**Central Nerves System Medications Outline**

https://www.youtube.com/watch?v=EeE7Fpg061I

The CNS consists of the *brain* and *spinal cord*.

**The brain**

- The most complex organ
- The cerebral cortex
- 15–33 billion neurons
- It is the central control module of the body and coordinates activity.
  - physical motion
  - secretion of hormones
  - creation of memories
  - sensation of emotion

**The Brain Lobes**

- **Temporal lobe:** processing sensory input and assigning it emotional meaning; long-term memories ;language perception
- **Occipital lobe:** Visual processing /visual cortex.
- **Parietal lobe:** Integrates sensory information including touch, spatial awareness, and navigation. It also plays a part in language processing.
- **Frontal lobe:** Contains the majority of dopamine-sensitive neurons and is involved in attention, reward, short-term memory, motivation, and planning.

**Brain Regions**

- **Basal ganglia:** control of voluntary motor movements, procedural learning, and decisions about which motor activities to carry out. ( Parkinson's disease)
- **Cerebellum:** precise motor control, but also in language and attention.( Ataxia)
- **Broca's area:** language processing. (Difficult to speak)
- **Corpus callosum:** a broad band of nerve fibres that join the left and right hemispheres. (Dyslexic)
- **Medulla oblongata:** involuntary functions, such as *vomiting, breathing, sneezing*, and maintaining the *correct Blood pressure.*
- **Hypothalamus:** Secretes a number of neurohormones and influences *body temperature control*, *thirst*, and *hunger*.
- **Thalamus:** It is involved in the regulation of *consciousness*, *sleep, awareness*, and *alertness*.
- **Amygdala:** They are involved in *decision-making, memory*, and *emotional responses*; particularly *negative emotions*.

**Spinal Cord**

The spinal cord, running almost the full length of the back, carries information between the brain and body, but also carries out other tasks. From the brainstem, where the spinal cord meets the brain, 31 spinal nerves enter the cord. Along its length, it connects with the nerves of the peripheral nervous system (PNS) that run in from the skin, muscles, and joints.

**Central Nervous System Diseases**

- Trauma
- Infections
- Degeneration
- Structural defects
- Tumours
- Autoimmune disorders
- Stroke
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**Central Nerves System Medications**

- Analgesics
- Anesthetics
- Antianxiety, sedative and hypnotic
- Antiepileptic

## 1. Analgesics

Analgesics are medicines that are used to relieve pain (provide analgesia).

- They are also known as painkillers.
- Technically, the term analgesic refers to a medication that relieves pain without loss of consciousness, as opposed to an anesthetic, which is a substance that induces insensitivity to pain via a loss of consciousness and an absence of sensory perception.

**Pain**

An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage (APS, 2003).

**Common Misconceptions about Pain**

**Health care providers:**

- A client's perception of chronic pain can be correlated with vital signs changes and evidence of injury.
- Clients in pain readily express their pain to HCP.
- Clients of certain gender, cultural, ethnic or socio-economic backgrounds consistently underreport or over report their pain.
- Opioids are addictive and a treatment of last resort because of unmanageable adverse effect.
- Older clients and cognitively impaired clients do not perceive pain as intensely as other clients.
- If clients are able to sleep, they are not in very much pain.

- The goal of managing chronic pain is to keep dose of medication as low as possible.

**Clients**:

- Sever or chronic pain can't be effectively controlled.
- Opioid are always addictive and a treatment of late resort.
- Pain is always evidence of disease progression.
- It is more admirable or socially acceptable to ignore pain.
- Pain is unavoidable result of aging or disease.
- Pain is deserved punishment (Cultural aspect).

**Types of Analgesic:**

1. **Opioid Agonists (moderate and severe pain)**

Drug binds to specific receptors (Mu, kappa, delta and sigma) inside and outside the central nerves system. (Morphine)

**2. Opioid antagonist (mild to moderate pain)**

Competitive antagonists that bind to the opioid receptors with higher affinity than agonists but do not activate the receptors. This effectively blocks the receptor, preventing the body from responding to opioids and endorphins. (Naloxone)

**3. Opioid –like Drug**

Drug binds to the mu opioid preceptor and inhibits the reuptake of norepinephrine and serotonin. (Tramadol)

**4. Partial Opioid Agonist-Antagonists**

These drugs have both agonist and antagonist effects on opioid respecters.

