Objectives

- Describe various anesthesia techniques
- Discuss the implications for the PACU nurse caring for patients who have received an inhalation agent
- Discuss the depolarizing and nondepolarizing muscle relaxants
- Describe the mechanism of action of reversal agents
What Every Anesthetic Aspires to Be!

- Rapid onset of action
- Controllable duration of action
- Identifiable levels or depths
- Technically easy to administer
- No untoward effects on vital signs
- No toxic metabolites
- Predictable elimination
- High specificity of action
- High margin of safety
- Useful with all ages

Anesthesia Techniques

- General (Inhalation, Intravenous, Total Intravenous Anesthesia [TIVA])
  - State of reversible unconsciousness where protective reflexes are partially or completely lost, appropriate muscle relaxation, sedation, amnesia, and analgesia are obtained
- Monitored Anesthesia Care (MAC) / Moderate Sedation
  - Relaxed, non-paralyzed state of analgesia and sedation
- Regional
  - Application of an anesthetic agent to produce loss of sensation in a body region

Factors in Selecting the Type of Anesthesia

- Age
- Physical status
- Type of surgery
- Skill and requirement of the surgeon
- Past surgical/medical history
- Patient wishes
- Teaching purposes
- Presence of fire and explosive dangers
- Emergency/trauma
- Site of surgery/body position during surgery
American Society of Anesthesiologists (ASA)
Physical Status Classification

- Developed by ASA as an indication of the overall complexity of the patient’s medical condition
- Assigned by the physician after the history and physical are completed and prior to the procedure

ASA Status

- ASA 1
  - normal, healthy patient

- ASA 2
  - patient with mild, systemic disease (i.e. chronic bronchitis, moderate obesity, DM Type 2, mild HTN, old MI etc)

- ASA 3
  - patient with severe systemic disease that limits activity but is not incapacitating (i.e. coronary artery disease with angina)

- ASA 4
  - patient with incapacitating systemic disease that is a constant threat to life (i.e. organic heart disease with marked cardiac insufficiency, persistent angina, intractable dysrhythmias, advanced pulmonary, renal, hepatic or endocrine insufficiency)
### ASA Status

- **ASA 5**
  - Patient is not expected to survive 24 hours without the operation
- **ASA 6**
  - Patient passed brain death criteria and is an organ donor
- **“E”**
  - An emergency patient with unknown history

### Stages of Anesthesia

#### Stage I: Stage of Analgesia
- Begins with initiation of anesthesia
- Ends with loss of consciousness
- Patient can follow simple commands
- Protective reflexes remain intact

#### Stage II: Stage of Delirium
- Begins with loss of consciousness
- Ends with disappearance of lid reflex
- Respirations irregular
- May be passed through quickly with newer inhalation agents
- High risk of aspiration at this time
Stages of Anesthesia

Stage III: Stage of Surgical Anesthesia
- Cessation of spontaneous respirations
- Absence of eyelash response, blink, and swallowing reflexes
- Need airway management

Stage IV: Cessation of Respiration to Circulatory Collapse
- Considered overdose of anesthetic

Recovery & Emergence
- Occurs in reverse order of induction
  - Surgical anesthesia
  - Delirium
  - Analgesia
- Also influenced by
  - Duration of anesthesia
  - Use of other drugs
  - Physical status of patient - including cardiac output
General Anesthesia  
Common Anesthetic Agents  
- Induction Agents  
- Muscle Relaxants  
- Inhalation Agents  
- Reversal Agents  
- Opioids  
- Adjuncts

Induction Agents  
- Given to obtund sensorium  
- Quick onset, brief duration  
- Laryngeal reflexes lost  
- No analgesia

IV Induction Agents  
- Nursing Implications  
  - Ventilation must be supported  
  - Aspiration risk  
  - BE VIGILANT  
  - Suction immediately available  
  - Rapid emergence may hasten pain awareness

Ventilation must be supported  
Aspiration risk  
BE VIGILANT  
Suction immediately available  
Rapid emergence may hasten pain awareness
Hypnotics (Barbiturates) Overview

- Indications for use: anesthetic induction, sedation, monitored anesthesia care (MAC), maintenance of anesthesia
- Therapeutic effect: produce rapid, pleasant induction to Stage III
- Commonly used: sodium thiopental (Pentothal), methohexital (Brevital)

