



PEDIATRIC ANESTHESIOLOGY EXAMINATION

The Content Outline for the Pediatric Anesthesiology Examination reflects the subject matter for the Pediatric Anesthesiology subspecialty. It is divided into five sections including Basic Science, Organ Based Basic and Clinical Sciences, Clinical Subspecialties, Clinical Science of Anesthesia, and Special Problems or Issues. The examination covers material from all of these sections. The outline reflects disease states, management considerations, and issues relatively unique to the pediatric patient. The subspecialty board certified pediatric anesthesiologist is expected to have knowledge within each of these categories and topics.

Revised – January 2019

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CONTENT OUTLINE

I. BASIC SCIENCE

A. Anatomy

1. General Development
 - a. Airway
 - b. Body habitus
 - c. Water, volume, and blood composition
2. Anatomy for Procedures
 - a. Airway management
 - b. Central neuraxial blockade
 - c. Peripheral nerve blockade
 - d. Vascular cannulation

B. Physics and Anesthesia Equipment

1. Respiration
 - a. Breathing circuits
 - b. Ventilation devices and techniques
2. Methods for Monitoring
 - a. Brain, spinal cord, and neuromuscular function
 - b. Cardiac rhythm and vascular pressures
 - c. Oxygenation, gas concentration, and ventilation
 - d. Temperature

C. Anesthetic Pharmacology: Physiologic States, Pathophysiologic States and Adverse Effects

1. Pharmacokinetics and Pharmacodynamics
 - a. Blood-brain barrier
 - b. Drug absorption
 - c. Drug distribution
 - d. Neuromuscular system
 - e. Biotransformation and excretion
 - f. Pharmacogenetics
2. Non-opioid Analgesics
3. Opioid Analgesics
4. Sedative and Anxiolytic Agents
5. Anti-emetics
6. Inhalation Anesthetics
7. Local Anesthetics
8. Neuromuscular Blocking and Reversal Agents
9. Sympathetic and Parasympathetic Agents
10. Agents Affecting Coagulation

II. ORGAN-BASED BASIC AND CLINICAL SCIENCES

A. Respiratory System

1. Anatomy and Physiology
 - a. Prenatal and postnatal development
 - b. Respiratory mechanics, ventilation, and lung volumes
 - c. Oxygen transport
 - d. Surfactant, surface activity, and lung mechanics
 - e. Lung physiology
 1. surfactant and surface tension
 2. metabolism

3. ventilation / perfusion matching
2. Clinical Sciences
 - a. Obstructive disease
 1. upper airway
 2. tracheobronchial
 3. parenchymal
 - b. Restrictive disease
 1. pleural
 2. neurologic
 3. musculoskeletal
 - c. Anesthesia for thoracic procedures
 1. one lung ventilation
 2. video-assisted thoracoscopy
 3. mediastinal masses
 4. chest wall surgery / reconstruction

B. Cardiovascular System

1. Anatomy and Physiology
 - a. Prenatal and postnatal development
 - b. Fetal, transitional, and adult circulation
 - c. Benign heart murmur
2. Clinical Science
 - a. General considerations
 1. cardiovascular effects on anesthetic uptake and delivery
 2. anesthetic effects on the cardiovascular system
 3. vasoactive medications
 - b. Disease states
 1. acyanotic lesions
 2. cyanotic lesions
 3. palliative procedures
 4. pulmonary hypertension
 5. infectious diseases
 6. cardiomyopathies
 7. pericardial disease
 8. intracardiac masses
 9. arrhythmic lesions
 10. heart transplantation
 - c. Anesthesia for cardiac procedures
 1. complete anatomic and physiological repairs
 2. single ventricle procedures
 3. palliation surgery
 4. management and consequences of cardiopulmonary bypass
 5. deep hypothermic circulatory arrest
 6. anesthesia for pacemaker / implantable cardiac defibrillator insertion and replacement
 7. anesthesia for diagnostic, interventional and electrophysical procedures
 - d. Anesthesia for the adult with congenital heart disease
 - e. Cardiopulmonary resuscitation

C. Central and Peripheral Nervous Systems

1. Anatomy and Physiology
 - a. Prenatal and postnatal development
 1. brain, fontanelles, cranial sutures, and spinal cord
 2. myelination, autonomic nervous systems, and pain pathways
 3. neurodegenerative changes after anesthesia
 - b. Neurophysiology
2. Clinical Science
 - a. General considerations
 1. intracranial pressure and blood flow
 2. pharmacology of diuretics, steroids, and anticonvulsant medications
 - b. Disease states
 1. autism, developmental delay, and attention-deficit hyperactivity disorder
 2. hydrocephalus
 3. tumors
 4. seizure disorders
 5. cerebrovascular disorders
 6. open and closed head injuries
 7. spinal cord disorders
 8. neurodegenerative disorders
 9. spasticity
 10. Chiari malformations
 - c. Anesthesia for neurosurgical procedures
 1. seizure surgery
 2. intracranial tumors and vascular lesions
 3. craniofacial reconstruction / cranioplasty
 4. meningomyelocele / spinal surgery
 5. neurologic imaging

