CNS Stimulants
Anesthetics
Sedatives/Hypnotics

NAPNES Guidelines

Unit III

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CNS Stimulants

- Actions
  - Stimulate specific area of the brain
    - Varying mechanisms of actions
    - Many affects on CNS
  - Mimic sympathetic nervous system or neurotransmitters
    - Epinephrine
    - Norepinephrine

CNS Stimulants
Amphetamines

- Actions
  - Produce mood elevation/euphoria
  - Increase mental alertness/capacity for work
  - Decrease fatigue/drowsiness
  - Prolong wakefulness
- Used to treat narcolepsy and ADHD

CNS Stimulants
Amphetamines

- Produce tolerance & psychological dependence
- Schedule II – high abuse potential
- Examples
  - Amphetamine (Adderall)
  - Methylphenidate (Ritalin, Concerta, Methulin, Metadate)
    - Daytrana (methylphenidate) – 1st patch/changed daily
    - Released end of 2006
  - dexmethylphenidate HCL (Focalin XR) – released 2007
    - *Next slide*
  - dextroamphetamine (Dexedrine)

CNS Stimulants

Amphetamines

- Focalin™ XR (dexmethylphenidate hydrochloride) extended-release capsules
  - Taken once each day in the morning.
  - May be taken with food or without food, although food may delay the absorption
    - May be swallowed as a whole capsule or the capsule
    - May be opened and the contents sprinkled on a small amount of applesauce
      - Taken immediately
    - The capsule should not be crushed or chewed or its contents divided

CNS Stimulants
Anorexiants

- Actions
  - Suppress appetite
- Used to treat exogenous obesity
- Examples
  - Sibutramine (Meridia)
  - Phenylpropanolamine (Dexatrim)
    - Removed from market by FDA
      - Association with increased incidence of hemorrhagic stroke

CNS Stimulants

Serotonin Agonists

- Stimulate 5-HT1 receptors in the brain
- Refered to as triptans
  - Constict dilated blood vessels in the brain
- Produce relief of moderate to severe migraine
  - Within 2 hours
  - 70-80% of patients

CNS Stimulants

Serotonin Agonists

- Triptans have 2 mechanisms of action
  - Vascular
    - Vasoconstriction – cranioselective, but coronary arteries have some 5-$HT_{1B/1D}$ receptors
    - All triptans are contraindicated with cardiovascular disease or peripheral vascular disease
  - Neuronal
    - Peripheral – inhibit release of inflammatory peptides from the trigeminal nerve
    - Central – possibly work at the trigeminal nucleus caudalis

CNS Stimulants
Serotonin Agonists (cont.)

- Examples
  - Sumatriptan (Imitrex)
    - Original prototype
  - Zolmitriptan (Zomig)
  - Naratriptan (Amerge)
  - Rizatriptan (Maxalt)
  - Eletripatan hydrobromide (Relpax)
  - Almotriptan malate (AXERT)
  - Frovatriptan succinate (Frova)

CNS Stimulants
Serotonin Agonists

- Contraindications
  - Ischemic heart disease
  - Uncontrolled hypertension
    - May cause a slight increase in BP after administration
  - Any hypersensitivity
- Interactions
  - MAOI
    - Concurrently or within 2 weeks of d/c'ing one
  - Ergotamine-containing or ergot-like compounds
  - Sumatriptan should not be taken for 24 hours after taking other triptans

Other migraine preventative treatments

- Antidepressants
  - Amitriptyline 10 -100mg q hs
  - Nortriptyline 10 -100mg q hs
- SSRIs
  - Standard antidepressant doses
- B-Blockers
  - Propranolol or propranolol LA 60 – 120 mg
- Calcium channel blockers
  - Verapmil 120 – 480 mg QD