A Word About Barbiturates

- Cause myocardial suppression
- Cause respiratory depression: due to ↑ sensitivity to CO₂ levels → apnea
- Depth of respiration is depressed more than the rate
- Laryngospasm due to laryngeal reflexes are not depressed until deep level of anesthesia is reached; intubation is attempted only after barbiturate and muscle relaxant are given

Thiopental (Pentothal)

- Penetrates all body tissues
- Become unconscious quickly
- Recovery may be prolonged if induction dose was excessive
- Rapid/pleasant induction
- No antagonist available
Methohexital (Brevital)

- More potent than thiopental (x 2.5)
- Ultrashort acting, quick induction & recovery; amnesic effects, no analgesia
- Same degree of CV & respiratory depression as thiopental
- Lowers the seizure threshold
- Burns on IV administration

Induction Agents:
Non-Barbiturates

- Etomidate (Amidate): Very short acting; hypnotic, no analgesia
- High therapeutic and safety level
- CV effects are minimal
- Great for emergency cases where there is little time for fluid replacement and there is risk of extreme blood loss
- Minimal reduction of CI, PVR, HR, BP

Etomidate

- Decreases cerebral blood flow and cerebral oxygen consumption without decreasing BP: great for neuro patients
- May have dose related reduction of TV and rate (apnea)
- Laryngospasm, cough, hiccups may occur but are less with use of opiates
- Inhibits steroid synthesis (adrenocortical suppression) for as long as 4 days post
Etomidate
- Agent of choice in CV patients
- Onset: 15 – 45 seconds
- Duration: 3 – 12 minutes
- HR and CO remain constant
- Increased risk of N & V
- Potent hypnotic
- Less respiratory depression than thiopental

Propofol (Diprivan)
- Non-barbiturate, hypnotic
- Midazolam acts synergistically: may reduce propofol by 50%
- Emergence is rapid
- Duration of single dose is 3 to 8 minutes (dose-dependent)
- Decreases cerebral perfusion, cerebral blood flow and ICP
- Does not interfere with or alter the effects of succinylcholine because of rapid plasma clearance
- Continuous IV drip

Propofol (Diprivan)
- Rapid and emergence
  - Onset: 15 – 45 seconds
  - Duration: 5 – 10 minutes
- No analgesia
- No cumulative effects
- Less N & V
- Dose dependent respiratory (rate, depth) & circulatory (BP, CO, SVR) depression
- Incidence of apnea greater than thiopental
**Disassociative Agent**

**Ketamine**

Indications for use
- Selectively blocks pain conduction and perception
- Produces profound state of analgesia and unconsciousness
- Respiratory function unimpaired/protective reflexes intact

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**Ketamine**

- Onset: 15 – 45 seconds
- Duration: 3 – 12 minutes
- Produces excellent analgesia
- Produces disassociative anesthesia
  - No recollection of surgery
  - Appears to be awake
  - Minimal respiratory depression

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**Ketamine**

- CV effects
  - Increases HR, BP and CO
- Respiratory effects
  - Reflexes remain nearly normal
  - Spontaneous ventilation maintained
  - Potential for increased secretions may require premed
- CNS effects
  - Increases cerebral blood flow
  - Emergence can be associated with delirium
Benzodiazepines

Indications for use
- Pre-medication for surgery
- Induction of general anesthesia
- Anesthetic adjunct
- Provides sedation during local and regional anesthesia
- Moderate sedation/analgesia
- Postop anxiety and agitation

Therapeutic effects: calming, sedation, hypnosis, amnesia, suppression of seizure activity
Commonly used: diazepam (Valium), midazolam (Versed), lorazepam (Ativan)
Benzodiazepine Antagonist used for reversal: flumazenil (Romazicon)

Diazepam (Valium)
- Premed, adjunct, induction agent
- Can be used as sole agent or as sedation with local
- Amnesia up to 48 hours
- Degree of respiratory depression increases with use of opiates
- Muscle relaxant properties
Diazepam (Valium)

- Useful for psychomotor and petit mal seizures
- Painful injection: IM or IV
- Don’t mix or dilute
- Long half-life

Midazolam (Versed)

- Used premed, endo, induction, intraop as adjunct to inhalation
- Sedation with regional
- Reduction in anxiety and profound amnesia
- Use with caution in MI, COPD
- No effect on ICP
- Decrease dose in elderly
- Hypnotic, anticonvulsant, muscle relaxant
- No pain on IV injection
- 3X as potent as diazepam
- Rapid onset, peak in 10 to 30 minutes, duration 1 to 4 hrs
- Decrease in BP, SVR
- Increase in HR