D. Gastrointestinal System

1. Anatomy and Physiology
 - a. Prenatal and postnatal development
2. Clinical Science
 - a. Esophageal, stomach and intestine disorders
 1. abdominal wall defects
 2. intestinal rotation defects
 3. atresias, stenoses and webs
 4. inflammatory states
 5. duplications and cysts
 6. hernias
 7. necrotizing enterocolitis
 - b. Liver, biliary tract and spleen disorders
 - c. Anorectal disorders
 - d. Morbid obesity / bariatric surgery
 - e. Gastrointestinal endoscopy
 - f. Esophageal / gastrointestinal foreign bodies
 - g. Organ transplantation

E. Renal/Urinary

1. Anatomy and Physiology
 - a. Prenatal and postnatal development
 - b. Homeostasis functions
2. Clinical Science
 - a. Renal failure
 - b. Phimosis and hypospadias
 - c. Ureteropelvic junction obstruction
 - d. Vesicoureteral reflux
 - e. Bladder exstrophy
 - f. Renal transplantation

F. Endocrine/Metabolic

1. Anatomy and Physiology
 - a. Prenatal and postnatal development
 - b. Puberty and variants
2. Clinical Science
 - a. Adrenal disorders
 - b. Diabetes mellitus
 - c. Diabetes insipidus
 - d. Disorders of sodium regulation
 - e. Pheochromocytoma
 - f. Thyroid disorders
 - g. DiGeorge syndrome

G. Hematology/Oncology

1. Anatomy and Physiology
 - a. Prenatal and postnatal development
2. Clinical Science
 - a. Hematology
 1. anemias
 2. coagulation disorders
 - b. Oncology
 1. leukemia
 2. neuroblastoma
 3. retinoblastoma
 4. sarcomas / osteosarcomas
 5. Wilms tumor
 - c. Chemotherapeutic agents and side effects
 - d. Radiotherapy
 - e. Bone marrow and stem cell transplants
 1. graft versus host disease
 - f. Immunologic disorders (congenital and acquired)

H. Genetics

1. Anatomy and Physiology
2. Clinical Sciences
 - a. Chromosomal abnormalities
 - b. Craniofacial syndromes
 - c. Effects of environmental agents

- d. Endocrine disorders
- e. Immunologic disorders
- f. Inborn errors of metabolism
- g. Malignant hyperthermia
- h. Mitochondrial myopathies
- i. Myopathic disorders
- j. Myotonias
- k. Muscular dystrophies
- l. Neurologic disorders
- m. Overgrowth syndromes
- n. Osteochondrodysplastic syndromes
- o. Skin and connective tissue disorders

III. CLINICAL SUBSPECIALTIES

A. Fetal

- 1. General Considerations
 - a. Fetal oxygenation
 - b. Fetal pain and stress
 - c. Fetal monitoring
- 2. Clinical Science
 - a. Fetal surgery
 - b. Ex utero intrapartum treatment (EXIT) procedure

B. Neonatal

- 1. General Considerations
 - a. Apgar scoring
 - b. Post conceptional age and organ system maturity
 - c. Effects of anesthesia and surgery on cognitive development
 - d. Stress response
 - e. Transport medicine
 - f. Neonatal resuscitation
- 2. Clinical Science
 - a. Surgical disease states
 - 1. amniotic bands
 - 2. congenital cystic adenomatoid malformation
 - 3. congenital diaphragmatic hernia
 - 4. duodenal atresia
 - 5. hernia
 - 6. hypertrophic pyloric stenosis
 - 7. myelomeningocele
 - 8. necrotizing enterocolitis
 - 9. neonatal lobar emphysema
 - 10. omphalocele and gastroschisis
 - 11. sacrococcygeal teratoma
 - 12. tracheo-esophageal fistula
 - 13. vein of Galen malformation
 - b. Medical disease states
 - 1. apnea and bradycardia
 - 2. anemia
 - 3. bronchopulmonary dysplasia

4. failure to thrive
5. intraventricular hemorrhage
6. kernicterus
7. persistent pulmonary hypertension
8. persistent fetal circulation
9. retinopathy of prematurity

C. Painful Disease States

1. Pathophysiology
 - a. Procedural, postoperative, and posttraumatic pain
 - b. Pain in the neonate
 - c. Chronic pain states
2. Treatment
 - a. Regional analgesia
 - b. Pharmacologic and non pharmacologic techniques of pain management
 - c. Complementary and alternative pain management

D. Otolaryngology

1. Airway Procedures
 - a. Bronchoscopic procedures
 - b. Tonsillectomy, adenoidectomy, and abscess drainage
 - c. Tracheotomy
 - d. Choanal atresia repair
 - e. Laryngotracheal reconstruction
 - f. Laser procedures
2. Otologic Procedures
 - a. Myringotomy and tubes
 - b. Cochlear implant, tympanoplasty, and mastoidectomy