**Side Effect of Opioid**

- Respiratory depression
- Nausea / vomiting
- Constipation
- Perceptual alteration
- Urinary retention
- Deficient fluid volume

**Nonopioid Analgesics**

**1. Cyclooxygenase inhibiters (NSAIDs, salicylate)**

These drugs directly targets cyclooxygenase-2- an enzyme responsible for inflammation and pain- used to treat mild and moderate pain, fever, and inflammation.

**2. Acetaminophen**

Inhabiting prostaglandin synthesis in the CNS and peripherally, and reduce fever via action in the hypothalamus.

**3. Adjunct analgesic**

Co-analgesic medications are used in combination with other analgesics to enhance pain relief or treat symptoms. (Corticosteroids, antihistamine)

**Side Effect of Nonopioid Analgesic**

- Constipation.
- Drowsiness.
- Dizziness.
- Upset stomach.
- Ringing in your ears.
- Skin itching or rash.
- Dry mouth

**Special Issues of Pain Management**

- Pregnancy, labor and delivery (assessment/ dosage/ risk or danger/ timing)
- Infant and Children (assessment/ graphic scale/ reduce the anxiety/ dosage and route)
- Elder adult/ seniors (assessment/ side effect tolerance/ monitor/ complication)
- Client with chemical dependence (assessment, dosage)

## 2. Anesthetics

Central nervous system depressants used to induce a loss of sensation, especially the sensation of pain.

**Two Major Categories:**

- **General anesthesia:** Induces a state of unconsciousness, amnesia, skeletal muscles relation and reflex reduction.
- **Regional or local anesthesia:** Block pain sensations in specific areas of the body without loss of consciousness.

**Stages of Anesthesia;**

**Stage 1: Analgesia**

- Analgesia/ numbness
- Loss of senses
- Auditory/ visual hallucination

Nursing Management- Maintain quiet and calm environment.

**Stage 2: Excitement**

- Exaggerated reflexes
- Client may struggle
- Periods of apnea
- Vomiting or incontinence may occur

Nursing Management- maintain airway/ protect against aspiration.

**Stage 3: Surgical anesthesia**

- Eye movement stop

- Partial intercostal paralysis
- Divergent pupil dilation
- Complete intercostal paralysis

Nursing Management- maintain airway/ protect against aspiration.

**Stage 4: Medullary paralysis (toxicity)**

- Respiratory arrest
- Vasomotor collapse

**Nursing Management-** resuscitation

**Inhaled Anesthetics:**

- Gases or liquids that can be administered by inhalation when mixed with oxygen. These can effect a concentration in the blood and brain to depress the CNS and cause anesthesia. (Gas:Nitrous Oxid; Liquid: Halthane)

**Advantage:**

- Complete anesthetics
- Controllable anesthetics
- Allergic uncommon
- Rapid recovery

**Intravenous anesthetics:**

Maintenance of general anesthesia, for the induction of amnesia and as adjunct to inhalation –type anesthetics.

- **Ultra-short- Acting Barbiturates (Thiopental sodium)**

**Advantage of intravenous anesthetics**

- Rapid induction of unconsciousness
- Amnesia
- Prompt recovery with minimal doses
- Simplicity of administration
- No irritation of mucous membranes
- No hazard of fire or explosion
- Less occupational exposure

**Disadvantage of Intravenous Anesthetics**

- Swelling, pain, ulceration, and necrosis if drug infiltrates tissue
- Thrombosis and gangrene if arterial injection.
- Hypotension, laryngospasm, respiratory failure from overdose or prolonged administration.

**Managing Undesirable Adverse Effects of General Anesthesia**

Pulmonary toxicity related to aspiration of gastric content

- Could be prevented by aggressive management of postoperative nausea and vomiting.
- Medications that affect the serotonin receptors (Dolasetron),
- Antimuscarinic agents (Atropine) prior to surgery to inhibit secretions and to reduce the possibility of vomiting.