Lorazepam (Ativan)

- Long-acting
- Slow onset: 20-40 minutes
- Duration: may last 24 hrs
- Profound amnesia, reduction in anxiety
- Good CV & respiratory stability
The Other Side of the Coin: Benzodiazepine Antagonists

- Flumazenil (Romazicon)

Flumazenil (Romazicon)

- Antagonizes...
  - Sedation
  - Amnesia
  - Psychomotor impairment
  - Ventilatory depression

…associated with benzodiazepines

Flumazenil (Romazicon)

- Not effective for hypoventilation & respiratory failure
- Does not reverse barbiturates, opiates & ethanol
- Caution with history of seizure or chronic benzo use ➔ seizure
- Shorter duration than benzo: watch for resedation
Opioids
Indications for use: sedation, analgesia, induction and maintenance of general anesthesia, regional anesthesia, moderate sedation/analgesia, postop pain management
Commonly used: morphine, fentanyl, sufentanil, alfentanil, remifentanil, hydromorphone

Morphine Sulfate
- Titrated to effect
- Alteration in pain perception and emotional response
- Myocardial function is preserved
- Causes histamine release
- Slight hypotension
- Onset: <1 minute
- Peak: 20 minutes
- Duration: 1 to 4 hours
- Dose: 1 to 10 mg titrated
- Watch for hypersensitivity

Fentanyl Citrate (Sublimaze)
- Short duration of action
- Stored in fat and muscle tissue
- When released from tissue may have delayed respiratory depression
- Onset: 1 to 3 minutes
- Duration: 30 to 60 minutes
- Dose: adult: 0.05 to 2μg/kg titrated
- Watch for apnea and chest wall rigidity
Hydromorphone (Dilaudid)
- Good for pain and sedation
- Alters perception and emotional response to pain
- Short half-life
- No metabolites
- Good in renal insufficiency
- Onset: 3 - 5 minutes
- Duration: 3 - 4 hours
- More potent than morphine: 7 to 1
- Morphine 10 = hydromorphone 1.5
- Not for ↑ICP or ↓ respiratory function

Naloxone to the Rescue!
- Rapid reversal of opioids only!
- Onset: 1 - 2 minutes
- Duration: dependent on dose and route
- Dilute 0.4mg with 9ml of NS (0.04mg/ml): 1/2cc @ time

Inhalation Agents
General Facts
- Used to produce unconsciousness and amnesia
- Usually used for maintenance
- No residual analgesia
Inhalation Agents

General Facts

- Distribution of agent is directly proportional to the amount of blood each region receives.
- Highly perfused regions: Brain, heart, kidney, liver.
- Moderately perfused regions: Muscle, skin.
- Poorly perfused regions: Tendons, ligaments, bone.

Elimination

- Reverse order of induction.
- Elimination primarily pulmonary: Blood flowing back to lungs brings agent back to exhale.
- Mildly perfused organs slow to return agent back to circulatory system.
- Elimination slower if hepatic/renal systems involved (based on agent).

Agents that potentiate effects

- Aminophylline.
- Acute ETOH intoxication.
- Nitrous oxide.
- Opioids, sedatives.

Agents that antagonize effects

- Amphetamines.
- Cocaine.
- Chronic ETOH use.
- Naloxone.
Inhalation Agents

**Cardiovascular effects**
- Cardiac depression
- Hypotension
- Vascular dilation
- Sensitization of myocardium to catecholamines
  - dysrhythmias
- Ventricular ectopy & tachycardia
- Heart rate tends to be unchanged

**Respiratory effects**
- Bronchodilation
  (benefit for patients w/COPD & asthma)
- Obtunds laryngeal and pharyngeal reflexes
  - Facilitates intubation
  - Increases risk for aspiration
- Spontaneous respirations depressed
  - Dose dependent respiratory depression

**Respiratory Effects**
- ↑ Apnea threshold (highest level of CO₂ that initiates breathing)
  - Norml CO₂: 30 – 35 ~ patient feels urge to breathe
  - Anesthesia: no compulsion to breathe until level is 50 or more
- Blunting of CO₂ respiratory curve
  - Normal: as level ↑, minute volume also ↑ to blow off
  - Under anesthesia: Unable to ↑ min volume
Inhalation Agents

- CNS Effects
  - Decreases cerebral metabolism
  - Increases cerebral blood flow
  - Effect occurs within minutes

