Objectives

1. Describe common CNS tumors
2. Describe signs and symptoms of neurologic alterations
3. Review key assessment skills and nursing interventions
Neuro Assessment

- Baseline assessment is essential and needs to be documented
- LOCATION and type of injury/insult
- Basic Assessment
  - Glasgow Coma Scale
  - Motor/Sensory Function
  - Cranial nerve dysfunction
  - Pupil

Glasgow Coma Scale

<table>
<thead>
<tr>
<th>Glasgow coma scale</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye opening</td>
<td>spontaneously</td>
</tr>
<tr>
<td></td>
<td>to speech</td>
</tr>
<tr>
<td></td>
<td>to pain</td>
</tr>
<tr>
<td></td>
<td>none</td>
</tr>
<tr>
<td>Verbal response</td>
<td>oriented</td>
</tr>
<tr>
<td></td>
<td>confused</td>
</tr>
<tr>
<td></td>
<td>inappropriate</td>
</tr>
<tr>
<td></td>
<td>incomprehensible</td>
</tr>
<tr>
<td></td>
<td>none</td>
</tr>
<tr>
<td>Motor response</td>
<td>obeys commands</td>
</tr>
<tr>
<td></td>
<td>localizes to pain</td>
</tr>
<tr>
<td></td>
<td>withdrawal to pain</td>
</tr>
<tr>
<td></td>
<td>flexion to pain</td>
</tr>
<tr>
<td></td>
<td>extension to pain</td>
</tr>
<tr>
<td></td>
<td>none</td>
</tr>
</tbody>
</table>

Maximum score: 15
**Motor Strength**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No muscle contraction is detected.</td>
</tr>
<tr>
<td>1</td>
<td>A trace contraction is noted in the muscle by palpating the muscle while the patient attempts to contract it.</td>
</tr>
<tr>
<td>2</td>
<td>The patient is able to actively move the muscle when gravity is eliminated.</td>
</tr>
<tr>
<td>3</td>
<td>The patient may move the muscle against gravity but not against resistance from the examiner.</td>
</tr>
<tr>
<td>4</td>
<td>The patient may move the muscle group against some resistance from the examiner.</td>
</tr>
<tr>
<td>5</td>
<td>The patient moves the muscle group and overcomes the resistance of the examiner. This is normal muscle strength.</td>
</tr>
</tbody>
</table>

**Pupil Assessment**

Dysphasia - difficulty in swallowing

Apraxia - loss of the ability to execute or carry out learned purposeful movements

Aphasia - disturbance of the comprehension and formulation of language

Dysreflexia - Abnormally increased or decreased response to physiologic stimuli
Nystagmus - *Rhythmic, oscillating motions of the eyes are called nystagmus*

Anascoria - *unequal pupils*

Focal - *impairments of nerve, spinal cord, or brain function that affects a specific region of the body*

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**Neuro Changes**

Types and signs of neuro change
- Change in LOC
- Pupil changes
- Motor or sensory changes
- Speech changes
- Vision changes
- Seizure activity
- Peripheral neuropathy

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**Seizures**

- **Definitions:**
  - Seizure: a sudden, explosive, disorderly discharge of cerebral neurons
    - Motor, sensory, autonomic, or psychic
    - Tonic: excessive muscle tone
    - Clonic: alternating contraction, relaxation
    - Epilepsy: disease condition that causes seizures
- **Types**
  - Partial (focal), simple, complex, generalized

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**Seizure Classification**

- Partial (seizure activity originates in one part of the brain)
  - Simple
  - Complex
- Generalised (seizure activity involves entire brain)
  - Absence
  - Myoclonic
  - Tonic clonic
  - Tonic
  - Atonic
Post Ictal

Thought:
• Memory loss
• Writing difficulty
• Somnolence/Lethargy

Emotional:
• Confusion
• Depression and sadness
• Fear
• Frustration
• Shame/Embarrassment

At risk for:
• Aspiration
• Falls
• Bruising/self injury
• Airway
• Status Epilepticus

Guidelines for Seizure Care

Diagnosing Seizure Activity
• You first have to be looking for any potential seizures in your patient with a brain tumor.
• Report any Symptoms that could be seizure activity to a provider
• EEG is the definitive test to discover whether your patient is seizing or not.