**Certain Cases Needs Special Precautions**

- Obesity
- Smoking
- Pregnancy
- Alcoholism
- Young age
- Advance age

**The Role of Nursing in Managing the Case of a Client Undergoing General Anesthesia**

**1. Preoperative Phase**

- Preoperative assessment / preparation
- Inform the clients of preoperative routine
- Pre-anesthetic medication
- Postoperative instruction

**2. Intraoperative Phase**

- Maintain client safety
- Physiologic mentoring
- Psychological support

**3. Postoperative**

- Assessment (airway and berating, circulation, metabolic states, condition, intake and output, muscles strength and responses, pain, ability of communicate.
- Mentoring
- Education

**Local Anesthetics**

It used to eliminate pain sensation (Lidocaine)

- A number of local anesthetic cannot be injected they can be used safely on open wounds ulcers and mucous membranes.
- Topical anesthetics for skin disorders are used primarily to relive discomfort, pain and soreness.
- Regional anesthesia: anesthesia by injection is accomplished with either infiltration or conduction.

**Reactions to Local Anesthetics**

It produces vasodilation by acting directly on blood vessels and by anesthetizing sympathetic vasoconstrictor fiber.

This action can cause rapid absorption that may cause toxic effects on the following systems;

- Central nerves system (anxiety, restless, confusion, dizziness, tremors, and seizure)
- Cardiovascular system (Myocardial depression, bradycardia, and hypotension)
- Allergic Reaction (hives, itching, skin rash)

## 3. Antianxiety, Sedative, and Hypnotic Drug

**Antianxiety:**

Reduce feelings of excessive anxiety, such as fear, worry nervousness and panic.

**Sedative:**

Reduce the nervousness excitability or irritability by producing a calming or soothing effect.

**Hypnotic:**

Used to induce sleep

**Note:**

- The different between sedative and hypnotic is the degree of CNS depression induced.
- A small dosage may be used for sedative effect; larger doses for hypnotic effect

**Anxiety:**

- A state of feeling of apprehension, uneasiness, agitation, uncertainty, and fear resulting from the anticipation of some threat or danger usually of psychic origin, whose source is generally unknown or unrecognized**.**

**Two Components:**

- Mental features: worry, fears difficulty concentrating
- Physical features: racing heart, shortness of breath, and trembling

**Conditions that Anxiety is a Major Component**

1.Panic Disorder
2. Generalized Anxiety Disorder
3. Phobic Disorder
4. Post-traumatic Stress Disorder
5. Insomnia

**The Primary Categories of Anxiolytic/Sedative/Hypnotic agents.**

**1. Benzodiazepines**

Muscle Relaxant, anti anxiety, anti- seizure, hypnotics

- Diazepam,(Valium), Midazolam, Clonazepam

**2. Benzodiazepine like drugs**

Short-term treatment of insomnia/ (Zolpidim /Tartrate)

**3. Serotonergic drug**

Anxiety disorders, alternative to benzodiazipines/ (Buspirone)

**4. Antihistamine Anxiolytics**

Anxiety sedative, motion sickness, nausea and vomiting / (Hydroxizine)

**Adverse Effects:**

- Psychological and physical dependence

- Most common: Drowsiness, Hiccups, lack of energy, loss of dexterity
- Less common: Dry mouth, nausea, vomiting, headache, constipation, abdominal cramping, dizziness, and blurred vision.

**Benzodiazepines types**

- **Short Acting Benzodiazepines** /(Alprazolam)/ Anti anxiety and antipanic
- **Intermediate / Moderate acting Benzodiazepines** (Estazolam)/ Short term treatment of insomnia.
- **Long Acting Benzodiazepines/** (Chlordiazepoxide)/Anti anxiety, sedative hypnotic, anti- tremor, anti- panic, relief of acute alcohol withdrawal symptoms.
- **Advantage of Benzodiazepines**
- Lower fatality rates with acute toxicity and overdose
- Lower potential for abuse compared with barbiturates
- More favorable adverse effect profiles
- Less potentiality serious drug interaction reported when administrated with other medication