Other migraine preventative treatments

- Neuronal Stabilizers
  - topiramate (Topamax)
    - 100 – 200 mg
  - gabapentin (neurontin)
    - 900 – 2400 mg
- Other therapies
  - Magnesium 500 mg
  - Vitamin B2 200 -400mg
  - Coenzyme Q10 150 – 300mg

CNS Stimulants

Adverse Effects

Cardiovascular	**Palpitations, tachycardia, hypertension, angina, dysrhythmias**
Central Nervous	**Nervousness, restlessness, anxiety, insomnia, headache, tremor, blurred vision**
Endocrine	**Hypoglycemia, hyperglycemia, increase metabolic rate**
GI	**n/v, diarrhea, abdominal pain, dry mouth**
GU	**Increase urinary frequency, diuresis**

CNS Stimulants
Contraindications

- Known drug allergy
- Marked anxiety or agitation
- Glaucoma
- Tourette's syndrome
- Tic disorders
- Use before 14 days after stopping therapy with MAOIs (Monoamine oxidase inhibitors)

CNS Stimulants
Drug Interactions

- Beta-blockers
- CNS stimulants
- Digoxin
- MAOIs
- TCAs
- Quinolones
- Serotonergic agents

CNS Stimulants
Nursing Process

- Assessment
  - For need
    - ADHD, narcolepsy, exogenous obesity, migraine
  - Pt's condition while receiving drug
    - Hypertension
    - Cardiovascular disease
    - Indiscriminate use

CNS Stimulants
Nursing Process

- Implementation
  - Drug administration
    - Administer 6 hours before bedtime
    - Frequent mouth care
    - Anorexiants
      - Exercise/dietary teaching
      - May take up to 8 weeks to work
    - Triptans
      - Varying forms
        - » Wafer – rapid absorption
        - » Nasal spray
        - » Self-injectable

CNS Stimulants
Nursing Process

- Teaching
  - Avoid other sources of CNS
    - Caffeine (coffee, tea, colas, chocolate)
  - Take same time each day
  - Avoid OTC/Herbal products
  - Avoid ETOH
  - Do not stop abruptly
  - Take drugs for obesity 30 – 45 minutes ac
  - Hard candy, gum
  - Avoid tyramine containing foods with serotonin agonists

CNS Stimulants
Nursing Process

- Observe for/minimize adverse effects
  - Know contraindications to drugs
  - Knowledgeable about drug interactions
  - Nursing intervention as necessary
- Evaluate effectiveness
  - Recognize therapeutic signs
  - Record/report effectiveness or side effects
  - Patient education

ANESTHETIC AGENTS

General and Local

General Anesthetics

- Used most commonly for surgery
  - Produce deep muscle relaxation
    - Loss of reflexes
  - Loss of consciousness

- Overall effect
  - Orderly & systematic reduction of sensory and motor CNS functions
  - Produce a progressive depression of cerebral & spinal cord functions

General Anesthetics

Preoperative adjunctive medications

- Indications (purposes)
  - Anesthesia induction →
  - Amnesia/Anxiety →
  - Dry up secretions →
  - Pain prevention/relief →
  - Sedation →
- Types
  - Opioid analgesic
  - Benzodiazepine
  - Anticholinergic
  - Opioid analgesic
  - Sedative/hypnotic

General Anesthetics

- Examples
  - Inhaled gas
    - Nitrous oxide (laughing gas)
  - Inhaled volatile liquid
    - Desflurane (Suprane)
  - Intravenous
    - Propofol (Diprivan)
    - Thiopental (Pentothal)
    - Ketamine HCL (Ketalar)

General Anesthetics

- Adverse effects
  - Dose/patient dependent
    - Myocardial depression (older drugs)
    - Hepatotoxicity (older drugs)
    - Respiratory depression – MONITOR!
    - Nausea & vomiting
    - Confusion
- Drug Interactions
  - Additive effects
    - Beta-blockers – increased myocardial depression
    - Anti-hypertensives – increased hypotensive effects
    - Tetracycline – increased renal toxicity