Inhalation Agents

- Renal effects
  - Decrease in blood flow – may be offset with adequate hydration
- Hepatic effects
  - Decrease in hepatic function
- Not a true muscle relaxant – dose dependent decrease in muscle tone

Inhalation Agents

- Gaseous inhalation anesthetic
  - Nitrous oxide
- Volatile inhalation anesthetic
  - Halothane
  - Enflurane
  - Isoflurane
  - Desflurane
  - Sevoflurane
**Halothane**
- Sweet, non-irritating
- Great Bronchodilator
- Agent of choice for mask inductions & peds
- Less likely to cause laryngospasm
- Greatest degree of respiratory depression
- MH Trigger

**Enflurane (Ethrane®)**
- Irritating odor
- Most likely to display lingering effects in recovery
- Vasodilator – may be used for intentional hypotension
- Little effect on HR
- Hemodynamically more stable than Halothane

**Isoflurane (Forane)**
- Most widely used
- Stabilizing effect on the CV system
- Excellent muscle relaxant
- No CNS excitatory effects
- Increase HR without compromising CO
- Strong pungent odor
- May cause breath holding and laryngospasm
- Potentiates neuromuscular blockade
- Great for neonates, geriatrics, critically ill, large blood/fluid loss
- Rarely toxic
Desflurane (Suprane)
- Fast onset, emergence
- Solubility in blood extremely low, similar to nitrous
- Eliminated primarily by exhalation as an intact molecule
- Strong pungent odor
- During sudden increase in inspired gas, stimulate transient sympathetically mediated increase in HR and BP
- High incidence of laryngospasm

Sevoflurane (Ultane)
- Less soluble than desflurane
- Produces minimal airway irritation, better with kids
- Contra: history of MH
- No analgesia
- Hypotension, dysrhythmias, respiratory depression
- Potentiates neuromuscular blockade
- Low solubility = rapid onset/recovery

Nitrous Oxide
- Separate class – gaseous inhalation agent
- Odorless to sweet smelling
- Reduces amount of volatile agents
- Minimal muscle relaxant properties
- Very good analgesia effects
- Increased PONV
**Inhalation Agents**

**Nursing Implications**

- Monitor for arrhythmias
- Impairment of spontaneous respirations
  - Hypoxia
- Depression of laryngeal & pharyngeal reflexes
  - BE VIGILANT – increased risk for aspiration
- No residual analgesia
  - Medicate for pain
- Decreased renal blood flow
  - Urine output – monitor
- Shivering

**Anesthesia:**

**Muscle Relaxants & Regional Techniques**

- Given IV
- Does not cross blood brain barrier
- Hypothermia prolongs block
- Sequence of paralysis fine to gross with recovery in reverse order (eyes-jaw-hands-limbs-neck-intercostal muscles-diaphragm)

**Muscle Relaxants**

**General**

- Given IV
- Does not cross blood brain barrier
- Hypothermia prolongs block
- Sequence of paralysis fine to gross with recovery in reverse order (eyes-jaw-hands-limbs-neck-intercostal muscles-diaphragm)
Muscle Relaxants

- Uses
  - Given to relax jaw and larynx to facilitate controlled breathing and intubation
  - Skeletal muscle relaxation for surgery

Muscle Relaxants

- Work at the site of the neuromuscular junction
- Impulse travels down nerve axon
- Impulse reaches end of nerve cell, acetylcholine is released from nerve cell, crosses gap to muscle cell
- Acetylcholine (ACH) binds to muscle cell, muscle cell responds (depolarizes)
**Muscle Relaxants**

- **Depolarizing**
  - Occupies muscle end plate causing initial depolarization of all skeletal muscles
  - Not reversible

**Depolarizing Muscle Relaxant: Succinylcholine**

- Metabolized by pseudocholinesterase (plasma cholinesterase)
- Pseudocholinesterase deficiency = prolonged block
- NOT reversible (mimics ACH)
Succinylcholine

- Ultra-short acting
  - Onset: About 1 minutes
  - Duration: About 5 minutes
- Postoperative myalgia (muscle pain) occurs frequently
- Side effects: bradycardia, ↑ potassium levels → cardiac standstill
- MH trigger

Depolarizing N-M Blocker

Ach=Acetylcholine
\( \text{\( \neq \) Acetylcholinesterase} \)
Sx=Succinylcholine

Muscle Relaxants

- Nondepolarizing
  - Occupy muscle end plate without activating muscle contraction
  - Can be reversed after some spontaneous recovery
Non-Depolarizing N-M Blockers