Seizure Med Management
• Benzo’s for immediate control
  – Ativan/valium/versed
• Maintenance meds(may require a load)
  – Phenytoin/Fosphenytoin
  – Keppra
  – Depakote
  – lacosamide
Common Types of CNS tumors

Breakdown of Brain Tumors

- There are more than 120 types of brain and central nervous system (CNS) tumors
- Brain metastases are about 10 times more common than primary tumors
- Classify brain tumors by cell origin and how the cells behave, from the least aggressive (benign) to the most aggressive (malignant)

Incidence of primary brain tumors
A. Incidence rate of all primary benign and malignant brain tumors,
   14 cases per 100,000 person-years
   - 1. Benign tumors, 5.7 per 100,000 person-years
   - 2. Malignant tumors, 7.7 per 100,000 person-years
B. Incidence rate by sex
   - 1. Men, 14.2 per 100,000 person-years
   - 2. Women, 13.9 per 100,000 person-years
C. Median age at diagnosis, 57 years

Figure 1. Distribution of Tumors in the Central Nervous System

Primary Brain Tumors

- Meningioma
  - Benign
  - Atypical
  - Malignant
- Primitive Neuroectodermal Tumors (PNET)
  - Medulloblastoma
  -Primitive neuroectodermal tumor
  - Pinealoblastoma
- Pituitary Tumors
  - Pituitary adenoma
  - Pituitary carcinoma
  - Compressing tumors
  - Rathke’s cleft cyst
- Pineal Tumors
  - Pineal cyst
  - Pinealoma
  - Pineal teratoma
- Choroid plexus tumors
  - Choroid plexus papilloma
  - Choroid plexus carcinoma
- Other, more benign primary tumors
  - Neurentoma
  - Dysembryoplastic neuroepithelial tumors
  - Lipoma
  - Hemangioblastoma
  - Hemangioma
  - Tumors of nerves and/or nerve sheaths
  - Neurofibroma
  - Schwannoma

Primary Brain Tumor- Gliomas

- Cysts
  - Colloid cyst
  - Arachnoid cyst

- Other primary tumors, including skull base
  - Chondroma
  - Chordoma
  - Sarcomas
  - Gliosarcoma
  - Chondrosarcoma
  - Rhabdomyosarcoma

- Primary Central Nervous System Lymphoma (PCNSL)

Grades of Gliomas

Table 3. WHO Grading System for Gliomas

<table>
<thead>
<tr>
<th>Grade</th>
<th>Tumor</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Pilocytic astrocytoma</td>
<td>Benign, slow-growing tumor; usually associated with long-term survival; frequently reoccurs in subependymal region.</td>
</tr>
<tr>
<td>II</td>
<td>Anaplastic astrocytoma</td>
<td>Increased hypercellularity, no mitosis; no vascular proliferation; no necrosis; can recur as a higher-grade tumor.</td>
</tr>
<tr>
<td>III</td>
<td>Anaplastic astrocytoma</td>
<td>High rate of hypercellularity, high rate of mitosis, no vascular proliferation, no necrosis; high rate of tumor recurrence.</td>
</tr>
<tr>
<td>IV</td>
<td>Glioblastoma</td>
<td>Very high rate of hypercellularity, very high rate of mitosis, presence of vascular proliferation, presence of necrosis.</td>
</tr>
</tbody>
</table>

How might the Patients present?

