Department of Anesthesiology
Tutorials vs. ABA/ASA Content Outline

Tutorials are organized as follows:

- The first year curriculum is aimed at the CA1 residents. It consists of 50 hours of tutorials and 10 hours of Board Reviews. It covers the “Basic Topics in Anesthesiology” of the ABA/ASA content outline that will be tested on Part I-A of the ABA exam. Topics marked with an asterisk in the CA1s curriculum are Advanced Topics that could not be covered in the CA2s curriculum because of lack of time in the second year.

- The second year curriculum is aimed at the CA2 residents. It consists of 56 hours of tutorials. It covers the “Advanced Topics in Anesthesiology” of the ABA/ASA content outline that will be tested on Part I-B of the ABA exam.

- The third year curriculum is aimed at the CA3 residents. It consists of 28 2-hours board reviews. It covers all the “Basic Topics in Anesthesiology” and the “Advanced Topics in Anesthesiology” of the ABA/ASA content outline.

- The three years of the curriculum include the same two 2-hours seminars: “Substance Abuse” and “Practice Management”

- All items from ABA/ASA content outline (equivalent to “key words”) are included in the 106 hours of tutorials and 4 hours of seminars. The items from the ABA/ASA content outline have been reorganized to delineate which items should be included in each tutorial. This list also serves as a study guide for the residents.

When appropriate, presentations should be developed using the corresponding chapter in Barash et al: Clinical Anesthesia, 8th ed., 2017. For those tutorials that include topics not well covered in Barash et al, it is preferable if one of the textbooks from the departmental “reading list” (See the list posted on the departmental website under “Teaching / Didactic Activities”) is used. Speakers should communicate to the residents which chapter(s) they are expected to read by posting the information on Blackboard.

CA1s Curriculum

Basic Topics in Anesthesiology (and few Advanced Topics marked with *)

1. **Mathemetic Principles (1 hour)**
2. **Mathemetic Principles (1 hour)**

   *Barash et al.: Chapter 7 (Experimental Design & Statistics)*
   - Simple math: logarithms; graph of simple equations; exponential functions; analysis of biological curves
   - Statistics: sample & population; probability; mean, median & mode; standard deviation & error; T-Test; Chi-Square; regression analysis/correlation; analysis of variance; power analysis; meta-analysis; confidence intervals; odds ratio; risk ratio; Bland-Altman plot
   - Computerized patient records:
Basic computer knowledge: program vs. operating system; computer virus; disk or central processing unit failure; amplifiers; microprocessor

Data handling, processing, and analysis

3. Vascular Access (1 hour)

*Barash et al.: Chapter 26 (Commonly Used Monitoring Techniques)*
- Topographical Anatomy as Landmarks: internal & external jugular veins, subclavian veins, thoracic duct, carotid & vertebral arteries, extremity arteries
- Insertion of central line / pulmonary artery catheter: choice of catheter, sterile technique
- Complications: arterial and venous thrombosis, thrombophlebitis, sheared catheter, intra-arterial injections, air embolism, cardiac/vascular perforation, pulmonary artery rupture

4. The Ultrasound Machine (1 hour)

*Barash et al: Chapter 36: Peripheral Nerve Block Blockade*
- Principles of Doppler ultrasound
- The ultrasound machine

5. Basic principles of Clinical Pharmacology – Part I (1.0 hour)

*Barash et al.: Chapter 11 (Basic Principles of Clinical Pharmacology)*
- General concepts: Pharmacokinetics (incl. 1st order pharmacokinetic) & pharmacodynamics; protein binding; partition coefficient; pKa; ionization; tissue uptake; compartmentalization & exponential models
- Termination of action: elimination; biotransformation (incl. p450 mechanism of action); context-sensitive half-time; impact of renal disease; impact of hepatic disease
- Drug interactions: enzyme induction & inhibition; hepatic blood flow; drug-drug binding; perioperative implications of alternative and herbal medicines

6. Basic principles of Clinical Pharmacology – Part II (1 hour)

*Barash et al.: Chapter 11 (Basic Principles of Clinical Pharmacology)*
*Barash et al: Chapter 9 (The Allergic Response)*
*Barash et al: Chapter 52: Transplant Anesthesia*
- Tolerance (incl. symptoms of opioid tolerance) & tachyphylaxis
- Addiction: physiology & pharmacology; anesthetic implications of patient addiction
- Allergic response:
  - Latex allergy
  - Drug reactions: anaphylactoid, anaphylaxis (incl. symptoms in patients on beta-blockers), idiosyncratic
- Immunosuppressive and anti-rejection drugs

7. Cardiac Anatomy and Physiology (1 hour)

*Barash et al.: Chapter 12 (Cardiac Anatomy and Physiology)*
- Cardiac anatomy:
• Normal anatomy of heart (incl. clinical findings with valvulopathies)
• Coronary circulation
• Cardiac topographical landmarks

• Cardiac physiology:
  o Cardiac cycle: control of heart rate; synchronicity of pressure, flow, ECG, sounds, valve action
  o Ventricular function: Frank-Starling law; preload and afterload; intracardiac pressures; force, velocity, length, rate of shortening; myocardial contractility, measurement limitations; cardiac output (determinants & regulation); myocardial oxygen utilization; systolic & diastolic function
  o Venous return: vascular compliance/venous capacitance, controlling factors; muscle action, intrathoracic pressure, body position; blood volume & distribution
  o Blood pressure: systolic, diastolic, mean & perfusion pressures; intracardiac, pulmonary, venous; systemic & pulmonary vascular resistance, viscosity; baroreceptor function

8. Cardiac Pharmacology (1 hour)
   Barash et al.: Chapter 14 (Autonomic Nervous System: Physiology and Pharmacology)
   Barash et al: Chapter 39 (Anesthesia for Cardiac Surgery)
   • Digitalis: actions & toxicity
   • Inotropes
   • Phosphodiesterase III inhibitors (Inodilators): milrinone, others
   • Direct vasodilators: nitroprusside, nitroglycerin, hydralazine, nesiritide, calcium channel blockers, others
   • Angiotensin converting enzyme inhibitors & angiotensin blockers
   • Non-adrenergic vasoconstrictors: vasopressin & congeners
   • Electrolytes (potassium, magnesium, phosphorus, calcium): cardiovascular effects

9. Circulation (1 hour)
   Barash et al.: Chapter 12 (Cardiac Anatomy and Physiology)
   Barash et al.: Chapter 14 (Autonomic Nervous System: Physiology and Pharmacology)
   • Microcirculation: capillary diffusion; osmotic pressure, Starling’s law; pre & post capillary sphincter control; viscosity; rheology
   • Regulation of circulation & blood volume: central (vasomotor center, hypothalamic-pituitary-adrenal axis); peripheral (receptors & reflexes); hormonal control; mixed venous oxygen tension & saturation
   • Regional blood flow and its regulation: cerebral and spinal cord; coronary; pulmonary (incl. mechanism of action of sildenafil); renal; splanchnic/hepatic; muscle and skin; uterine and placental

10. Dysrhythmias (Treatment & Anesthetic Implications) (1 hour)
Anatomy: heart conduction system; innervation
Physiology: impulse propagation; normal ECG; electrophysiology; ion channels and currents
* Chronic abnormalities: etiology, diagnosis
* Perioperative dysrhythmia: etiology, diagnosis, therapy
Antiarrhythmic (incl. effects on QTc)
Defibrillators: Automated implantable cardioverter/defibrillator (AICD) (incl. electromagnetic interference); external; energy; cardioversion; types of waveforms (monophasic, biphasic); paddle size & position; automated external defibrillators
* Pacemakers: permanent (epicardial, endocardial), temporary; transvenous, transcutaneous; types (fixed rate, biventricular synchronized, ventricular, atrial, atrio-ventricular sequential; standard nomenclature; raisons for failure of malfunction)
* Ablation, cryotherapy, Maze procedure
* Perioperative implications of pacemakers & AICD

11. Respiratory system: Anatomy & Physiology (1 hour)
Barash et al.: Chapter 15 (Respiratory Function in Anesthesia)
Anatomy:
  o Larynx: muscles, blood supply, cartilages, vocal cord position with paralysis
  o Trachea: structure & relationships in neck & chest
  o Lungs: divisions & bronchoscopic anatomy; bronchial & pulmonary circulation; microscopic anatomy
  o Muscles of respiration, accessory muscles
Physiology:
  o Lung volumes: definitions; methods of measurement; normal values (incl. effect of patient position on closing capacity); time constants; static and dynamic volumes; dead space; nitrogen washout; O₂ uptake; CO₂ production
  o Lung mechanics: static & dynamic compliances; pleural pressure gradient; surfactant; LaPlace Law; resistances; work of breathing; regulation of airway caliber
  o Ventilation-perfusion: distribution of ventilation; distribution of perfusion, zones, hypoxic pulmonary vasoconstriction
  o Diffusion: definition, pulmonary diffusion capacity; apneic oxygenation, diffusion hypoxia
  o Control of ventilation: respiratory center; central & peripheral chemoreceptors, proprioceptive receptors, respiratory muscles & reflexes, innervation; CO₂ and O₂ response curves
  o Non-respiratory functions of lungs: metabolic, immune

12. Preoperative Pulmonary Evaluation & Preparation (1 hour)
Barash et al.: Chapter 15 (Respiratory Function in Anesthesia)
Barash et al.: Chapter 38 (Anesthesia for Thoracic Surgery)

- Preoperative pulmonary evaluation:
  - * History & physical examination
  - * Radiological: chest x-ray, CT, MRI; lung scan
  - *ABG
  - Respiratory function tests: spirometry; inspiratory force; flow-volume loops (incl. in bronchopleural fistula) and hysteresis; static & dynamic compliance; principles of gas flow measurement; methods of measurement; measurement of ventilation/perfusion ratio; exercise testing