Ach = Acetylcholine
\( \times \) = Acetylcholinesterase
NDP = Non-depolarizing agent

Nondepolarizing Muscle Relaxant: Atracurium (Tracrium)

- Intermediate acting
  - Onset: 3 – 5 minutes
  - Duration: 20 – 35 minutes
- Histamine release may cause hypotension
- Breaks down through Hofmann elimination
- Tolerated well in peds and elderly

Cisatracurium (Nimbex)

- Longer acting than atracurium
  - Onset: 1 – 2 minutes
  - Duration: 50 – 60 minutes
- Histamine release less of a concern
Pancuronium (Pavulon)
- Long acting
  - Onset: 3 – 5 minutes
  - Duration: 60 – 90 minutes
- Ventricular arrhythmias – dose related tachycardia

Rocuronium (Zemuron)
- Intermediate acting
  - Onset: 1 – 2 minutes
  - Duration: 12 – 67 minutes
- Histamine release
- No significant cumulative effects
- May be used for intubation, especially in pediatrics

Vecuronium (Norcuron)
- Intermediate acting
  - Onset: 3 – 5 minutes
  - Duration: 20 – 35 minutes
- No histamine release
- No effect on heart rate
**Muscle Relaxants**

**General Information**
- NDMR paralysis enhanced by
  - Aminoglycosides, Ca\(^+\) Channel blockers, magnesium
  - Respiratory acidosis, dehydration, hypothermia
- NDMR paralysis antagonized by
  - Caffeine, epinephrine
  - Respiratory alkalosis, hyperkalemia

**Muscle Relaxants**

**Nursing Considerations**
- NEVER assume a paralyzed patient is asleep
- Hypothermia can prolong recovery
- Watch for “re-paralysis”
- Inquire as to how much and when a long-acting NDMR was given
- Ensure adequate “recovery” before extubating

**Reversal Agents**

- Provide a means of reversing effects of NDMR
- Must have some spontaneous recovery
Reversal Agents

Anticholinesterases

- Desired effect – increasing synaptic levels of ACh
- Undesired effects – bradycardia, increased secretions, bronchospasm
- Undesired effects minimized by co-administration of antimuscarinic agents

Reversal of Muscle Relaxants

- Anticholinesterase drugs: displace neuromuscular blockade, binds with acetylcholinesterase & prevents hydrolysis of ACH (neostigmine, edrophonium, physostigmine, pyridostigmine)
- Anticholinergic drugs: prevent bradycardia, excessive salivation and bronchoconstriction caused by anticholinesterase drugs (glycopyrrrolate, atropine)
Reversal Agents

- Neostigmine
  - Peak: 7 minutes
  - Duration 55-75 minutes
  - Give with glycopyrrolate
- Edrophonium (rarely used)
  - Peak: 1 minute
  - Duration 40 - 65 minutes
  - Give with atropine

Anesthesia Techniques

Regional Anesthesia

Injecting local anesthetic into a specific region of the body in order to create a “numbing” effect; localized to area of surgery
Goal of regional – to produce a loss of sensation and/or motor function in a specific extremity or area of the body
Used in conjunction with or in place of general anesthesia
Regional Anesthesia

Routes of administration
- Topical
- Local infiltration
- Intravenous regional block
- Peripheral nerve block
- Central nerve block

Local Anesthetics

Mechanism of action
- Impairs conduction of nerve impulses along nerve fibers
- Alters cell membrane permeability to sodium ions
- Drug diffuses into cell, attaches to site near sodium channel
- Sodium channel maintained in a closed position - slows depolarization, blocks conduction

Local Anesthetic Agents

- Amides: good penetration of nerve fibers, metabolized in liver, rare allergic reaction
- Esters: poor penetration of nerve fibers, metabolite (PABA), allergic reactions associated with PABA, drug effect may be prolonged with pseudocholinesterase abnormalities
**Duration of Action**

- Depends on drug used

- Can be altered by adding:
  - Epinephrine: increases duration by 50%
  - Altering 'weight' of solution for spinals
  - Sodium bicarb alters the pH, decreasing pain at site, which can reduce onset of action

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**Agent**

<table>
<thead>
<tr>
<th>Agent</th>
<th>Class</th>
<th>Onset</th>
<th>Potency</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remifentanil</td>
<td>Short-acting</td>
<td>1-2 min</td>
<td>Moderate</td>
<td>20-60 min</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>Medium-acting</td>
<td>5-10 min</td>
<td>High</td>
<td>1-2 hr</td>
</tr>
<tr>
<td>Morphine</td>
<td>Long-acting</td>
<td>15-20 min</td>
<td>Low</td>
<td>6-8 hr</td>
</tr>
</tbody>
</table>