Conscious Sedation

- Used for procedures where complete anesthesia not necessary
  - Diagnostic tests, endoscopy, simple suturing
- Patient is awake but deeply sedated
  - Amnesic effects
- midazolam (Versed)
  - Most common drug used

General Anesthetics

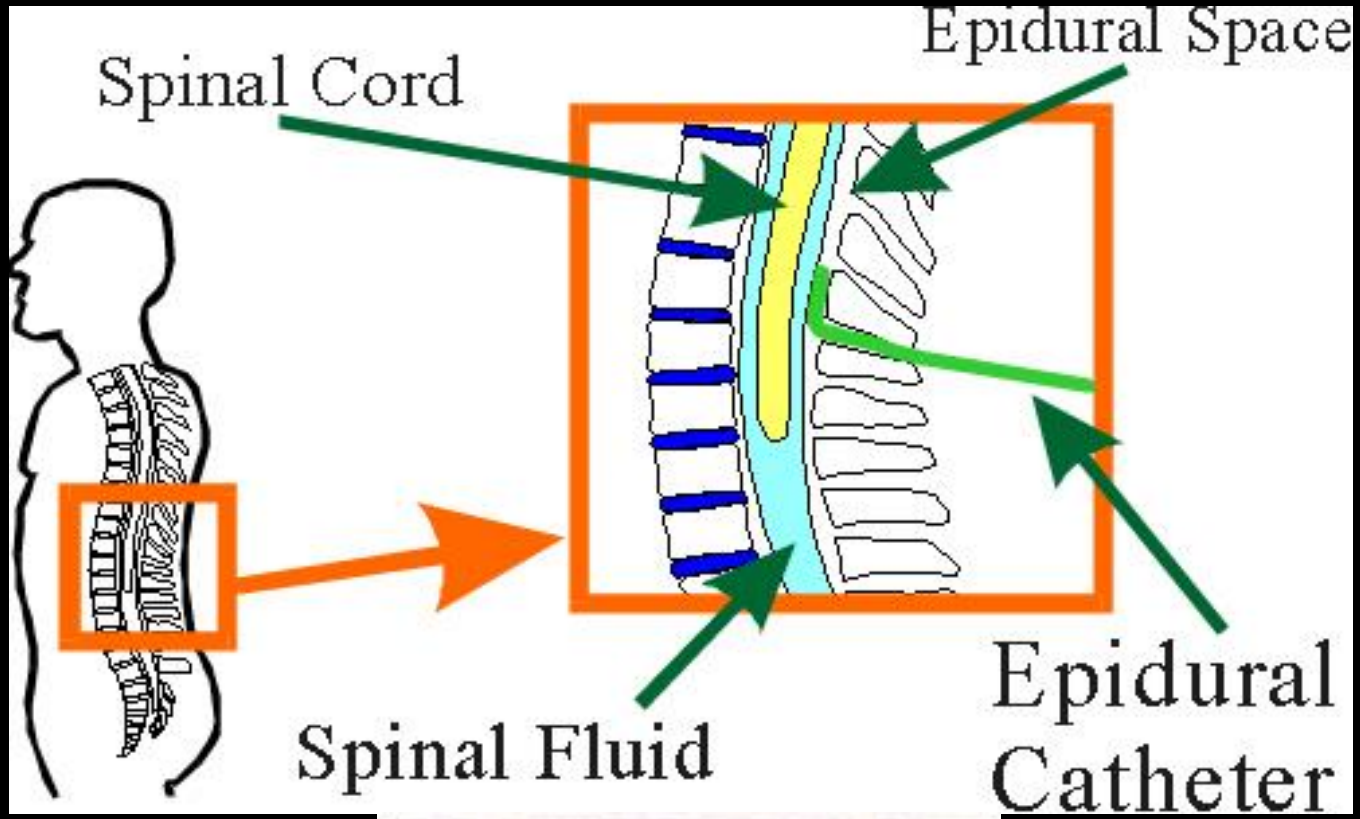
- Nursing process
  - Assessment
  - Nurse responsibilities
    - Monitor respiratory/neurological/GI systems post-op
      - ESP. ELDERLY
  - Observing for/minimizing adverse effects
    - Nursing intervention as necessary
  - Evaluation effectiveness
    - Recognizing therapeutic signs
    - Reporting/recording
    - Patient education

