

CONTENT OUTLINE  
RECERTIFICATION EXAMINATION  
AMERICAN BOARD OF ANESTHESIOLOGY

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I. PHARMACOLOGY

A. Anesthetics - Gases and Vapors

(N<sub>2</sub>O, halothane, isoflurane, enflurane, desflurane and sevoflurane)

1. Effects on CNS
2. Effects on circulation
3. Effects on respiration
4. Effects on neuromuscular function
5. Effects on renal function
6. Effects on hepatic function
7. Effects on hematologic and immune systems
8. Biotransformation - toxicity
9. Minimum alveolar concentration
10. Trace concentrations, O.R. pollution, personnel hazards

B. Anesthetics - Intravenous

(opioids, thiopental and methohexital, propofol, etomidate, ketamine)

1. Metabolism and excretion
2. Effect on circulation
3. Effect on respiration
4. Effect on other organs
5. Adverse effects

C. Anesthetics - Local

1. Biotransformation and excretion
2. Comparison of drugs and chemical groups
3. Prolongation of action
4. Toxicity

- a) CNS
- b) cardiac
- c) allergy
- d) preservatives
- e) fetal

#### D. Muscle Relaxants (non-depolarizing and succinylcholine)

1. Mechanism of action
2. Non-relaxant side effects
3. Abnormal responses
4. Biotransformation and excretion
5. Prolongation of action; termination of action
6. Antagonism
7. Drug interactions (antibiotics, magnesium, etc.)

#### E. Autonomic Drugs

##### 1. Sympathetic

- a) transmitters and types of receptors
- b) target organ effects; metabolic effects
- c) agonists - peripheral and central actions
- d) antagonists - alpha and beta blockers, anti- hypertensives, ganglionic blockers, peripheral vasodilators
- e) tocolytic uses

##### 2. Parasympathetic

- a) transmitters
- b) muscarinic effects
- c) nicotinic effects
- d) agonists - cholinergic and anticholinesterases
- e) antagonists

#### F. Cardiovascular Drugs

1. Positive inotropes
2. Vasodilators
3. Vasoconstrictors
4. Antianginal drugs
5. Antiarrhythmics
6. Electrolytes (cardiac effects)

#### G. CNS Drugs (other than primary anesthetics)

1. Pre- and postanesthetic medications
  - a) opioids

- b) opioid antagonists, agonist-antagonists
- c) barbiturates
- d) tranquilizers - phenothiazines; butyrophenones; benzodiazepines

2. Antidepressants, anti-Parkinson drugs

3. Ethyl alcohol

4. Anticonvulsants

5. Analeptics - physostigmine, benzodiazepine antagonists

6. Antiemetics - phenothiazines; butyrophenones; metoclopramide; anticholinergics; serotonin antagonists

7. Antihistamines (H<sub>1</sub>, H<sub>2</sub>, mixed)

8. Drug abuse and addiction; tolerance, dependence

#### H. Diuretics

1. Mechanism of action

2. Comparison of drugs

3. Adverse effects

4. Effect on electrolyte and acid-base balance

#### I. Immunosuppressive and Anti-Rejection Drugs

#### J. Pharmacogenetics

1. Malignant hyperthermia (including diagnosis and therapy)

2. Pseudocholinesterase deficiency

#### K. Drug Reactions (anaphylactoid, anaphylaxis)

### II. PHYSICAL SCIENCES

#### A. Anatomy - Regional Anesthesia, Nerve Blocks

1. Autonomic - stellate, celiac, lumbar sympathetic

2. Head and neck - cervical, superior laryngeal, transtracheal

3. Extremities - brachial plexus, ulnar, radial, median, sciatic, femoral, lateral femoral cutaneous, obturator, ilio-inguinal