- SEIZURES
- Back/neck pain/headache
- Mental status changes
- Foot drop
- Gait disturbance
- Nausea/vomiting
- Incidental finding on MRI
Primary Brain Tumor TX

- Stereotactic biopsy
- Surgical Debulking
- Radiosurgery
- Chemo/Radiation
  - Temozolomide – oral/IV agent that crosses BBB
- Gliadel wafers

Complications of Radiation to the Brain

- Can be direct damage at time or occur months later
  - Increased ICP (cerebral edema)
  - Disruption of BBB
  - Cognitive deficits
  - Seizures
  - Headaches

Radiosurgery

CNS Lymphoma

- Systemic chemotherapy with or without stem cell rescue: High dose methotrexate, high dose Cytarabine
- Intra-thecal chemotherapy: methotrexate (e.g. 12 mg)
- Rituxan for CD 20+ lymphoma – role in treatment unclear
- Corticosteroids – for edema, ICP, and its role in chemotherapy (potentiates action)
- Anticonvulsants – seizures prophylaxis
- Radiation therapy – may have a role (whole brain for primary, or to specific sites for secondary CNS lymphoma)
Blood Brain Barrier
• a filtering mechanism of the capillaries that carry blood to the brain and spinal cord tissue, blocking the passage of certain substances

High Dose Methotrexate for CNS tumors
• HDMTX therapy can cause significant toxicity, which not only leads to morbidity and occasional mortality, but also disrupts therapy, resulting in dose reductions that can adversely affect control of the cancer
• Hydration- flushes kidneys
• Urine alkalization- Sodium bicarb
• Leucovorin Rescue- is particularly effective in the prevention of myelosuppression, GI toxicity, and neurotoxicity during treatment with HDMTX

Intrathecal Chemo
Nurse Role Post lumbar puncture
• Monitor for S/S of CSF leak
  – Nausea
  – Vomiting
  – Headache
  – fluid leaking
• Monitor for S/S of CNS irritation
• Pain
• Hypotension
• Infection
Mets to the Brain

Monroe Kellie Hypothesis

The Monro Kellie Doctrine describes the interrelation of the various volume compartments of the CNS:
- Ventricles w/CSF
- Brain (white and gray matter)
- Subarachnoid space (SAS) w/CSF
- Volume of the blood in vessels

- The Monro Kellie Doctrine suggests that when the volume of one compartment increases, there must be a corresponding and compensatory decrease in the volume of the other spaces.

Increased ICP

1. altered levels of consciousness
2. changes in sensory and motor function
3. changes in pupil size, equality, and reaction to light, and extraocular movements
4. changes in vital signs and patterns of respiration.
Types of Herniation

- a) Subfalcial herniation
- b) uncal herniation
- c) central transtentorial herniation
- d) external herniation
- e) tonsillar herniation

Treatment of ICP

- Medication
  - Corticosteroids
  - Hypertonic saline-23.4%
  - Mannitol
- Surgery
- Nursing interventions
  - Increase HOB(30-45 degrees)
  - Keep body in alignment
  - Head/neck straight

Spinal Tumors

- Spinal tumors are relatively rare and affect only a minority of the population.
- Cause significant morbidity in terms of pain and limb dysfunction
- Associated with mortality as well
- Early diagnosis and prompt treatment is important.
- MR imaging
- Tumors to be classified as
  - Extradural
  - Intradural-extramedullary
  - Intradural-intramedullary
Mets to the Spine

- Most common source of bone metastasis
- 3rd overall most common site after lung and liver
- Bowel/Bladder dysfunction
- Treatment
  - Palliative VERSUS cure
  - Surgery - who qualifies?
  - Radiation
  - Embolization
  - Biphosphonates
  - Steroids

How do the Tumors get Identified?