- Preoperative preparation:
  - * Respiratory therapy
  - Drug therapy: antibiotics; bronchodilators (beta-agonists, anticholinergics), mucolytics; anti-inflammatory medications (steroids, leukotriene modifier drugs, mast cell stabilizers, Immunoglobulin E stabilizers)
  - Perioperative smoking: physiologic effects; cessation of smoking

13. Fluid & Electrolytes (1 hour)
Barash et al.: Chapter 16 (Fluids, Electrolytes and Acid-Base Physiology)

- Biochemistry of normal body metabolism:
  - Carbohydrates: aerobic & anaerobic utilization; chemical processes, enzymes; relationship to hormones, insulin, human growth hormone, glucocorticoids, glucagon, epinephrine; effects of stress
  - Proteins: functions, hormones, antibodies; cAMP; cGMP
  - Lipids: triglycerides, lipoproteins, cholesterol (incl. effect of lipogenesis on respiratory quotient and lipolysis as a stress response)
  - Specific organ metabolism: brain, heart, liver, muscle

- Intravenous fluid therapy during anesthesia: water, electrolyte, glucose requirements and disposition, crystalloid vs., colloid

- Sodium, potassium, calcium, magnesium: homeostasis & disorders; cardiovascular effects

- Fluid requirements and fluid calculations

- Normal saline Vs plasmalyte Vs D5W (incl. osmolality)

14. Hemostasis and Transfusion (1 hour)
Barash et al.: Chapter 17 (Hemostasis and Transfusion Medicine)

- Hemostasis
  - Anticoagulants (incl. lepirudin and LMWH), antithrombotics & anti-platelet drugs (incl. clopidogrel) (mechanism of action, comparison of drugs, drug interactions, monitoring of effects, side effects & toxicity)
  - Coagulation monitors

- Transfusions
  - Indications
  - Blood preservation, storage
  - Blood filters and pumps
  - Blood warmers, autotransfusion devices
Effects of coiling and heating; blood warmers
Blood components, volume expanders
Preparation for transfusion: type & cross, type & screen; uncrossmatched blood; autologous blood; designated donors
Synthetic & recombinant hemoglobin’s
 Alternatives to transfusions: hemodilution (incl. hemodynamic effects), sequestration, autotransfusion, blood substitutes, erythropoietin
Reactions to transfusions: febrile, allergic, hemolytic (acute, delayed)
Complications of transfusions: infections (hepatitis, HIV, CMV, others); citrate intoxication (diagnosis and treatment); electrolytes and acid-base abnormalities; massive transfusion (coagulopathies, hypothermia); Pulmonary (transfusion-related acute lung injury, transfusion related circulatory overload); immunosuppression

15. Acid-base (1 hour)
16. Acid-base (1 hour)

Barash et al.: Chapter 16 (Fluids, Electrolytes and Acid-Base Physiology)

• Normal acid-base regulation: buffer systems; compensatory mechanisms
• Basic interpretation of arterial blood gases (incl. Treatment of acid-base disturbances)
• Effects of imbalance on electrolytes and organ perfusion
• ABG interpretation: anion gap; strong ionic difference; temperature effect on blood gases (alpha-stat vs. pH-stat)
• Blood gas transport
  - O2 transport; O2 physical solubility; oxyhemoglobin (Hb-O2) saturation (incl. partition coefficient and O2 content); Hb-O2 dissociation curve; 2,3-diphosphoglycerate; P50; respiratory enzymes; Hb as a buffer
  - CO2 transport; blood CO2 content; carbonic anhydrase; CO2 dissociation curve; Bohr effect; Haldane effect
  - Systemic effects of hypercarbia & hypocarbia
  - Systemic effects of hyperoxia & hypoxemia
• Arterial and venous blood gases: electrodes for pH, PO2, PCO2, calibration, temperature corrections, errors

17. Autonomic Nervous System: Anatomy & physiology (1 hour)

Barash et al.: Chapter 14 (Autonomic Nervous System: Physiology and Pharmacology)

• Sympathetic nervous system: ganglia, Rami communicants, sympathetic chain; cranial nerves; carotid & aortic bodies; carotid sinus
• Sympathetic: receptors; transmitters; synthesis; storage; release; responses (incl. bladder); termination of action
• Parasympathetic system: location of ganglia; vagal reflex pathways
• Parasympathetic: receptors; transmitters; synthesis; storage; release; responses (incl. bladder); termination of action (incl. mechanism of action of botulism)
• Ganglionic transmission
• Reflexes: afferent and efferent limbs
18. Electrical Safety (1 hour)

*Barash et al.: Chapter 5 (Electrical and Fire Safety)*
- Fire and explosion hazards
- Basic Electronics
- Source of ignition; static
- Prevention: grounding, isolation transformers
- Macro and micro current hazards
- Risks factors for intraoperative fire
- Safety regulations; National Fire Protection Association Standards
- Alarms: operating room, electrical
- Patient burns

19. Inhaled Anesthetics: Pharmacokinetic (1 hour)

20. Inhaled Anesthetics: Pharmacokinetic (1 hour)

*Barash et al.: Chapter 18 (Inhaled Anesthetics)*
- Uptake and distribution of inhaled anesthetics: Uptake & elimination curves; effect of ventilation; circulation; anesthetic systems
- Concentration effect
- Second gas effect (incl. nitrous oxide FA/FI and effect on recovery)
- Nitrous oxide & closed spaces (incl. bowel distension and risks with LMA)

21. Inhaled Anesthetics: Pharmacology (1 hour)

22. Inhaled Anesthetics: Pharmacology (1 hour)

*Barash et al.: Chapter 18 (Inhaled Anesthetics)*
- Physical properties
- Mechanism of action
- Effects on CNS
- Effects on cardiovascular system
- Effects on respiration (incl. sensitivity of hypoxic drive)
- Effects on neuromuscular function
- Effects on renal function
- Effects on hepatic function
- Effects on hematologic & immune systems
- Biotransformation & toxicity (Compound A, carbon monoxide)
- Minimal alveolar concentration and factors affecting MAC
- Trace concentrations, OR pollution, personnel hazards (chronic environmental exposure, fertility, teratogenicity, carcinogenicity, scavenging)
- Comparative pharmacodynamics

23. Neuromuscular Blocking Agents (1 hour)

24. Neuromuscular Blocking Agents (1 hour)

*Barash et al.: Chapter 21 (Neuromuscular Blocking Agents)*
- Skeletal muscle contraction: depolarization, role of calcium, actin, myosin, energy source & release, repolarization (ionic flow)
• Neuromuscular transmission:
  o Morphology, receptors, receptor density
  o Membrane potential (mechanism)
  o Action potential (characteristics, ion flux)
  o Synapse (transmitters, precursors, ions, termination of action, transmission characteristics)
  o Presynaptic and postsynaptic functions
• Neuromuscular junction: prejunctional events (acetylcholine synthesis and release, modulation by nicotinic and muscarinic prejunctional receptors); postjunctional events (acetylcholine binding to acetylcholine receptors, ion flow through acetylcholine receptor)
• Neuromuscular junction: prejunctional components (motor neurons, neuronal transport system, synaptic vesicles); postjunctional components (muscle cell, acetylcholine receptor); perijunctional voltage-gated channels
• Monitoring: Electromyography & nerve stimulators (incl. TOFR & monitoring sites)
• Muscle relaxants (depolarizing & non-depolarizing)
  o Mechanism of action
  o Pharmacokinetics & pharmacodynamics, abnormal responses
  o Prolongation of action; synergism
  o Metabolism & excretion
  o Side effects & toxicity (residual paralysis, muscle soreness)
  o Indications & contraindications
  o Antagonism of blockade
  o Drug interactions (antibiotics, antiepileptic’s, lithium, magnesium, calcium channel blockers, inhalational anesthetics)

25. Intravenous Anesthetics & Opioids (1 hour)
  Barash et al.: Chapters 19 (Intravenous Anesthetics) & 20 (Opioids)
• Opioids: mechanism of action; pharmacokinetics & pharmacodynamics; metabolism (incl. remifentanil) & excretion (incl. with renal failure); effect on circulation, respiration & other organs; side effects & toxicity; indications & contraindications; antagonists
• Barbiturates: mechanism of action; pharmacokinetics & pharmacodynamics; metabolism & excretion; effect on circulation, respiration & other organs; side effects & toxicity; indications & contraindications
• Propofol: mechanism of action; pharmacokinetics & pharmacodynamics (incl. context sensitive half-time); metabolism & excretion; effect on circulation, respiration & other organs; side effects & toxicity; indications & contraindications
• Etomidate: mechanism of action; pharmacokinetics & pharmacodynamics; metabolism & excretion; effect on circulation, respiration & other organs; side effects & toxicity (incl. adrenal insufficiency); indications & contraindications
• Benzodiazepines: mechanism of action; pharmacokinetics & pharmacodynamics (incl. midazolam bioavailability); metabolism & excretion; effect on circulation, respiration & other organs; side effects & toxicity; indications & contraindications; antagonists
• Ketamine: mechanism of action; pharmacokinetics & pharmacodynamics; metabolism & excretion; effect on circulation, respiration & other organs (incl. effect on BIS monitoring); side effects & toxicity; indications & contraindications
• Dexmedetomidine: mechanism of action; pharmacokinetics & pharmacodynamics; metabolism & excretion; effect on circulation, respiration & other organs; side effects & toxicity; indications & contraindications

26. Local Anesthetics & Anatomy of Upper and Lower Extremities (1 hour)  
Barash et al.: Chapter 22 (Local Anesthetics)  
Barash et al.: Chapter 36 (Peripheral Nerve Blockade)

• Local Anesthetics:
  o Uptake, mechanism of action  
  o Biotransformation & excretion  
  o Comparison of drugs & chemical groups  
  o Prolongation of action  
  o Side effects & toxicity (CNS (seizures, cauda equina syndrome, transient neurological symptoms); cardiac; allergy; preservatives/additives; maternal-fetal; methemoglobinemia)  
  o Intralipid for local anesthetic toxicity  
  o Intraneural injection
• Anatomy of upper and lower extremities
  o Upper extremity: Bones, vasculature and nerves relationships (incl. Stellate ganglion anatomy & brachial plexus anatomy)  
  o Lower extremity: Bones, vasculature and nerves relationships (incl. femoral nerve anatomy & ankle block anatomy)