4. Trunk - intercostal, paravertebral somatic

5. Spine - epidural, caudal, intrathecal

#### B. Biochemistry

1. Acid-base regulation - buffer systems; effects of imbalance on electrolytes and organ perfusion

2. Water and electrolytes - distribution and balance; compartments

3. Hyperalimentation

#### C. Physics - Monitoring Methods

1. Vascular pressures - arterial, CVP, PAP, LAP, LVEDP

2. Heart function - heart tones, ECG, echocardiography, cardiac output
3. Brain and spinal cord function - EEG (raw and processed), evoked potentials, wake-up test, ICP
4. Neuromuscular function - nerve stimulators, EMG
5. Ventilation - respirometers, inspiratory force
6. Capnography, O<sub>2</sub>, CO<sub>2</sub>, nitrogen, anesthetic gas and vapor measurement
7. Oximetry
8. Temperature - measurement, sites

### III. CLINICAL SCIENCES

#### A. Anesthesia Procedures, Methods and Techniques

##### 1. Patient Evaluation and Preoperative Preparation

###### a) Physical status

###### b) Premedication

- 1) interaction with chronic drug therapy; anesthetic agents
- 2) adverse reactions to premedications; patient variability, dose response curves, side effects
- 3) specific problems in disease states - hyper- and hypothyroid, drug abuse, glaucoma, uremia, increased CSF pressure, chronic steroid ingestion, obesity, depression, COPD
- 4) pediatric and geriatric doses, routes of administration
- 5) role in patients with allergies
- 6) alteration of gastric fluid volume and pH, sphincter tone

###### c) NPO recommendations

##### 2. Regional Anesthesia

###### a) General - premedication, patient position, equipment

###### b) Spinal, epidural, caudal

- 1) indications, contraindications, techniques, complications, comparison of techniques
- 2) sites of actions
- 3) factors influencing onset, duration, and termination of action
- 4) systemic toxicity, test dose
- 5) complications - precipitating factors, prevention, therapy

###### c) Peripheral and autonomic nerve blocks - indications, contraindications, techniques, clinical assessment, complications

###### d) IV Regional - mechanism, agents, indications, contraindications, techniques, complications

##### 3. General Anesthesia

###### a) Monitoring depth of anesthesia; awareness under anesthesia

###### b) Airway management; airway assessment; intubation; fiberoptic techniques; awake; ASA practice guidelines; techniques for difficult intubation, endobronchial intubation, complications

###### c) Hypocarbia and hypercarbia - systemic effects

d) Hypoxemia - systemic effects

4. Intravenous fluid therapy during anesthesia

5. Complications (etiology, prevention, treatment)

a) Trauma

1) upper airway, epistaxis

2) larynx and trachea; stridor; laryngospasm

3) eyes

4) vascular - arterial and venous thrombosis; thrombophlebitis; sheared catheter, intra-arterial injections, air embolism

5) neurological - pressure injuries of mask, tourniquet, body position, intraneural injections, retractors

6) burns

b) Temperature

1) hypothermia - etiology, treatment, prognosis

2) shivering

c) Nausea and vomiting

1) physiology; etiology; gastroesophageal sphincter; gastric emptying time

2) preoperative; full stomach and induction of anesthesia

3) use of antacids, H<sub>2</sub> blockers, metoclopramide, transdermal scopolamine, droperidol, ondansetron, propofol

4) pulmonary aspiration

d) Laryngospasm, bronchospasm

6. Special Techniques

a) Controlled hypotension; choice of drugs, use of posture, ventilation

b) Controlled hypothermia; techniques, systemic effects, shivering, rewarming, complications

c) Hemodilution - intentional; unintended

d) Barbiturate coma

7. Postoperative Analgesia

a) pharmacologic

1) drugs - opioids, agonist-antagonists, local anesthetics, alpha-2 agonists, non-steroidal anti-inflammatory, ketorolac

2) routes - oral, SC, IM, IV (PCA), epidural, spinal, intrapleural

3) risks and benefits

b) other techniques

8. Risk Management, QA, CQI

B. Disease States - Clinical Problems and Management

1. Painful Disease States

a) Types of pain - cutaneous; deep somatic; visceral; central

b) Specific pain syndromes - sympathetic dystrophy, phantom limb, low back pain, intractable cancer pain, causalgia, post-herpetic neuralgia

c) Treatment

- 1) drugs - analgesics, sedatives, stimulants
- 2) nerve blocks
- 3) others - transcutaneous nerve stimulation, acupuncture
- 4) surgical and chemical neurolysis