- Non-malignant
  - Often an incidental finding
  - Sometimes weakness/numbness
- Malignant/mets
  - Pain
  - Weakness/numbness
  - Bowel/bladder dysfunction
Spinal Cord Injury

- When there is injury to the actual spinal cord
- Goal is to relieve pressure on the cord and promote function
- "complete" spinal cord injury results in permanent injury. Goal is to prevent complications and to strengthen current function

Neuro Complications of Chemo Therapy

Peripheral Neuropathy
- Vincristine
- Cisplatin
- Taxanes
  - Paclitaxel
  - Docetaxel

Cyclosporin/tacrolimus
- Confusion
- Cortical blindness
- Brain hemorrhage
- Peripheral neuropathy
- Aphasia
- Cerebellar changes

Peripheral Neuropathy

Peripheral neuropathy describes damage to the peripheral nervous system
- Numbness
- Tingling
- Pricking sensations (paresthesia)
- Sensitivity to touch
- Muscle weakness
- Burning pain (especially at night)
- Muscle wasting
- Paralysis
- Organ or gland dysfunction

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<thead>
<tr>
<th>Drug</th>
<th>Threshold</th>
<th>Effects</th>
<th>Side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vincristine</td>
<td>10-20 mg</td>
<td>Peripheral nerve, paresthesia, numbness, tingling</td>
<td>Numbness, tingling</td>
</tr>
<tr>
<td>Cisplatin</td>
<td></td>
<td></td>
<td>Nausea, vomiting, hearing loss, peripheral neuropathy</td>
</tr>
<tr>
<td>Taxanes</td>
<td></td>
<td>Zofoxelene, vinorelbine, paclitaxel</td>
<td>Nausea, vomiting, peripheral neuropathy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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“Chemo or Radiation” Brain

- “Chemo brain is a common term used by cancer survivors to describe thinking and memory problems that can occur after cancer treatment. Chemo brain can also be called chemo fog, chemotherapy-related cognitive impairment or cognitive dysfunction” - Mayo Clinic

General Neuro Patient Care needs

- Neuro changes/seizure identification
- Respiratory/Airway Protection
- Cardiovascular
- GI/GU
- Delirium
- SAFETY
- Pain Assessment
- Communication

Normothermia

- Goal of Normothermia
  - varies in the literature but typically try for 36-37.5
- Patients neuro exam will worsen if they are warm
- Hyperthermia in neuro = worse outcomes
- Rule out infectious origin (culture blood/any drains or tubes, chest x-ray)
- Strategies
  - PRN or scheduled tylenol
  - Ibuprofen in some cases (must have NS approval as can extend bleeding time)
  - Ice Packs to Groin/axilla
Respiratory Care

Lungs/Vitals
- Monitor RR/O2 Sats
- Pay close attention to the respiratory rhythm and any abnormal pauses or cycling of breathes

Airway
- What kind of airway does your patient have?
- Do they have control of their airway?
- Can they manage their secretions?
- Do they have a cough/gag reflex?
- Are they aware enough that they could turn over if they vomited?

HOOK UP SUCTION IN ALL NEURO PATIENTS ROOMS!

Altered Breathing Patterns

Airway Management
- Side lying in patients without airway control
- HOB >30 degrees
- Position pillow under shoulders/neck to prevent airway obstruction from tongue
- Suction set up in the room and active
- Frequent Mouth care
GI
- Evaluate their ability to swallow prior to med and food intake
- Spinal cord Mets- may need a bowel program to facilitate bowel movement.

GU
Voiding
- Need for PVR and bladder ultrasounds
- Complex, requires intact nerves and control
- Requires uninjured muscles
>350 cc of urine shown to cause damage in neuro patients' bladders

NEVER TRUST A NEURO PATIENT!
- Almost all neuro patients are at risk for injury
- Identify patients at risk to fall
- Bed Alarms on all at risk patients- make sure they are on and working
Red Flags of Neurological Emergency

**Stroke**
- Facial droop
- Motor weakness
- Pronator drift
- Ataxia
- Speech dysfunction

**Seizure**
- Starring spells
- Eye deviation and unresponsive
- Periods of loss of consciousness
- Muscle Twitching
- Periods of stuttering

Questions?
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206-320-2821