27. Radiology (1 hour)

• Chest (including CT and MRI) (incl. mediastinal mass)  
• Brain and skull (including CT and MRI)  
• Spine – cervical, thoracic and lumbar (including CT and MRI)  
• Radiation safety (incl. radiation exposure Vs. distance)

28. Preoperative Evaluation & Medications (1 hour)  
Barash et al.: Chapter 23 (Preoperative Patient Assessment and Management)

• ASA preoperative laboratory testing guidelines  
• American College of Cardiology / American Heart Association guidelines for perioperative cardiovascular evaluation  
• Physical examination, airway evaluation  
• Practice guidelines for preoperative fasting  
• ASA physical status classification

• Premedication: interaction with chronic drug therapy, interaction with anesthetic agents
• Adverse reactions to premedications; patient variability, dose response curves, side effects
• Specific problems in disease states: hyperthyroidism & hypothyroidism, drug abuse, glaucoma, uremia, increased CSF pressure, chronic steroid ingestion, obstructive sleep apnea, obesity, depression, COPD, hypertension
• Pediatric & geriatric doses, routes of administration
• Role in patients with allergy
• Alteration of gastric fluid and pH, gastroesophageal and pyloric gastroesophageal reflux disease, sphincter tone
• Continuation vs. discontinuation of chronic medications: antihypertensives (incl. mechanism of action of ACE inhibitors), antianginal, antihyperglycemics, antidepressants, platelets inhibitors, etc
• Prophylactic cardiac risk reduction: beta-adrenergic blockers, etc.
• Prophylactic antibiotics: indications, risks of administrations, cross-reactivity

29. Physics & Anesthesia Delivery Devices (1 hour)

30. Physics & Anesthesia Delivery Devices (1 hour)
   Barash et al.: Chapter 25 (The Anesthesia Workstation and Delivery Systems for Inhaled Anesthetics)
   • Mechanics:
     o Pressure measurement of gases, liquids
     o Regulators, medical gas cylinders
   • Flow velocity:
     o Viscosity-density; laminar-turbulent flow
     o Flowmeters; rotameter
   • Properties of liquids, gases, and vapors:
     o Diffusion of gases
     o Solubility coefficients
     o Relative & absolute humidity
     o Critical temperature, critical pressure
   • Gas laws
   • Vaporizers:
     o Vapor pressure & calculation of anesthetic concentrations (incl. output determinants)
   • Breathing systems:
     o Resistance
     o Turbulent flow
     o Mechanical dead space
     o Rebreathing, dilution, leaks, gas mixtures
     o Humidity, heat

31. Anesthesia Machine / Breathing Systems (1 hour)
32. Anesthesia Machine / Breathing Systems (1 hour)
   Barash et al.: Chapter 5 (The Anesthesia Workstation and Delivery Systems for Inhaled Anesthetics)
• Components: connectors, adaptors, mask, endotracheal tube, laryngeal mask airways, reservoir bag, unidirectional valves, corrugated breathing tubes, airway pressure relief valves
• Characteristics:
  o Circle systems: closed and semi-closed (incl. characteristics and rebreathing); adult; pediatric
  o Non-circle systems: insufflation; open; semi-open
  o Portable ventilation devices (self-inflating, non-self-inflating), non-rebreathing valves
  o CO₂ absorption: principles, canisters, efficiency, CO production
• Oxygen supply systems: FiO₂, O₂ supply for transtracheal jet ventilation
• Waste gas evacuation systems (incl. reservoir bag)
• Vaporizer types & safety features (incl. misfiled vaporizers/output calculation)
• Safety features (proportioning devices, rotamer configuration, pressure fail-safe)
• Design; alarms

33. Airway management (1 hour)

  **Barash et al. Chapter 28 (Airway Management)**

• Anatomy: nose, pharynx (subdivisions, innervation); larynx (innervation, vocal cords); trachea (structure and relationship in neck and chest); tracheotomy site; cricothyroid membrane; location of cricoid cartilage; effect of head position on ETT
• Assessment/identification of difficult airway: anatomic correlates, Mallampati classification, range of motion
• Techniques of managing airway: awake vs. asleep, use vs. avoidance of muscle relaxants, drug selection retrograde intubation techniques; ASA difficult airway algorithm
• Devices: flexible fiberoptic; transillumination; laryngoscope blades; Bullard laryngoscope; rigid bronchoscope; videolaryngoscopes
• Endotracheal tube types: tube material (polyvinyl chloride, silicone, laser-resistant, silver impregnated, other), tube tip design (Murphy Eyes, flexible tip, moveable tip, short-bevel), cuff design (high vs. low volume/pressure, cuffed vs. uncuffed, cuff shapes), cuff pressure management (Lanz valves, active management, pilot balloon, inflation valve), specific tube types (wired-reinforced, nasal and oral RAE, microlaryngeal, supraglottic, secretion suctioning, other)
• Alternatives and adjuncts: laryngeal mask airway (original & modified) (incl. intubation guide, effect of cricoid pressure and detection of misplaced LMAs), esophageal obturator airways, occlusive pharyngeal airways
• Transcutaneous or surgical airways: tracheostomy; cricothyroidotomy; translaryngeal or transtracheal jet ventilation
• Nerve blocks: glossopharyngeal (incl. complications), superior laryngeal, transtracheal; topicalization
• Intubation and tube change adjuncts: bougies, jet stylets, soft and rigid tube change devices; complications
• Endobronchial intubation: double-lumen endotracheal tubes; bronchial blockers (integral to endotracheal tube or separate), placement and positioning considerations, postoperative considerations
• Complications: laryngospasm (incl. management); pressure injuries of mask; epistaxis; trauma of larynx (incl. management of edema), trachea, esophagus

34. General Anesthesia / Monitored Anesthesia Care / Sedation (1 hour)

Barash et al.: Chapter 30 (Monitored Anesthesia Care)

• Stages and signs of anesthesia; awareness under anesthesia
• Techniques of general anesthesia: inhalational, total intravenous, combined intravenous/inhalational
• Monitored anesthesia care & sedation:
  o Techniques
  o Risks and complications (incl. monitoring ventilation)
  o ASA guidelines for sedation; sedation guidelines for non-anesthesiologists
• Complications: bronchospasm, laryngospasm, postobstructive pulmonary edema, aspiration of gastric contents
• Antiemetics and aspiration prophylaxis: phenothiazines, butyrophenones, metoclopramide (incl. mechanism of action), anticholinergics, serotonin antagonists, antihistamines, antacids, proton pump inhibitors; risk factors for PONV
• Full stomach & induction of anesthesia: NPO & full stomach status; implications for airway management; choice of anesthesia technique and induction of anesthesia; gastric emptying time; full stomach and induction of anesthesia (incl. effect of cricoid pressure)
• Arousal agents: physostigmine, benzodiazepine antagonists

35. Regional Anesthesia: Epidural & Spinal Anesthesia (1 hour)

Barash et al.: Chapter 35 (Neuraxial Anesthesia)

• Pharmacokinetics of neuraxial drug administration:
  o Epidural and subarachnoid
  o Factors influencing onset, duration, and termination of action (incl. fentanyl Vs. morphine)
  o Systemic toxicity, test dose (incl. with beta-blockers)
• Topographical anatomy for regional anesthesia: neck, spine (vertebra prominens, Chassaignac’s tubercle, vertebral levels, caudal space), nerves and bones
• Anatomy: caudal space; meninges (epidural, subdural & subarachnoid spaces); variations in vertebral configurations; spinal nerves (level of exit, covering, sensory distribution); sacral nerves
• Indications, contraindications, techniques, comparison of techniques (incl. risks of LOR technique)
• Sites of actions
• Premedication, patient position, equipment, monitoring
• * Epidural (cervical, thoracic, lumbar, caudal, transforaminal), spinal, combined spinal-epidural (CSE)
• Complications: precipitating factors (incl. spinal baroreceptors), prevention (incl. post dural puncture headache), therapy (incl. differential diagnosis of dyspnea and treatment of high-spinal), implications of anticoagulants (incl. LMWH) and platelet inhibitors, ASRA guidelines

36. Monitoring the Anesthetized Patient (1 hour)
37. Monitoring the Anesthetized Patient (1 hour)

Barash et al.: Chapter 26 (Commonly Used Monitoring Techniques)

• ASA monitoring standards
• Vascular pressures:
  o Arterial (invasive/noninvasive differences); central venous; pulmonary arterial; pulmonary artery occlusion; left atrial; left ventricular end-diastolic; alarms
  o Transducers: resonance; damping
  o Non-invasive blood pressure measurement: Doppler; oscillometry; Korotoff sounds; palpation
• Heart function:
  o Heart tones
  o Electrocardiogram
  o Doppler
  o Cardiac output: Fick; Dye dilution; thermodilution; Doppler impedance
• Gas concentrations:
  o O₂, CO₂, nitrogen, anesthetic gases and vapors; alarms
  o Gas concentrations: infrared absorption, mass spectrometry, Raman scatter analysis
  o Alarms
• Oxygen: oximetry; co-oximetry; pulse oximetry, mixed venous oxygen saturation (incl. factors affecting), alarms; alarms
• Ventilation: respirometers, inspiratory force

38. Patient Positioning (1 hour)

Barash et al.: Chapter 29 (Patient Positioning and Potential Injuries)

• Eyes: corneal abrasion, blindness (incl. etiology), post-op vision loss
• Pressure injuries of mask, tourniquet, body position (incl. risk factors for ulnar nerve injury)
• Retractors
• Peripheral neuropathies
• ASA patient positioning guidelines

39. Temperature Regulation (1 hour)

Barash et al.: Chapter 26 (Commonly Used Monitoring Techniques)
Barash et al: Chapter 43 (Pediatric Anesthesia)

