, tranquilizers.

Management

- Protect body temperature while seizing.

- Maintain airway after seizure
- High flow O2
- IV no D50 if ED will deliver dilantin which is incompatible with dextrose solutions
- If hypoglycemic give D50
- Place on left side after seizure
- ECG
- 5-10mg diazepam IV
- Have romazicon ready – why?

Status epilepticus

- Two or more seizures without regaining consciousness.

Syncope

- Fainting
- ½ of all Americans will experience this at least once.
- Causes – cardiac, hypoglycemia, TIA, anxiety, pain, and unknown causes.
- Lasts under 1 minute.

- Care: Standard treatment and work-up.

Headache

- 45 million Americans have chronic headaches.
- 17 million of them are migraines.
- Headaches are acute/chronic/local/general.

1. Vascular headaches – include migraines and cluster headaches. Throbbing pain, photosensitivity, n/v.

Migraines are one sided and aura present and last days. Cluster headaches are one sided acute and last from 15 minutes to 4 hours.

2. Tension headaches – Dull achy pain that increased as the day continues. Pressure headaches.

3. Organic headaches – tumors, infection.

- Headaches with meningitis will: occiput pain, fever, confusion, nuchal pain. Also assess closer patient with rash, vomit
- Care: Standard work-up including d stick. Consider antiemetics or pain control. Imitrix and Compazine are most common agents for migraines. Calm quiet environment.

Neoplasms

- Abnormal tissue growth.
- 40,000 people per year CNS is affected by neoplasms.

Benign tumors

Malignant tumors

- HA
- n/v
- Weakness in one arm or side
- Dizzy
- Seizures

Degenerative Neurological Disorders

- Alzheimer's – most significant – nerve cells in cerebral cortex disappear. Short term memory loss and get worse. Body becomes rigid.
- Muscular Dystrophy – progressive muscle weakness of voluntary or involuntary muscles. (Dr. Sherman).
- Multiple Sclerosis – Inflammation of nerve cells followed by demyelination (destruction of myelin sheath of nerves. 20-40 years of age starts. Weakness, sensory loss and severity ranges.

- Dystonias – twisting or repeated movements or freezing. Repetitive movements. May affect a single muscle or a group.
- Parkinson's – Motor system disorder. Dopamine levels are low. Onset age 60. Progressive disease: Tremors, Rigidity, Bradykinesia, Instability.
- Bell's Palsy – Most common form of facial paralysis. Inflammatory reaction to cranial nerve 7. One sides weakness. Cannot close eyes, Head presents like a stroke. Common history: Head trauma, herpes simplex, Lyme disease. Corticosteroids may be useful. Recovery within 3 months.
- Spina Bifida – Neural defect from failure of fetal vertebrae to close.
- Polio – infection viral disease that attacks the CNS.

Back pain

- Is the most common reason that health care.
- Low back pain – most common complaint.
- Many causes.
- Cartilage disk deterioration with age.
- Herniated disk.