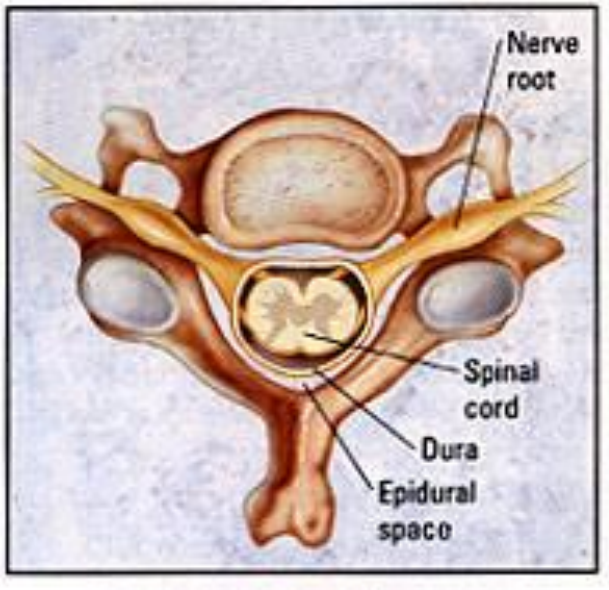
Local Anesthetics

- Regional anesthetics
  - Affect specific portion of body
    - Desensitized to pain
    - Interfere/block with nerve transmission
  - No loss of consciousness
  - Uses
    - Childbirth
    - Dental procedures
    - Suturing
    - Spinal anesthesia

Local Anesthetics (cont.)

- Two major types ("*caines*")
  - Topical
    - Refer to Table 11-5 for examples (Liley, pg. 174)
    - Used on skin or mucous membranes
  - Parenteral
    - Refer to Table 11-6 for examples (Liley, pg. 175)
    - Infiltration
    - Regional
      - Nerve blocks
      - Epidural
      - Spinal
        - » Directly into the CNS by spinal injection


Spinal Cord
Epidural Space
Spinal Fluid
Epidural Catheter

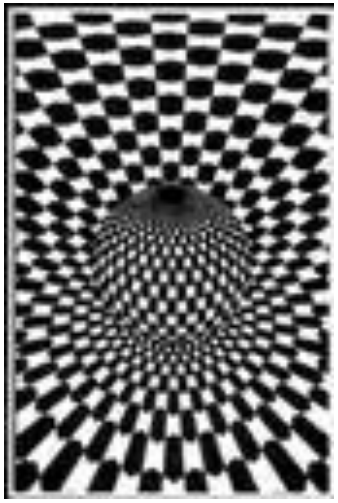

Nerve root
Spinal cord
Dura
Epidural space

Sedative/Hypnotic Agents

Central Nervous System Depressants

Sedative/Hypnotic Agents

- Sedative
  - Drugs that have an inhibitory effect on the CNS to the degree that they reduce:
    - Nervousness, excitability, irritability
      - Without causing sleep
- Hypnotics
  - Calm or soothe the CNS to the point that they cause sleep
  - Much more potent than sedatives
  - 3 main groups
    - Barbiturates
    - Benzodiazepines
    - Miscellaneous



Sedative/Hypnotic Agents
Barbiturates

- Produce many unwanted side effects
- Habit-forming
- Narrow therapeutic index
- Not many in clinical use today
  - Due to the replacement with benzodiazapines
- 4 groups based on onset & duration of action
  - Long-acting - Phenobarbital (Solfoton)
  - Intermediate-acting - butabarbitol (Butisol)
  - Short-acting - secobarbitol (Seconal)
  - Ultra-short-acting - thiopental (Pentothal)

Sedative/Hypnotic Agents
Barbiturates

Mechanism of Action

- Site of action:
  - Brain stem (reticular formation)
  - Cerebral cortex
- Potentiates GABA
  - Nerve impulses traveling in the cerebral cortex are also inhibited.