• Temperature sensing: central, peripheral
• Temperature regulating centers: concept of set point
• Heat production & conservation
• Heat loss: mechanisms
• Body temperature measurement: sites, gradients
• Effects of drug/anesthesia on temperature regulation
• Hypothermia: etiology, prevention, treatment, complications (shivering, \( O_2 \) consumption), prognosis
• Nonmalignant hyperthermia: complications, treatment
• Body warming devices: forced air; heating lamps; insulation devices, warming blankets, water-flow ‘second skin’ devices
• Special pediatric considerations

40. Postoperative Recovery Care (1 hour)

Barash et al.: Chapter 54 (Postanesthesia Recovery)

• Cardiovascular consequences of general and regional anesthesia: differential diagnosis and treatment of postoperative hypertension and hypotension
• Postoperative Pulmonary Complications:
  o Aspiration of gastric content (prevention & treatment)
  o Respiratory consequences of anesthesia & surgical incisions (incl. management of atelectasis)
  o Laryngospasm & postoperative pulmonary edema
• * Extubation criteria
• Management of respiratory failure: nonventilatory respiratory management (\( O_2 \) therapy and toxicity; tracheobronchial toilet; positive airway pressure; respiratory drugs); ventilator management (criteria for ventilatory commitment & weaning)
• Neurologic consequences of anesthesia: confusion, delirium, cognitive dysfunction, failure to emerge from anesthesia
• Neuromuscular consequences of general anesthesia: residual paralysis, muscle soreness, recovery of airway reflexes
• Nausea and vomiting
  o Physiology, etiology, risk factors, preventive strategies
  o Use of antacids, histamine 2 blockers, metoclopramide, transdermal scopolamine, droperidol, serotonin antagonists, proton pump inhibitors, dexamethasone, phenothiazines, butyrophenones, multimodal therapy, acupressure/acupuncture
• * Arousal agents: physostigmine, benzodiaxepine antagonists, naloxone

41. Ventilators (1 hour)

Barash et al.: Chapter 57 (Critical Care Medicine)

• Classifications: flow generation vs. pressure generation
• Principles of action: assistors, controllers, assist-control; pressure-limited, volume-limited; \( FiO_2 \) control; periodic sigh, inverse ratio, high frequency ventilation, intermittent mandatory ventilation (IMV), synchronized IMV, pressure support, airway pressure release ventilation (APRV), pediatric adaptation non-invasive techniques: BIPAP, others
• Alarms
• Modes of ventilation: conventional mechanical ventilation, PEEP, CPAP, IMV, SIMV, volume control, pressure control, high frequency ventilation (positive pressure, jet, oscillation), prone ventilation, BIPAP, airway pressure-release ventilation
• Complications and side effects of mechanical ventilation: volutrauma, barotrauma
• Monitors; pressure (plateau; peak), oxygen, apnea, inspiratory/expiratory ratio dynamic compliance, static compliance; alarms (incl. differential diagnosis of pressure alarms)

42. Management of Acute Postoperative Pain (1 hour)

* Acute postoperative and posttraumatic pain, ASA practice guideline
- Pharmocologic pain relief:
  - Drugs: opioids, agonist-antagonists, local anesthetics, alpha-2 agonists (clonidine, dexmedetomidine), nonsteroidal anti-inflammatory drugs, N-Methyl-D-Aspartate receptor blockers, tricyclic antidepressants, selective serotonin reuptake inhibitor; tramadol
  - Routes: oral, rectal, subcutaneous, transcutaneous, transmucosal, intramuscular, intravenous (including PCA and PCA settings), epidural, spinal, intrapleural, peripheral nerve catheter
  - Risks, benefits, complications
• Other techniques: transcutaneous electrical nerve stimulation, cryotherapy, acupuncture, hypnosis
• * Drug delivery devices: patient-controlled intravenous and epidural analgesia

43. Chronic Pain Management

- Nociceptions:
  - Peripheral nociceptors: transduction
  - Afferent pathways: neurons, dorsal horn, CNS pathways
- Pain mechanisms & pathways:
  - Nociceptors & nociceptive afferent neurons, wind-up phenomenon
  - Dorsal horn transmission and modulation
  - Spinal and supraspinal neurotransmission and modulation; opioids receptors
  - Autonomic contribution to pain; visceral pain perception and transmission
  - Reflexes: afferent and efferent limbs
  - Social, vocational and psychological influences on pain perception
  - Gender and age differences in pain perception
- Opioid dependence:
  - Chronic opioids dependence & therapy
  - Pharmacologically-assisted opioids withdrawal

44. Neuroanatomy & Physiology (1 hour)

* Anatomy:
Brain: cerebral cortex; cerebellum, basal ganglia, major nuclei & pathways, brainstem (respiratory centers, reticular activating system); cerebral circulation, Circle of Willis, venous sinuses and drainage

- Spinal cord & spine: blood supply; organization; tracts

**Physiology:**
- **Brain:**
  - Cerebral cortex, functional organization
  - Subcortical areas: basal ganglia, hippocampus, internal capsule, cerebellum, brain stem, reticular activating system
  - *Metabolism:* substrates, aerobic and anaerobic
  - Cerebral blood flow: regulation; effect of perfusion pressure, pH, PaCO₂ (incl. CO₂ and blood-brain barrier), PaO₂, and cerebral metabolic rate for O₂; inverse steal, gray vs. white matter; autoregulation (normal, altered and abolished); pathophysiology of ischemia/hypoxia (global vs. focal, glucose effects, effects of brain trauma or tumor); increased ICP (incl. fluid management and hypertonic saline)

- Cerebrospinal fluid:
  - Formation, volume, composition, flow & pressure
  - Blood-brain barrier, active & passive molecular transport, causes of disruption
  - Relation to blood chemistry & acid-base balance
- Cerebral protection: hypothermia; anesthetic & adjuvant drugs
- Spinal cord: regulation of blood flow; reflexes (incl. anesthetic effects)

**45. *Neuromonitoring (1 hour)*

*Barash et al.: Chapter 37 (Anesthesia for Neurosurgery)*

- *Monitoring of brain & spinal cord function:*
  - Electroencephalogram (raw & processed)
  - Depth of anesthesia monitors (bispectral & others) (incl. accuracy)
  - Evoked potentials
  - Wake-up tests

- *Electroencephalography:*
  - Wave patterns; frequency & amplitude; raw & processed; spectral edge
  - Sleep; convulsions; effects of O₂ and CO₂, hypothermia; brain death
  - Specific anesthetic and drug effects; depth of anesthesia; burst suppression; electrical silence

- *Evoked responses:*
  - Morphology; effects of ischemia and anesthetics
  - Sensory: somatosensory, visual, brainstem auditory
  - Motor

**46. Endocrine Function (1 hour)**

*Barash et al.: Chapter 47 (Endocrine Function)*

- **Thyroid:**
  - Physiology
Hyperthyroidism: metabolic & circulatory effects
Hypothyroidism: metabolic & circulatory effects
- Parathyroid:
  - Physiology
  - Hyperparathyroidism: physiologic effects
  - Hypoparathyroidism: physiologic effects
- Pituitary:
  - Physiology: Hypothalamus, pituitary
  - Hypopituitarism: physiologic effects
  - Hyperpituitarism: physiologic effects
- Adrenal:
  - Physiology: adrenal medulla; adrenal cortex
  - Cushing’s syndrome (incl. cortisol physiology)
  - Primary aldosteronism
  - Addison’s disease
  - Pheochromocytoma (circulatory & metabolic manifestations, diagnosis)
- Pancreas
  - Physiology
  - Diabetes mellitus (incl. effects of insulin deficiency)
  - Hyperinsulinism

47. Hepatic Anatomy, Function and Physiology (1 hour)

* Barash et al.: Chapter 46 (The Liver: Surgery and Anesthesia)
- Physiology: dual blood supply and its regulation; metabolic & synthetic function (incl. tests of hepatic function and coagulation factors); excretory function; mechanism of drug metabolism & excretion, cytochrome P450
- * Nutrition:
  - Parenteral: peripheral or central vein, hyperalimentation, solutions used and complications, anesthetic implications
  - Enteral: GI elementary diets, routes of delivery, complications, anesthetic complications
- * Hepatic diseases:
  - Preoperative laboratory assessment
  - Anesthesia choice (hepatocellular disease, ascites, portal hypertension)
  - Postoperative hepatic dysfunction, hepatorenal syndrome

48. Renal System (1 hour)

* Barash et al.: Chapter 50 (The Renal System and Anesthesia for Urologic Surgery)
- Renal physiology:
  - Blood flow (regulation), glomerular filtration, tubular reabsorption and secretion
  - Renal function tests
  - Hormonal regulation of extracellular fluid (incl. renin release)
  - Hormonal regulation of osmolality
  - Regulation of acid base balance
• Drug excretion (incl. lipophilic drugs clearance)
• Water and electrolytes: distribution and balance; compartments (incl. regulation of potassium)
• Pharmacology:
  • Diuretics: mechanism of action; comparison of drugs, effects on electrolytes and acid-base balance; adverse effects (incl. acetazolamide)
  • Dopaminergic drugs
• Renal diseases:
  • Pathophysiology of renal disease; risk factors for acute renal failure
  • Anesthetic choice in reduced renal function
  • Anesthetic management in renal failure, arteriovenous shunts
  • Perioperative oliguria and anuria (incl. diagnosis of acute renal failure)
  • Dialysis and hemofiltration: hemodialysis, peritoneal dialysis, continuous hemofiltration
  • Pharmacologic prevention and treatment of renal failure: osmotic and loop-acting diuretics, low-dose dopamine, fenoldopam

49. Ethics (1 hour)
50. Ethics (1 hour)
  • Advance directives/DNR orders; suspended DNR
  • Patient privacy issues, e.g., health insurance portability & accountability act (HIPAA) (incl. appropriate use of email communications with patients and requirements for email communications)
  • Informed consent (principles, components)
  • Disclosure of errors to patients

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CA2s Curriculum
Advanced Topics in Anesthesiology