2. Respiratory System

a) Obstructive airway disease

- 1) upper airway - congenital, infectious, neoplastic, traumatic, foreign body
- 2) tracheobronchial - congenital, infectious, neoplastic, traumatic, foreign body

3) parenchymal - asthma, bronchitis, lung abscess, bronchiectasis, emphysema, cystic fibrosis, mediastinal masses

b) Restrictive lung disease

- 1) neurologic - CNS depression, spinal cord dysfunction, peripheral nervous system
- 2) musculoskeletal - muscular, skeletal, obesity, chest trauma
- 3) parenchymal - atelectasis, pneumonia, interstitial pneumonitis, pulmonary fibrosis, respiratory distress syndrome, bronchopulmonary dysplasia
- 4) pleural and mediastinal - pneumo-, hemo- and chylothorax, pleural effusion, empyema, bronchopleural fistula, cardiomegaly
- 5) other - pain, abdominal distention

c) Management of the patient with respiratory disease

- 1) evaluation - H & P, CXR, ABGs, PFTs; assessment of perioperative risk
- 2) anesthetic management - preoperative preparation; intraoperative management; postoperative care
- 3) management of respiratory failure - supportive medical therapy; monitoring; nonventilatory management; ventilatory management, modes, and complications

3. Cardiovascular System

a) Ischemic heart disease - anesthesia risk, myocardial O<sub>2</sub> supply and demand, diagnosis and treatment of intraoperative ischemia

b) Valvular heart disease - classification, diagnosis, anesthetic considerations

c) Rhythm disorders and conduction defects - chronic dysrhythmias, conduction blocks; AICD implantation; intraoperative dysrhythmias; intraoperative use and implications of pacemakers

d) Heart failure and cardiomyopathy - pathophysiology, compensatory responses; left vs right ventricular dysfunction; treatment and intraoperative management; acute perioperative pulmonary edema; cardiac transplantation

e) Cardiac tamponade and constrictive pericarditis - etiology; treatment; anesthetic management

f) Circulatory arrest - cardiopulmonary bypass, anticoagulation during cardiac surgery; IABP; ventricular assist devices

g) Myocardial preservation during cardiac surgery

h) Pulmonary embolism - types; diagnosis; treatment; prophylaxis

i) Hypertension - pathophysiology; treatment; anesthetic implications; management of acute perioperative hypertension

- j) Peripheral circulatory failure - pathophysiology; anesthetic management of patient in shock
  - k) Vascular diseases - cerebrovascular, carotid endarterectomy; AAA; arterial occlusive disease; thoracic aortic aneurysm and dissecting hematoma; anesthetic management
  - l) Cardiopulmonary resuscitation - ACLS guidelines; recognition, management and complications of therapy
4. Central Nervous System
- a) Seizures
  - b) Coma - pathophysiology; Glasgow Coma Scale; management
  - c) Drug intoxication
  - d) Spinal cord injury - paraplegia, quadriplegia, spinal shock, autonomic hyperreflexia
  - e) Neuromuscular diseases
  - f) Tetanus
  - g) Special problems of anesthesia for neurosurgery
    - 1) increased intracranial pressure
    - 2) posture
    - 3) air embolism
    - 4) neuroradiological investigative procedures; CT scan, MRI
    - 5) cerebral protection from hypoxia, ischemia, glucose effects
    - 6) meningomyelocele
    - 7) aneurysms and A-V malformations, cerebral vasospasm
    - 8) anesthetic and ventilatory effects on cerebral blood flow and metabolism
    - 9) fluid management
5. Other Entities
- a) Massive obesity
  - b) Hepatic disease - preoperative assessment; anesthetic management of acute and chronic hepatic insufficiency; postoperative hepatic dysfunction; transplantation
  - c) Diabetes mellitus - pathophysiology; autonomic dysfunction, perioperative management; DKA and hyperosmolar coma
  - d) Renal disease - pathophysiology; anesthetic management of acute and chronic renal failure; pharmacokinetic implications; perioperative oliguria, anuria; transplantation; inappropriate ADH secretion
  - e) Endocrine disorders
    - 1) pituitary disease
    - 2) thyroid disease - hyperthyroidism, thyroid storm, anesthetic management; hypothyroidism, anesthetic implications
    - 3) parathyroid disease
    - 4) adrenal disease - Cushing's syndrome; primary aldosteronism; Addison's disease; pheochromocytoma
    - 5) carcinoid syndrome
  - f) Intestinal obstruction - causes; pathophysiology; anesthetic management
  - g) Hematologic disorders
    - 1) diseases of blood - anemias; polycythemias; hemoglobinopathies; clotting disorders