Sedative/Hypnotic Agents
Barbiturates

Drug Effects

- Low doses: Sedative effects

- High doses: Hypnotic effects
  (also lowers respiratory rate)

- Notorious enzyme inducers
  - Drug interactions
    - Warfarin, theophylline, phenytoin

Sedative/Hypnotic Agents
Barbiturates

Therapeutic Uses

- Hypnotics
- Sedatives
- Anticonvulsants
- Surgical procedures
  - Anesthesia induction
  - Provide anesthesia for short surgical procedures

Sedative/Hypnotic Agents
Barbiturates

Side Effects:

Body System	Effects
CNS	Drowsiness, lethargy, vertigo mental depression, coma,
Respiratory	Respiratory depression, apnea, bronchospasms, cough

Nightmares can occur after drug stopped

Sedative/Hypnotic Agents

Barbiturates

Side Effects

Body System	Effects
GI	Nausea, vomiting, diarrhea
Other	Agranulocytosis, vasodilation, hypotension, Stevens-Johnson syndrome

Sedative/Hypnotic Agents
Barbiturates

Toxicology

- Overdose frequently leads to respiratory depression, and subsequently, respiratory arrest
- Can be therapeutic:
  - Anesthesia induction
  - Uncontrollable seizures
    - Induce a “phenobarbital coma”

Sedative/Hypnotic Agents
Barbiturates

Drug Interactions

- Additive effects:
  - ETOH, antihistamines, benzodiazepines, narcotics, tranquilizers
- Inhibited metabolism:
  - MAOIs will prolong effects of barbiturates
- Increased metabolism:
  - Reduces anticoagulant response, leading to possible clot formation

Sedative/Hypnotic Agents
Benzodiazepines

- Most commonly prescribed drug classes
- Favorable side effects profiles
- Favorable efficacy
- Favorable safety

Sedative/Hypnotic Agents
Benzodiazepines

Classified as either:

- Sedative-hypnotic
- Anxiolytic
  - Medication that relieves anxiety

Sedative/Hypnotic Agents
Benzodiazepines

Sedative-Hypnotic Type

- Long-Acting:
  - flurazepam (Dalmane), quazepam (Doral)

- Short-Acting:
  - estazolam (Prosom), temazepam (Restoril),
  - triazolam (Halcion)

Sedative/Hypnotic Agents
Benzodiazepines

- Anxiolytic Type
  - alprazolam (Xanax)
  - chloridiazepoxide (Librium)
  - diazepam (Valium)
  - lorazepam (Ativan)
  - midazolam (Versed)

Sedative/Hypnotic Agents
Benzodiazepines

- Mechanism of Action
  - Depress CNS activity
    - Affect hypothalamic, thalamic, and limbic systems of the brain
    - Benzodiazepine receptors
      - Specific receptors in the brain
      - Inhibit stimulation of the brain

Sedative/Hypnotic Agents
Benzodiazepines

Drug Effects

- Calming effect on the CNS
- Useful in controlling agitation and anxiety

Sedative/Hypnotic Agents
Benzodiazepines

Therapeutic Uses

- Sedation
- Sleep induction
- Skeletal muscle relaxation
- Anxiety relief
- Treatment of alcohol withdrawal
- Agitation
- Depression
- Epilepsy
- Balanced anesthesia

Sedative/Hypnotic Agents
Benzodiazepines

Side Effects

- Mild and infrequent
- Headache
- Drowsiness
- Vertigo/Dizziness
- Lethargy
- Paradoxical excitement (nervousness)
- “Hangover effect”