1. Pharmacologic principles
   Barash et al: Chapter 11 (Basic Principles of Pharmacology)
   • Patient drug addiction and tolerance:
     o Physiology and pharmacology
     o Anesthetic implications
   • Drugs affecting CNS and anesthesia management:
     o Opioids, opioids antagonists, agonists-antagonists
     o Alpha-2-agonists: clonidine, dexametomididine
     o Tranquilizers: butyrophenones, benzodiazepines
     o Anticonvulsivants: phenytoin, carbamazepine, gabapentin, barbiturates, others
     o Antidepressants, anti-parkinson drugs
     o Antiemetics and aspiration prophylaxis: phenothiazines, butyrophenones, metoclopramide, anticholinergics, serotonin antagonists, antihistamines, antacids, proton pump inhibitors)
2. Malignant Hyperthermia and Other Pharmacogenetic Disorders (1 hour)

Barash et al.: Chapter 24 (Rare Coexisting Diseases)
Barash et al: Chapter 43 (Pediatric Anesthesia)
- Malignant hyperthermia (including diagnosis & therapy)
  o Malignant hyperthermia in children: susceptibility, associated diseases, anesthetic management of MH susceptibility
  o Intraoperative management: diagnosis and treatment
- Butyrylcholinesterase (Pseudocholinesterase) deficiency
- Prolonged QT syndrome
- Genetic factors in drug-dose response relationship

3. Autonomic Nervous System: Pharmacology (1 hour)

Barash et al.: Chapter 14 (Autonomic Nervous System: Physiology and Pharmacology)
- Sympathetic:
  o transmitters & types of receptors
  o target organ effects; metabolic effects
  o agonists: peripheral & central actions; direct & indirect actions; alpha vs. beta vs. mixed agonists; alpha & beta receptor subtype-selective agonists; alpha-2 agonists (clonidine, dexmedetomidine)
  o antagonists: alpha & beta blockers; selective blockers; ganglionic blockers
  o tocolytic applications
- Parasympathetic:
  o transmitters
  o muscarinic effects
  o nicotinic effects
  o agonists: cholinergic & anticholinesterases
  o antagonists

4. Anesthesia for Patients with Coexisting Diseases: Hematological Diseases (1 hour)

Barash et al.: Chapter 24 (Rare Coexisting Diseases)
- Anemias (compensatory mechanisms)
- Polycythemias; primary vs. secondary
- Hemoglobinopathies, porphyrias (incl. anesthesia risks)
- Clotting disorders:
  o Thrombocytopenia, thrombocytopeny
  o Congenital and acquired factor deficiencies
  o Disseminated intravascular coagulation
  o Fibrinolysis
  o Pharmacologic anticoagulants and antagonists

5. Anesthesia for Patients with Coexisting Diseases: Neuromuscular Diseases (1 hour)
**Barash et al.: Chapter 24 (Rare Coexisting Diseases)**

- Demyelinating diseases:
  - Multiple sclerosis
  - Motor neuron diseases: amyotrophic lateral sclerosis, spinobulbar muscular atrophy, hereditary spastic paraplegia
  - Guillain-Barre syndrome
  - Charcot-Marie-Tooth disease

- Primary muscle diseases:
  - Muscular dystrophies: Duchenne’s, Becker’s, limb-girdle, congenital, myotonic
  - Mitochondrial myopathies

- Channelopathies

- Myasthenic syndromes
  - Myasthenia gravis (incl. predictors of postoperative ventilation)
  - Lambert-Eaton myasthenic syndrome
  - Congenital myasthenic syndromes

- Ion channel myopathies:
  - Acquired neuromyotonia
  - Myotonia congenital
  - Hyperkalemic periodic paralysis, paramyotonia congenital, potassium-aggravated myotonia
  - Hypokalemic periodic paralysis

6. **Anesthesia for Trauma and Burn Patients (1 hour)**
   
   **Barash et al.: Chapter 53 (Trauma and Burn)**

- Trauma patient:
  - Hyperbaric therapy

- Burn patient:
  - Hyperbaric oxygen and anesthesia care

7. **Ambulatory Anesthesia and Office-Based Anesthesia (1 hour)**
   
   **Barash et al.: Chapter 31 (Ambulatory Anesthesia)**
   **Barash et al.: Chapter 32 (Office-Based Anesthesia)**

- Patient selection
- Anesthetic management
- Discharge criteria & postoperative follow up (including continuous nerve block)
- Office-based anesthesia: equipment, safety, organization, patient management
- Guidelines

8. **Anesthesia Provided at Alternate Sites (1 hour)**
   
   **Barash et al.: Chapter 33 (Nonoperating Room Anesthesia)**
   **Barash et al: Chapter 43 (Pediatric Anesthesia)**

- Anesthetic implications/management
- Radiologic procedures: CT scan, MRI (incl. thermal injuries)
- Endoscopies
- ECT (incl. effect of lidocaine)
- Pediatric anesthesia outside the operating room: diagnostic and interventional radiologic procedures, gastrointestinal laboratory, MRIs, radiation therapy

9. Epidural & Spinal Anesthesia (1 hour)  
   Barash et al.: Chapter 35 (Neuraxial Anesthesia)
   - Premedication, patient position, equipment, monitoring
   - Anatomy: vertebral levels of topographical landmarks; caudal space; meninges (epidural, subdural & subarachnoid spaces); variations in vertebral configurations; spinal nerves (level of exit, covering, sensory distribution); sacral nerves
   - Indications, contraindications, techniques, complications, comparison of techniques
   - Sites of actions
   - Epidural (cervical, thoracic, lumbar, caudal, transforaminal), spinal, combined spinal-epidural (CSE)
   - Pharmacokinetics of neuraxial drug administration: factors influencing onset, duration, and termination of action
   - Systemic toxicity, test dose
   - Complications: precipitating factors, prevention, therapy, implications of anticoagulants and platelet inhibitors, ASRA guidelines

10. Peripheral Nerve Blockade: Head, Neck & Trunk (1 hour)  
    Barash et al.: Chapter 36 (Peripheral Nerve Blockade)
    - Head and neck nerve blocks: indications, contraindications, techniques (relationship of bones, nerves and arteries), clinical assessment, complications (intraneural injection), use of nerve stimulators, use of ultrasound
      - Retrobulbar/peribulbar
      - Facial
      - Trigeminal nerve and branches
      - Cervical plexus
      - Occipital
    - Trunk and perineum nerve blocks: indications, contraindications, techniques (relationship of bones, nerves and arteries), clinical assessment, complications (mechanisms of injury incl. intraneural injection), use of nerve stimulators, use of ultrasound
      - Intercostal
      - Ilio-inguinal
      - Genitor-femoral
      - Paravertebral (somatic)
      - TAP block: anatomy

11. Peripheral Nerve Blockade: Upper Extremity (1 hour)  
    Barash et al.: Chapter 36 (Peripheral Nerve Blockade)
    - Upper extremity nerve blocks: indications, contraindications, techniques (relationship of bones, nerves and arteries), clinical assessment, complications
(mechanisms of injury incl. intraneural injection), use of nerve stimulators, use of ultrasound
  o Brachial plexus (interscalene, supraclavicular, infraclavicular, axillary)
  o Ulnar
  o Radial
  o Median
  o Musculocutaneous
  • IV regional: mechanism, agents, indications, contraindications, techniques, complications

12. Peripheral Nerve Blockade: Lower Extremity (1 hour)
  *Barash et al.: Chapter 36 (Peripheral Nerve Blockade)*
  • Lower extremity nerve blocks: indications, contraindications, techniques (relationship of bones, nerves and arteries), clinical assessment, complications (mechanisms of injury incl. intraneural injection), use of nerve stimulators, use of ultrasound
    o Sciatic (incl. contraindications)
    o Femoral
    o Lateral femoral cutaneous
    o Obturator
    o Lumbar plexus
    o Popliteal fossa
    o Ankle

13. Management of Neurological Critical Care Conditions (1 hour)
  *Barash et al.: Chapter 37 (Anesthesia for Neurosurgery)*
  • Seizures
    o Anticonvulsivants: phenytoin, carbamazepine, gabapentin, barbiturates, others
  • Increased intracranial pressure (ICP)
    o Intracranial pressure: brain volume, elastance & compliance
    o Increased ICP: herniation; causes (tumors, hematomas, hydrocephalus)
    o Monitoring: intracranial pressure; jugular venous oxygen saturation; near infrared spectroscopy (cerebral oximetry); transcranial Doppler
  • Coma (traumatic, infectious, toxic-metabolic, cerebrovascular accident, cerebral hypoxia)
    o Glasgow coma scale; management of traumatic head injury
    o Therapeutic barbituric coma
  • Spinal cord injury: Paraplegia, quadriplegia, automatic hyperreflexia, spinal shock
  • CSF drainage: ventriculostomy, lumbar drain

14. Neurovascular Diseases: Anesthetic Considerations (1 hour)
  *Barash et al.: Chapter 37 (Anesthesia for Neurosurgery)*
  • Cerebrovascular diseases: luxury perfusion, steal, infarcts, intracranial hemorrhage
  • Aneurysms and arteriovenous malformations:
    o Anatomy: cerebral circulation (Circle of Willis, venous sinuses & drainage)
Cerebral vasospasm
Interventional radiology: coils & embolization

- Carotid endarterectomy:
  - Cerebral circulation, luxury perfusion, steals, infarcts, intracranial hemorrhage
  - Anesthetic management; monitoring of cerebral perfusion; complications

15. Special Problems of Anesthesia for Neurosurgery (1 hour)
16. Special Problems of Anesthesia for Neurosurgery (1 hour)

Barash et al.: Chapter 37 (Anesthesia for Neurosurgery)
- Positioning: prone, sitting, other; head stabilization in tongs
- Ventriculostomy
- Air embolism
- Cerebral protection from hypoxia, ischemia, glucose effects
- Transphenoidal approach: pituitary adenomas
- Anesthetic and ventilatory effects on cerebral blood flow & metabolism
- Fluid management: hypertonic vs. isotonic vs. balanced salt solutions
- Spinal fluid drainage; ventriculostomy
- Stereotactic & gamma-knife techniques, deep brain stimulator placement; intraoperative wake-up techniques