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**Advantages:**

- Postop analgesia at site
- Safe for patients with systemic disease
- Fewer side effects (PONV, sedation, respiratory depression)

**Disadvantages:**

- Toxic reaction
- Allergic reaction
- IV injection
- Inadvertent infiltration
Toxicity

- Causes: excessive dose or injection into vascular area
- **CNS:** mild progressing to severe
  - Tingling around mouth
  - Dizziness, drowsiness, confusion, tinnitus
  - Tremors of face, extremities, tonic-clonic seizures
  - Unconsciousness, respiratory arrest

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Toxicity

- **CV:** mild to severe
  - Hypertension, tachycardia
  - Decreased cardiac output, mild hypotension
  - Peripheral vasodilation, hypotension, bradycardia, circulatory collapse

Can occur twenty minutes after injection

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Treatment of Toxicity

Treatment
- Early detection
- Support circulation with fluids, vasopressors, antiarrythmics
- Oxygen, airway management
- Control of seizure activity
- 20% lipid emulsion infusion
- CPR/ACLS management if necessary
www.lipidrescue.org

- 20% Intralipid
  - 1.5 mL/kg as an initial bolus, followed by
  - 0.25 mL/kg/min for 30-60 minutes
  - Bolus could be repeated 1-2 times for persistent asystole
  - Infusion rate could be ↑ if the BP declines

Allergic Reaction

- S/S: rash, pruritus, laryngeal edema, hypotension, bronchospasm

- Treatment: oxygen, airway management, fluid support for hypotension

Types of Regional Blocks

- Topical
- Local infiltration
- IV regional (Bier block)
- Eye
- Peripheral
- Central: spinal, epidural, caudal
Bier Block

Eye Blocks

Blocks sensation of eye and motor movement

Complications
- Ruptured globe
- Inadvertent infiltration
- Ruptured artery

Peripheral Nerve Blocks

- Cervical plexus
- Brachial plexus: interscalene, supraclavicular, infraclavicular, axillary
- Intercostal
Cervical Plexus

Uses: blocks area around neck
Complications
- Injury to vertebral artery
- Paralysis of diaphragm due to phrenic nerve block
- Hoarseness from laryngeal nerve block
- Inadvertent subarachnoid or epidural block

Brachial Plexus Blocks

Interscalene/Supraclavicular
Infraclavicular

Blocks arm from shoulder down
Complications
- Horner's syndrome: ptosis, miosis, nasal congestion, vasodilatation, ↑ skin temperature
- Unilateral phrenic and laryngeal nerve block
- Vertebral artery injection
- Possible high spinal or epidural
Supraclavicular, Infraclavicular Blocks

Complications

- Pneumothorax
- Subclavian artery puncture

Axillary Block

Complications

- Intravenous injection
- Hematoma if axillary artery punctured

Intercostal Blocks

Complications

- Pneumothorax
- Intravenous injection
- Toxicity related to rapid uptake by intercostals
**Spinal or Subarchnoid Block**

Order of block
- Autonomic (hypotension)
- Sensory
- Temperature
- Motor
- Proprioception

Block resolves in reverse order

**Spinal Blocks**

- Injected at L3 – L4, L4 – L5 interspace
- Intrathecal or subarchnoid space
- Drug mixes with CSF, acts on nerve roots and part of spinal cord
- Block height can be manipulated by
  - Drug mix: 10% dextrose (hyperbaric)
  - Patient position

**Assessing Spinals & Epidurals**

**Landmarks**
- T4 nipple line
- T6 edge of ribs
- T10 umbilicus
- T12 top of iliac crest
**Assessment**

- Total Spinal: respiratory arrest
- T3: carotid bodies in aortic arch - unable to compensate by ↑ HR to augment BP
- T4: intercostal muscles
- T10: can pool 500cc blood volume

**Dermatome Assessment**

- Assessment
  - Phase I for symptom management
  - Phase II for DC criteria
  - Like surface to like surface

**Potential Complications**

- Urinary retention
- Postdural puncture ("Spinal") headache
Epidural Specific Care

- Post anesthesia care

- Possible complications
  - Epidural hematoma
  - Epidural abcess

Questions?

Bibliography

Thank you!