Sedative/Hypnotic Agents
Miscellaneous Agents

- **Ramelteon (Rozerem)**
  - **Class**
    - Anxiolytic/Hypnotic, Non-BZD
  - **Mechanism Of Action**
    - Binds to melatonin MT1 and MT2 receptors, induces sleep (melatonin receptor agonist)
  - Indication
    - ***Long term*** treatment of insomnia

Sedative/Hypnotic Agents
Miscellaneous Agents

- Chloral hydrate (Noctec)
  - Oldest miscellaneous sedative/hypnotic agent
  - Favorable characteristics
  - Potential disadvantage
    - Tachyphylaxis
      - Useful for only short-term therapy
  - If mixed with ETOH
    - Rapid loss of consciousness
    - Known as a “Mickey Finn”

Sedative/Hypnotic Agents
Miscellaneous Agents

- Nonprescription drugs
  - Sleeping aids
    - Contain antihistamines
      - Depressant effect on the CNS
      - May also contain analgesics (aspirin or acetaminophen)
    - Examples
      - Doxylamine
      - Diphenhydramine
      - Pyrilamine

CNS Depressants
Nursing Process

- Assessment
  - Prior to therapy
    - Perform a thorough history
      - Allergies
      - Other medications
      - Health history
      - Medical history
    - Obtain baseline vital signs and I&O, including supine and erect BPs
    - Potential disorders or conditions that may be contraindications
    - Potential drug interactions

CNS Depressants
Nursing Process

- Interventions
  - Obtain baseline vital signs and I & O, including supine and erect BPs.
  - **Give 15 to 30 minutes before bedtime for maximum effectiveness in inducing sleep.**
  - Use with caution in the elderly.
  - Patients should be instructed to avoid alcohol and other CNS depressants.
  - Most benzodiazepines (except flurazepam) cause REM rebound and a tired feeling the next day; use with caution in the elderly

CNS Depressants
Nursing Process

- Interventions (cont.)
  - Safety is important
    - Keep side rails up
    - Do not permit smoking
    - Assist patient with ambulation (especially the elderly)
    - Keep call light within reach
  - Monitor for side effects

CNS Depressants
Nursing Process

- Patient Education
  - Check with physician before taking any other medications, including OTC medications.
  - It may take 2 to 3 weeks to notice improved sleep when taking barbiturates.
  - Abruptly stopping these medications, especially barbiturates, may cause rebound insomnia.

CNS Depressants: Nursing Implications

- Evaluation of effectiveness
  - Monitor for therapeutic effects
    - Increased ability to sleep at night
    - Fewer awakenings
    - Shorter sleep induction time
    - Few side effects, such as hangover effects
    - Improved sense of well-being because of improved sleep
  - Report/record effect
  - Patient education regarding drug

Muscle Relaxants

- Act to relieve pain associated with skeletal muscle spasms
- Majority are central acting
  - CNS is the site of action
  - Similar in structure and action to other CNS depressants
- Direct acting
  - Acts directly on skeletal muscle
  - Closely resembles GABA

Muscle Relaxants: Indications

- Relief of painful musculoskeletal conditions
  - Muscle spasms
  - Management of spasticity of severe chronic disorders
  - Multiple sclerosis, cerebral palsy
- Work best when used along with physical therapy

Muscle Relaxants: Side Effects

- Extension of effects on CNS and skeletal muscles
  - Euphoria
  - Lightheadedness
  - Dizziness
  - Drowsiness
  - Fatigue
  - Muscle weakness

Common Muscle Relaxants

- baclofen (Lioresal)
- cyclobenzaprine (Flexeril)
- dantrolene (Dantrium)
- metaxalone (Skelaxin)
- tizanidine (Zanaflex)

Muscle Relaxants: Nursing Implications

- See others listed for CNS depressants

IS EVERYONE RELAXED?