17. Special Techniques: Controlled hypotension, Controlled Hypothermia & High altitude (1 hour)

Barash et al.: Chapter 37 (Anesthesia for Neurosurgery)
- Controlled hypotension: choice of drugs, use of posture, ventilation
- Controlled hypothermia: techniques, systemic effects, shivering, rewarming, complications
- High altitude: anesthetic implications

18. Endocrine Disorders: Anesthetic Considerations (1 hour)

Barash et al.: Chapter 47 (Endocrine Function)
- Thyroid:
  - Hyperthyroidism: metabolic & circulatory effects; diagnosis; anesthetic management; thyroid storm
  - Hypothyroidism: metabolic & circulatory effects, myxedema coma; substitution therapy; anesthetic implications
  - Complications of surgery: hypocalcemia, recurrent laryngeal nerve injury (diagnosis and treatment)
- Parathyroid:
  - Hyperparathyroidism: physiologic effects
  - Hypoparathyroidism: postoperative manifestations & treatment
- Pituitary:
  - Hypopituitarism, pituitary removal: substitution therapy, diabetes insipidus
  - Hyperpituitarism: acromegaly (airway management); inappropriate secretion of ADH
- Adrenal:
Cushing’s syndrome
Primary aldosteronism
Addison’s disease (incl. laboratory findings)
Pheochromocytoma (circulatory & metabolic manifestations, diagnosis, treatment (incl. alpha-blockers specificity) anesthetic management)
Carcinoid syndrome

19. Respiratory system: Anatomy & Physiology (1 hour)
Barash et al.: Chapter 15 (Respiratory function in Anesthesia)

- Anatomy:
  - Trachea structure & relationships in neck & chest
  - Lungs: divisions & bronchoscopic anatomy; bronchial & pulmonary circulation; microscopic anatomy
  - Muscles of respiration, accessory muscles

- Physiology:
  - Lung volumes: definitions; methods of measurement; normal values; time constants; deadspace; nitrogen washout; O2 uptake; CO2 production
  - Lung mechanics: static & dynamic compliances; pleural pressure gradient; surfactant; LaPlace Law; resistances; work of breathing; regulation of airway caliber
  - Ventilation-perfusion: distribution of ventilation; distribution of perfusion, zones, hypoxic pulmonary vasoconstriction; implications of alveolar-arterial O2 gradient, arterial-Alveolar CO2 gradient; dead space to tidal volume ratio, shunt fraction, measurement of ventilation/perfusion ratio, lung scan
  - Diffusion: definition, pulmonary diffusion capacity; apneic oxygenation, diffusion hypoxia
  - Regulation of ventilation: respiratory center; central & peripheral chemoreceptors, proprioceptive receptors, respiratory muscles & reflexes, innervation; CO2 and O2 response curves
  - Non-respiratory functions of lungs: metabolic, immune, cellular processes

20. Respiratory Diseases: Anesthetic Considerations (1 hour)
Barash et al.: Chapter 15 (Respiratory Function in Anesthesia)

- Obstructive diseases:
  - Upper airway: congenital, infectious, neoplastic, traumatic, foreign body, obstructive sleep apnea
  - Tracheobronchial: congenital, infectious, neoplastic, traumatic, foreign body
  - Parenchymal: asthma, bronchitis, emphysema, lung abscess, bronchiectasis, cystic fibrosis
  - Mediastinal masses
  - Management of bronchospasm: bronchodilator drugs, anti-inflammatory drugs, acute and chronic management, perioperative management

- Restrictive diseases:
  - Neurologic: CNS depression, spinal cord dysfunction, peripheral nervous system
  - Musculoskeletal: muscular, skeletal, obesity, chest trauma
- Parenchymal: atelectasis, pneumonia, interstitial pneumonitis, pulmonary fibrosis, respiratory distress syndrome, bronchopulmonary dysplasia
- Pleural & mediastinal: pneumo-, hemo-, and chylothorax, pleural effusion, empyema, bronchopleural fistula
- Other: pain, abdominal distension

Anesthetic management:
- Evaluation: history and physical examination; Chest x-ray; ABG; pulmonary function tests; assessment of perioperative risk
- Monitoring
- Choice of anesthesia: Nonpulmonary surgery

21. Anesthesia for Thoracic Surgery (1 hour)
   Barash et al.: Chapter 38 (Anesthesia for Thoracic Surgery)

- Evaluation:
  - History & physical examination
  - Radiological: chest x-ray, CT, MRI; lung scan
  - Arterial blood gas, pulmonary function test
  - Assessment of perioperative risk
- Preoperative preparation:
  - Respiratory therapy
  - Drug therapy: antibiotics; bronchodilators (beta-agonists, anticholinergics), mucolytics; anti-inflammatory medications (steroids, leukotriene modifier drugs, mast cell stabilizers, Immunoglobulin E stabilizers)
  - Tobacco smoking discontinuation
- Intraoperative management:
  - Monitoring
  - Choice of anesthesia: thoracic & pulmonary surgery; one-lung ventilation; thoracoscopic surgery; non-thoracic surgery; mediastinoscopy
  - Endobronchial intubation: double-lumen endotracheal tubes; bronchial blockers (integral to endotracheal tube or separate), placement and positioning considerations
- Postoperative care: pain management; respiratory therapy; ventilatory support; extubation criteria

22. Pulmonary Hypertension & Lung Transplantation (1 hour)
   Barash et al.: Chapter 52 (Transplant Anesthesia)

- Pulmonary blood flow (regulation)
- Nitric oxide
- Lung transplantation (incl. anesthetic techniques)

23. Cardiovascular Monitoring
   Barash et al.: Chapter 12 (Cardiac Anatomy and Physiology)
   Barash et al.: Chapter 39 (Anesthesia for Cardiac Surgery)

- Radiographic: Chest x-ray, CT, MRI
- Vascular pressures:
  - Arterial: invasive/noninvasive differences
Central venous pressure
- Pulmonary artery pressure, pulmonary artery occlusion pressure
- Left atrial pressure
- Left ventricular end-diastolic pressure
- Ultrasound guided placement of central venous catheters
- Heart function: heart tones, ECG, echocardiography, Doppler
- Cardiac output:
  - Mixed venous oxygen saturation
  - Fick, dye dilution, thermodilution
  - Doppler, impedance, pulse wave analysis, stroke volume assessment

24. Echocardiography (1 hour)
*Barash et al.: Chapter 27 (Echocardiography)*
- Anatomy: chambers, valves, great vessels, pericardium
- Basic transesophageal echocardiography views
- Principles of Doppler
- Technical aspects; complications

25. Coronary Artery Diseases: Anesthetic Considerations (1 hour)
*Barash et al.: Chapter 39 (Anesthesia for Cardiac Surgery)*
- Coronary circulation (regulation)
- Detemminants of myocardial oxygen requirements & delivery
- Silent ischemia; postoperative ischemia
- Classification of types of MI: STEMI vs. demand
- Manifestations
- Diagnosis of myocardial infarction and acute coronary artery syndrome: clinical, ECG, enzymes, echocardiography, nuclear techniques
- Pharmacological treatment of angina, thoracic epidural for angina, interventional cardiologic techniques
- Risk factors; predictors of perioperative risk, modification of perioperative risk (prophylactic beta-blockers (incl. risks and benefits))
- Perioperative diagnosis & treatment of ischemia (ECG, TEE)
- Coronary artery bypass procedures: CPB and off-pump techniques

26. Cardiopulmonary Bypass & Circulatory Assist Devices (1 hour)
*Barash et al.: Chapter 39 (Anesthesia for Cardiac Surgery)*
- Cardiopulmonary bypass:
  - Components: pump, oxygenator, heat exchanger, filters
  - Cardiopulmonary bypass techniques
  - Mechanisms of gas exchange
  - Priming solutions; hemodilution
  - Anticoagulation& antagonism; activated clotted time & other clotting times, heparin assays, antithrombin III, protamine reactions, heparin & protamine alterations
  - Prophylaxis with aminocaproic acid, tranexamic acid and aprotinin
ECMO
- Cooling and warming, deep hypothermic circulatory arrest
- Monitoring, blood pressure management
- Minimally invasive bypass techniques
- Myocardial preservation: physiology, techniques, complications
- Preconditioning
- Anesthetic considerations during bypass

Minimally invasive techniques:
- Off-pump coronary artery bypass
- Minimally invasive direct coronary artery bypass (MIDCAB)
- Percutaneous valve repair/replacement

Intra-aortic balloon: rationale, indications, limitations
Ventricular assist devices & artificial heart: internal & external

27. Valvular Heart Diseases: Anesthetic Considerations (1 hour)

Barash et al.: Chapter 39 (Anesthesia for Cardiac Surgery)

- Classification
- Diagnosis (including echocardiography), natural history, surgical management
- Anesthetic considerations
- Subacute bacterial endocarditis prophylaxis
- Minimally invasive techniques, percutaneous valve repair/replacement

28. Heart failure, Cardiomyopathies, Heart transplant: Anesthetic Considerations (1 hour)

Barash et al.: Chapter 52 (Transplant Anesthesia)

- Cardiomyopathies:
  - Definition & functional classification
  - Preoperative diagnosis & treatment
  - Compensatory responses
- Right or left ventricular dysfunction: etiology; signs & symptoms; diagnostic tests; systolic vs. diastolic dysfunction
- Treatment: pulmonary edema, pulmonary hypertension, cardiogenic shock
- Heart transplantation: autonomic effects; anesthetic implications

29. Other Cardiovascular Diseases: Anesthetic Considerations (1 hour)

Barash et al.: Chapter 39 (Anesthesia for Cardiac Surgery)