2) transfusions - blood storage; use of filters, warmers; blood component therapy; type and cross, type and screen, autologous blood, designated donors, intraoperative cell saving; transfusion reactions, recognition and therapy; infections; citrate toxicity; massive transfusion; electrolyte and acid base abnormalities; alternatives to transfusion

#### h) Pediatric anesthesia

1) equipment and apparatus - circuits, airway equipment

2) premedication

3) anesthetic drugs and techniques - differences from adults; neuromuscular blockers; regional anesthesia

4) fluid therapy and blood replacement

5) difficult airway, intubation - full stomach; awake intubation; Pierre-Robin; T-E fistula; diaphragmatic hernia

6) neonatal physiology - respiratory, CV, differences from adult; retinopathy of prematurity; metabolism and thermal regulation; fetal hemoglobin; apnea of prematurity

7) congenital heart disease - cyanotic and acyanotic defects; altered uptake/distribution of IV and inhalation anesthetics

8) newborn emergencies - diaphragmatic hernia; T-E fistula; neonatal lobar emphysema; pyloric stenosis; necrotizing enterocolitis; omphalocele, gastroschisis; RDS; myelomeningocele

9) postoperative analgesia

#### i) Obstetrical anesthesia

1) maternal physiology - respiratory, effects on uptake and distribution; CV, aortocaval compression, uterine blood flow; renal; liver; GI; coagulation; placental blood flow, gas exchange

2) maternal-fetal - pharmacology; amniotic fluid; effects of anesthetics and techniques; physiology of labor and effects of anesthetics; fetal monitoring

3) pathophysiology and complicated pregnancy

a) problems during pregnancy - anesthesia for non- obstetric procedures; endocrine, diabetes; hypertension; cardiac disease; respiratory disease; renal disease; Rh and ABO incompatibilities; ectopic pregnancy

b) problems of term and delivery - evaluation of fetus; toxemia; placenta previa; supine hypotensive syndrome; pulmonary aspiration; DIC; amniotic fluid embolism; dystocia and malposition; multiple pregnancy; abruptio placenta; retained placenta; cord prolapse; uterine atony; breech presentation

c) newborn resuscitation - evaluation and Apgar scoring; neurobehavioral testing; techniques and pharmacology of resuscitation

#### 6. Special Problems in:

a) ENT surgery - airway endoscopy; microlaryngeal surgery; laser surgery, hazards, complications

b) plastic surgery

c) laparoscopic surgery - cholecystectomy, thoracoscopy, gynecologic surgery; anesthetic management, complications

d) urology, lithotripsy

e) ophthalmologic surgery; retrobulbar block; open eye injuries

f) orthopedic surgery; tourniquet management, complications

g) trauma, burn management

h) radiologic procedures; CT scan; MRI - anesthetic implications, management

i) ambulatory surgery - patient selection; anesthetic management; discharge criteria

j) electroconvulsive therapy

k) nutrition and hyperalimantation in the surgical or critically ill patient

l) adverse outcomes - anesthetic accidents; closed claims findings; professional liability

m) costs of medical/anesthesia care