**Barbiturates (**Hypnotic & sedative) (p. 234)

1. **Ultra short-acting barbiturates** (IV anesthetics)

2. **Short acting barbiturates** (10 – 15 min)
   - Insomnia, pre anesthetic sedation
3. **Intermediate acting barbiturates** (45 – 60 min)
   - Insomnia
4. **Long acting barbiturates** (More than 60 min)
   - Epilepsy, chronic neurologic disorders
   - Sedation for higher anxiety

**Important Hints**

- High dose of barbiturates may induce *coma* and potentially death.
- The barbiturates are not regarded as analgesics and cannot be depended on to produce restful sleep when insomnia is caused by pain.
- Barbiturates depress the motor cortex of the brain when used in large dose, this explain their use as antiepileptic.
- Barbiturate are commonly used as adjuncts to anesthesia
- Long –term of using barbiturates may cause *osteomalacia* and rickets.
- Must be avoided during *pregnancy*

**Special Consideration For children (p.325)**

- Lower rate of metabolism by immature liver (neonates)
- Barbiturates should not be used to treat a hyperactive or psychotic child.
- Mentor child for excessive sedation, lethargy and lack of coordination

**Special Consideration for older adults**

- Sleep latency/ sleep disturbance
- Evaluate the preexisting health condition which may effect the sleep patterns
- Hypnotic should be reserved to treat acute insomnia and limited to short term to avoid the development if tolerance and dependency.

## 4. Antiepileptic Drugs

**Epilepsy**

A brain disorder in which clusters of neurons in brain sometimes signal abnormally. The normal pattern of neuronal activity becomes disturbed, causing strange sensation, emotions, behaviors, sometimes seizures, and loss of consciousness.

**Goal of Therapy:** To prevent the seizures without adverse effects for the clients.
**Mechanism of Action**: Stabilization of the cell membrane by altering transport of sodium, potassium and calcium. Example, **(Carbamazepine)**

- Optimal AED therapy may completely control seizures in 60%-90 % of clients
- **Short term AED**: the secondary seizures
- **Long term AED**: the primary recurrent seizures
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**The two main pharmacologic effects of AEDs are:**

- Increase motor cortex threshold to reduce its responses to incoming electric or chemical stimulation.
- Depress the spread of seizure discharge from its focus or origin by depressing synaptic transport or decrease nerve conducting

**International Classification of Seizures:**

**1. Partial seizures:**

**Simple partial seizures:**
No impairment of consciousness /motor symptoms/ somatosensory/ autonomic symptoms/ psychic
**Complex partial seizures:**
Impaired consciousness / Simple partial followed by impaired consciousness
**Partial seizures evolving to generalized:**
tonic –clonic.

**2. Generalized Seizure:**

**Absence seizures:** loss consciousness for few seconds
**Myoclonic seizures:** isolated clonic contractions
**Clonic seizures:** various dysrhythmia contraction in the body
**Tonic seizures:** sustained contractions of large muscle group
**Generalized tonic –clonic seizures:** (alternating tonic –clonic movement.
**Atonic seizures:** brief, generalized seizure (the epileptic drop attacks)

**Major drugs:**

- Carbamazipine (Tegretol)
- Phenytoin (Dilantin)
- Valproate (Valproic acid)

**Nurse Responsibility**

- A client being prescribed AED therapy is treated more effectively with a holistic approach (physical, psychological and socio-emotional).
- The person with epilepsy needs information about the seizure condition and it management, along with psychological support from the nurse.
- AEDs may exhibit varying blood level in different clients even if the same dose is administrated. Serum level must be measured to establish individual level/dose ratio.

**Special Consideration for Older Adults (p.334)**

- Cerebrovascular accident risk may considerably higher in older clients with new onset seizure activity compered to other individuals.
- Older individuals are at great risk for fracture.
- If skin rash develop with the use of phenytoin, discontinue drug immediately and notify the physician.
- Clients with renal or liver disease have a great risk of development toxicity.
- Older adults tend to metabolize meds more slowly; thus drug accumulation and toxicity may occur.