- Rhythm disorders and conduction defects:
  - Chronic abnormalities: etiology and diagnosis
  - Therapy:
    - Automated implantable cardioverter/defibrillator (AICD)
    - Pacemakers: permanent, temporary; transvenous, transcutaneous; types (fixed rate, biventricular synchronized, ventricular, atrial, atrio-ventricular sequential); standard nomenclature; raisons for failure of malfunction
    - Ablation, cryotherapy, Maze procedure
  - Perioperative dysrhythmia: etiology, diagnosis, therapy
o Perioperative implications of pacemakers & AICD
• Cardiac tamponade & constrictive pericarditis:
  o Etiology
  o Diagnosis (TEE, PA catheter)
  o Anesthetic management
• Pulmonary embolism:
  o Etiology (blood, air, fat, amniotic fluid)
  o Diagnosis (TEE findings)
  o Treatment (acute, preventive)
• Hypertension:
  o Etiology, pathophysiology, course of disease
  o Drug treatment, interaction with anesthetics, risk of anesthesia
  o Intraoperative & postoperative hypertension: differential diagnosis & treatment

30. Anesthesia for Vascular Surgery and the Older Patient (1 hour)
   Barash et al.: Chapter 40 (Anesthesia for Vascular Surgery)
• Anesthesia for vascular surgery:
  o Anatomy: blood supply of other major organs
  o Peripheral arteriosclerotic disease
  o Carotid endarterectomy (incl. complications)
  o Abdominal aneurysm resection: anesthetic management
  o Aneurysms of ascending, descending and aortic arch of aorta, thoracoabdominal aneurysms
  o Endovascular repair techniques
• The older patient
  o Pharmacological implications, MAC changes
  o Physiological implications: CNS, cardiovascular, respiratory, renal, hepatic

31. The Pregnant Patient: Anesthetic Considerations (1 hour)
   Barash et al.: Chapter 41 (Obstetric Anesthesia))
• Effects of pregnancy on uptake and distribution
• Respiratory physiology (lung volumes & capacities, oxygen consumption, ventilation, blood gases, acid-base)
• Cardiovascular physiology (aorto-caval compression, regulation of uterine blood flow)
• Renal physiology
• Liver physiology (albumin/globulin ratio), protein binding of drugs
• Gastrointestinal physiology (gastric acid, motility, anatomic position, gastroesophageal sphincter function)
• Hematology (blood volume, plasma proteins, coagulation)
• Placenta (placental exchange – O₂, CO₂; placental blood flow; barrier function)
• Amniotic fluid (amniocentesis, oligohydramnios, polyhydramnios)

32. Problems during Pregnancy (1 hour)
   Barash et al.: Chapter 41 (Obstetric Anesthesia))
• Problems during pregnancy:
  o Ectopic pregnancy
  o Spontaneous abortion
  o Gestational trophoblastic disease
  o Autoimmune disorders (lupus, antiphospholipid syndrome)
  o Endocrine disorders (thyroid, diabetes, pheochromocytoma)
  o Heart diseases (valvular disorders, pulmonary hypertension, congenital heart disease, arrhythmias, cardiomyopathy)
  o Hematologic (sickle cell anemia, idiopathic thrombocytopenic purpura, von Willebrand disease, DIC, anticoagulant therapy, Rh and ABO incompatibility)
  o Hypertension (chronic, pregnancy-induced)
  o Neurologic (seizures, myasthenia gravis, spinal cord injury, multiple sclerosis, subarachnoid hemorrhage)
  o Respiratory (asthma, respiratory failure)
  o Renal
  o HIV infection
• Antepartum fetal assessment: ultrasonography, fetal heart rate, nonstress test, stress test, biophysical profile
• Anesthesia for cerclage or non-obstetric surgery

33. Anesthesia for Vaginal Delivery (1 hour)
34. Anesthesia for Vaginal Delivery (1 hour)

  Barash et al.: Chapter 41 (Obstetric Anesthesia)

• Pharmacology:
  o Anesthetic drugs & adjuvants
  o Oxytocic drugs (indications, adverse effects)
  o Tocolytic drugs (indications, adverse effects)
  o Antiseizure drugs; interactions (magnesium sulfate)
  o Mechanisms of placent al transfer; placental transfer of specific drugs
  o Fetal disposition of drugs
  o Drug effects on newborn
• Physiology of labor: metabolism, respiration, cardiovascular, thermoregulation
• Intrapartum fetal assessment: fetal heart rate monitoring, fetal scalp blood gases, fetal pulse oximetry
• Anesthetic techniques and risks
  o Systemic medications: opioids, sedatives
  o Regional techniques: epidural, caudal, spinal, combined spinal/epidural; paracervical block, lumbar sympathetic block, pudendal block
  o Complications (nerve palsies)
• Influence of anesthetic technique on labor

35. Anesthesia for Cesarean Section (1 hour)

  Barash et al.: Chapter 41 (Obstetric Anesthesia)

• Indications
• Elective vs. emergency
• Anesthetic techniques:
36. Problems at Term & during Delivery (1 hour)

Barash et al.: Chapter 41 (Obstetric Anesthesia)

- Intrapartum fetal assessment: fetal heart rate, fetal scalp blood gas, fetal pulse oximetry
- Preeclampsia and eclampsia (incl. placental effects)
- Supine hypotension syndrome
- Aspiration of gastric contents
- Embolic disorders (amniotic fluid embolism, pulmonary thromboembolism)
- Antepartum hemorrhage (placenta previa, abruptio placenta, uterine rupture)
- Postpartum hemorrhage (uterine atony, placenta accreta)
- Cord collapse
- Retained placenta
- Dystocia, malposition, malpresentation (breech, transverse lie)
- Maternal CPR
- Fever & infection
- Preterm labor
- Vaginal birth after cesarean section (VBAC)
- Multiple gestation
- Resuscitation of newborn: Apgar scoring, umbilical cord gas measurements, intrauterine surgery

37. Basics of Pediatric Anesthesia (1 hour)

Barash et al.: Chapter 43 (Pediatric Anesthesia)

- Anesthetics: actions different from adults (drug toxicities preferentially occurring in children, e.g. propofol; opioid dosing and sensitivity)
- Neuromuscular blockers: sensitivity, age-related and drug-related pharmacodynamics and pharmacokinetics, congenital diseases, complications of succinylcholine
- Fluid therapy & blood replacement, physiologic anemia, glucose requirements
- Warming devices: types, efficacy, complications
- Pediatric medical problems with anesthetic implications:
  - Respiratory: upper respiratory infections (cold, epiglottitis, laryngotracheobronchitis), bronchopulmonary dysplasia, cystic fibrosis
  - Musculoskeletal: muscular dystrophies, myotonias
  - Developmental delay, cerebral palsy, autism
  - Childhood obesity
  - Endocrine diseases: childhood diabetes, congenital adrenal hyperplasia
o Skeletal abnormalities with or without systemic implications: Klippel-Feil, achondroplasia, Marfan’s, Morquio’s, osteogenesis imperfect
o Trisomy 21 and other chromosomal abnormalities
o Juvenile rheumatoid arthritis
o Anemias: congenital and acquired: iron deficiency, sickle cell, thalassemia

38. Pediatric respiratory physiology & anesthesia circuits (1 hour)
   Barash et al.: Chapter 43 (Pediatric Anesthesia)
   - Respiratory physiology: development, anatomy, surfactant; pulmonary oxygen toxicity; pulmonary function; lung volumes vs. adults; airway differences, infant vs. adult
   - Endotracheal tube selection (cuffed vs. uncuffed), sizing
   - Apparatus: breathing circuits (advantages, disadvantages), dad space, humidity, thermal control

39. Pediatric cardiovascular physiology & cardiac surgery (1 hour)
40. Pediatric cardiovascular physiology & cardiac surgery (1 hour)
   Barash et al.: Chapter 42 (Neonatal Anesthesia)
   Barash et al: Chapter 39 (Anesthesia for Cardiac Surgery)
   - Physiology:
     o Transition, fetal to adult
     o Persistent fetal circulation
   - Congenital heart diseases:
     o Cyanotic defects (incl. Tetralogy of Falot)
     o Acyanotic defects
     o Major vascular malformations: coarctation, persistent patent ductus arteriosus, vascular rings
   - Primary pulmonary hypertension
   - Altered uptake/distribution of IV and inhalation anesthetics
   - Anesthetic considerations for noncardiac surgery
   - Chronic congenital heart disease, corrected, uncorrected and palliated (in childhood beyond the newborn and infant periods, in adulthood)
   - Cardiac surgery: corrective and palliative

41. Pediatric Premedication & Induction Techniques (1 hour)
   Barash et al.: Chapter 43 (Pediatric Anesthesia)
   - Preoperative anxiety
   - Premedication: drugs; dosage; routes; vehicles (including eutectic mixture of local anesthetics cream; parental presence
   - Induction techniques
   - Problems in intubation and extubation: full stomach, micrognatia, syndromes associated with “difficult airway”, dentition, laryngospasm, stridor
   - Postoperative nausea & vomiting: risk factors, prophylaxis treatment

42. Pediatric Pain Management & Sedation (1 hour)
   Barash et al: Chapter 43 (Pediatric Anesthesia)
Barash et al.: Chapter 56 (Acute Pain Management)

- Pediatric sedation: guidelines, pharmacology, credentialing, indications, monitoring, complications
- Regional anesthesia
- Postoperative analgesia:
  - Systemic administration and routes of administration, multimodal therapy
  - Regional techniques: caudal, epidural, nerve blocks

43. Neonatal Anesthesia (1 hour)

Barash et al.: Chapter 42 (Neonatal Anesthesia)

- Physiology (other than respiratory & cardiovascular):
  - Retinopathy of prematurity (anesthetic implications)
  - Metabolism, fluid distribution & renal function
  - Thermal regulation (neutral temperature, nonshivering thermogenesis)
  - Fetal hemoglobin
  - Prematurity, apnea of prematurity
  - Bronchopulmonary dysplasia
  - Respiratory distress syndrome: etiology, management, ventilation techniques

- Neonatal emergencies:
  - Diaphragmatic hernia
  - Tracheoesophageal fistula (incl. associated anomalies)
  - Neonatal lobar emphysema
  - Pyloric stenosis
  - Necrotizing enterocolitis
  - Omphalocele/gastroschisis
  - Myelomeningocele

44. Anesthetic Implications for Common Non-neonatal Pediatric Subspecialty Surgeries (1 hour)

Barash et al.: Chapter 43 (Pediatric Anesthesia)

- Otolaryngology: Cleft lip and palate, tonsillectomy and adenoidectomy, common ear procedures, peritonsillar abscess, flexible and rigid bronchoscopy, diagnostic and therapeutic laryngoscopy techniques (jet ventilation, laser implications)
- Neurosurgery: Craniotomies for tumor or vascular malformations, hydrocephalus, ventriculoperitoneal shunts, craniofacial procedures, tethered spinal cord, halo placement implications
- Thoracic surgery: Anterior mediastinal mass, lung isolation techniques, pectus excavatum and carinatum
- General and urologic surgery: Laparotomy vs. laparoscopy, bowel surgery, urologic surgery (Wilms tumor, ureteral reimplantation, bladder and urethral malformations), neuroblastoma
- Orthopedic surgery: Fractures and dislocations, congenital hip dysplasia, foot and hand malformations, scoliosis implications and repair
- Ophtalmologic surgery: Strabismus, cataract, glaucoma procedures
• Outpatient pediatric anesthesia: Indications & contraindications; anesthetic considerations: premedication, induction, maintenance, monitoring; postoperative considerations: recovery period, discharge criteria, post-discharge monitoring/follow-up

45. Gastrointestinal Disorders, Obesity, Anesthesia for Laparoscopic Surgery & Plastic Surgery (1 hour)
   
   Barash et al.: Chapter 44 (Anesthesia for Laparoscopic and Robotic Surgery)

   Barash et al.: Chapter 45 (Anesthesia and Obesity)

   • Gastrointestinal disorders:
     o Gastroesophageal reflux disease and hiatus hernia; gastroesophageal sphincter
     o Intestinal obstruction:
       • Cause: paralytic ileus; mechanical; vascular
       • Physiologic changes; fluid & electrolyte; respiratory
       • Anesthesia management: full stomach; fluid therapy; nitrous oxide

   • Morbid obesity:
     o Preanesthetic evaluation and management
     o Pharmacologic considerations (incl. succinylcholine dosing)
     o Anesthetic management (airway, ventilation, monitoring, venous access)
     o Postoperative management (ventilation, analgesia)

   • Laparoscopic surgery (anesthetic management and complications (incl. cardiovascular & respiratory)): cholecystectomy, gynecological surgery, gastric stapling, hiatus hernia repair

   • Plastic surgery (liposuction)

46. The Renal System and Anesthesia for Urologic Surgery (1 hour)

   Barash et al.: Chapter 50 (The Renal System and Anesthesia for Urologic Surgery)

   • Renal disease:
     o Pathophysiology of renal disease; risk factors for acute renal failure (incl. radiological contrast)
     o Anesthetic choice in reduced renal function
     o Anesthetic management in renal failure, arteriovenous shunts
     o Perioperative oliguria (incl. differential diagnosis) and anuria
     o Dialysis and hemofiltration: hemodialysis, peritoneal dialysis, continuous hemofiltration
     o Pharmacologic prevention and treatment of renal failure: osmotic and loop-acting diuretics, low-dose dopamine, fenoldopam

   • Lithotripsy

   • Transurethral resection of prostate /irrigant fluids / hyponatremia

47. The Liver and Transplant Anesthesia (1 hour)

   Barash et al.: Chapter 46 (The Liver: Anesthesia and Surgery)

   Barash et al.: Chapter 52 (Transplant Anesthesia)

   • Hepatic diseases:
- Preoperative laboratory assessment
- Anesthesia choice (hepatocellular disease, ascites, portal hypertension)
- Postoperative hepatic dysfunction, hepatorenal syndrome
  - Hepatic transplantation: anesthetic management; reperfusion effect
  - Renal transplantation: anesthetic management
  - Organ donors: pathophysiology & clinical management; process

48. Diabetic Patients & Anesthesia for Pancreas Transplantation (1 hour)
   *Barash et al.: Chapter 47 (Endocrine Function)*
   *Barash et al.: Chapter 52 (Transplant Anesthesia)*
   - Pathophysiology
   - Control of blood glucose (hypoglycemia, hyperglycemia, ketoacidosis)
   - Elective anesthesia – perioperative management
   - Emergency surgery (anesthesia management)
   - Pancreas transplantation

49. Anesthesia for Ophthalmologic Surgery (1 hour)
   *Barash et al.: Chapter 49 (Anesthesia for Ophthalmologic Surgery)*
   - Retrobulbar & peribulbar blocks (incl. hemodynamic effects)
   - Open globe injuries

50. Anesthesia for Otolaryngologic Surgery (1 hour)
   *Barash et al.: Chapter 47 (Anesthesia for Otolaryngologic Surgery)*
   - Airway endoscopy
   - Microlaryngeal surgery
   - Laser surgery: hazards, complications, safety, endotracheal tubes
   - Sinus surgery: sphenoganglion

51. Anesthesia for Orthopedic Surgery (1 hour)
   *Barash et al.: Chapter 51 (Anesthesia for Orthopedic Surgery)*
   - Tourniquet management
   - Complications
   - Regional vs. general anesthesia

52. Management of Acute Postoperative Pain (1 hour)
   *Barash et al.: Chapter 55 (Acute Pain Management)*
   - Acute postoperative and posttraumatic pain, ASA practice guideline
   - Pharmacologic pain relief:
     - Drugs: opioids, agonist-antagonists, local anesthetics, alpha-2 agonists (clonidine, dexmedetomidine), nonsteroidal anti-inflammatory drugs, N-Methyl-D-Aspartate receptor blockers, tricyclic antidepressants, selective serotonin reuptake inhibitor
     - Routes: oral, rectal, subcutaneous, transcutaneous, transmucosal, intramuscular, intravenous (including PCA), epidural, spinal, intrapleural, peripheral nerve catheter
• Risks, benefits, complications (incl. PCA)
• Other techniques: transcutaneous electrical nerve stimulation, cryotherapy, acupuncture, hypnosis, ketamine
• Drug delivery devices: patient-controlled intravenous and epidural analgesia

53. Chronic Pain Management

Barash et al.: Chapter 56 (Chronic Pain Management)

• Cancer-related pain: ASA practice guidelines
• Other chronic pain states:
  o Acute and chronic neck and low back pain
  o Neuropathic pain states:
    • Complex regional pain syndromes, types I and II
    • Postherpetic neuralgia
    • Peripheral neuropathies (e.g., diabetic neuropathy)
  o Central pain: phantom limb pain, post-stroke pain,
  o Somatic pain conditions: myofascial pain, facet arthropathy
• Treatment:
  o Cancer pain: systemic medications; tolerance and addiction; continuous spinal and epidural analgesia; neurolytic and non-neurolytic blocks
  o Chronic pain (non-cancer related): systemic medications: NSAIDs; opioids, anticonvulsivants, antidepressants; spinal and epidural analgesia; peripheral nerve blocks; sympathetic nerve blocks; TENS, spinal cord stimulators, neuroablative (surgical and chemical)
  o World Health Organization analgesic ladder

54. Miscellaneous Blocks (1 hour)

Barash et al.: Chapter 56 (Chronic Pain Management)

• Autonomic nerve blocks: indications, contraindications, techniques, clinical assessment, complications
• Blocks: Stellate, celiac, lumbar sympathetic, paravertebral somatic, epidural, facet

55. Anesthesia and Critical Care Medicine (1 hour)

56. Anesthesia and Critical Care Medicine (1 hour)

Barash et al.: Chapter 57 (Critical Care Medicine)

• ARDS
  o Ventilators settings (See material covered in tutorial #46 “Ventilators”)
  o Measurement of lung compliance
  o CPAP & PEEP; nasal CPAP & BIPAP
  o Nebulizers, humidifiers, drug delivery systems (nitric oxide, others)
• Drug intoxications (CNS drugs, carbon monoxide, insecticides, nerve gases)
• Tetanus
• Near drowning
• Shock states:
  o Etiology, classification, pathophysiology
Septic shock, life-threatening infection
Systemic Inflammatory Response Syndrome
Multiple Organ Dysfunction Syndrome
Management of the patient in shock

- Infection control:
  - General and universal precautions
  - Needle stick injury
  - Catheter sepsis
  - Nosocomial infections (incl. MRSA treatment)
  - Antibiotics: antibacterial, antifungal, antiviral, antiparasitic, antimicrobial resistance

Yearly Seminars: 4 Hours per Year

1. Substance Abuse Seminar (2 hours)
   Barash et al.: Chapter 3 (Occupational Health)
   - Substance abuse (incl. reporting)
   - Addiction among health care workers and anesthesiologists
   - Dependence:
     - Chronic opioid dependence and therapy
     - Pharmacologically –assisted opioid withdrawal
   - Other physician impairment or disabilities: fatigue, aging, visual or auditory impairment, American Disability Act

2. Practice Management (2 hours)
   Barash et al.: Chapter 2 (Scope of Practice)
   Barash et al.: Chapter 4 (Anesthetic Risk, Quality Improvement, and Liability)
   - Professionalism; credentialing, licensure
   - Malpractice: definition, legal actions & consequences, national practitioner database, closed claims findings, anesthetic accidents, professional liability insurance
   - Practice management; Medicare/Medicaid requirements
   - Primary certification, recertification, maintenance of certification & related issues (professional standing, lifelong learning, cognitive knowledge, clinical practice assessment, systems-based practice)
   - Costs of medical/anesthesia care, operating room management
   - Patient safety:
     - Definitions: medical error, adverse event, sentinel event
     - Medications errors: assessment and prevention
     - Reporting: mandatory and voluntary systems, legal requirements
     - Disclosure of errors to patients
     - Safety practices: process-based, evidence-based; sentinel events (definition)
     - Core competencies