E. Plastic and Oral-Maxillary Facial Surgery

1. Coexisting Diseases
 - a. Craniofacial syndromes
 - b. Congenital heart disease
 - c. Increased intracranial pressure
 - d. Obstructive sleep apnea
2. Clinical Science
 - a. Craniosynostosis repairs
 - b. Cleft repairs
 - c. Hypoplasia repairs
 - d. Syndactyly repairs
 - e. Tissue flaps and tissue expanders
 - f. Vascular malformations
 - g. Mandibular repairs

F. Ophthalmology

1. General Considerations
 - a. Physiology
 - b. Pharmacology of ophthalmologic medications
2. Clinical Science
 - a. Enucleations
 - b. Retinopathy of prematurity

- c. Trauma
- d. Tear duct probing
- e. Strabismus repair

G. Orthopedic Surgery

1. Coexisting Diseases
 - a. Cardiopulmonary disease
 - b. Congenital malformations
 - c. Myopathic disease
 - d. Neuromuscular disease
 - e. Oncologic disease
 - f. Systemic disease
2. Clinical Science
 - a. Anterior, posterior, and combined spine fusion
 - b. Chest wall reconstruction
 - c. Tourniquet management

H. Trauma and Burns

1. Trauma
 - a. Age-related mechanisms and associated injuries
 - b. Incidence, patterns, implications of abuse
 - c. Management of the polytrauma victim
 - d. Hypothermia and submersion injury
2. Burns
 - a. Types, mechanisms, locations and implications of injuries
 - b. Inhalation injuries/airway management
 - c. Fluid resuscitation and calculating burn surface area
 - d. Anesthetic and pain management of the burn patient

IV. CLINICAL SCIENCE OF ANESTHESIA

A. Evaluation and Preoperative Preparation of the Pediatric Patient (See Specific Disease States)

1. Normal developmental milestones
2. Evaluation of Coexisting Disease
 - a. Cerebral palsy
 - b. Cystic fibrosis
 - c. Down syndrome
 - d. Gastro-esophageal reflux
 - e. Latex allergy
 - f. Mediastinal masses
 - g. Reactive airway disease
 - h. Upper respiratory tract infections
 - i. Congenital heart disease
 - j. Autism spectrum disorders
3. Physical Examination
4. Laboratory Testing
5. Psychosocial Preparation of the Patient and Family
6. Parental Presence and Pharmacologic Preparation for Anesthetic Induction
7. Fasting Requirements
8. Age-Related Differences in Anesthetic Risk
9. Informed Consent

- B. General Considerations of the Perioperative Period**
 - 1. Fluid, Electrolyte, and Glycemic Management
 - 2. Positioning
 - 3. Thermoregulation
 - 4. Transfusion Therapy and Blood Conservation Techniques
- C. Regional Anesthesia and Analgesia**
 - 1. Pharmacology and Toxicity of Local Anesthetics
 - 2. Central Neuraxial Blockade: Indications, Contraindications, Techniques, Adjuvants, and Controversies
 - 3. Peripheral Nerve Blockade: Indications, Contraindications, Techniques, Adjuvants, and Controversies
- D. General Anesthesia**
 - 1. Stages and Signs of Anesthesia
 - 2. Induction Techniques
 - 3. Airway Management
 - a. Indications, techniques, limitations, and devices for mask ventilation
 - b. Indications, techniques, limitations, and devices for endotracheal intubation
 - c. Management of the difficult airway
 - d. Methods for single lung ventilation and lung separation
- E. Complications of Anesthesia**
 - 1. Airway Obstruction
 - 2. Inadequate Vascular Access
 - 3. Iatrogenic trauma / positioning injury
 - 4. Hypotension
 - 5. Hypertension
 - 6. Dysrhythmias
 - 7. Cardiac Arrest
 - 8. Anaphylactic and Anaphylactoid Reactions
 - 9. Awareness and Recall Under Anesthesia
 - 10. Psychosocial Complications
- F. Special Techniques and Situations**
 - 1. Controlled Hypotension
 - 2. Controlled Hypothermia
 - 3. Surgery on ECMO
 - 4. Management of Laparoscopic Surgery
 - 5. Anesthesia for Satellite and Remote Locations
 - 6. Perioperative Management of the Intensive Care Unit Patient
- G. Postoperative Period**
 - 1. Management and Diagnosis of Pain, Anxiety and Emergence Agitation
 - 2. Respiratory, Cardiovascular, and Neurologic Consequences of Anesthesia
 - 3. Post Operative Nausea and Vomiting
 - 4. Management of the Post Anesthetic Care Unit
- H. Monitored Anesthesia Care and Sedation**
- I. Acute and Chronic Pain Management**
- V. SPECIAL PROBLEMS OR ISSUES**
 - A. Special Surgical Procedures**

B. Professional Issues

1. Ethical and Legal Obligations of Pediatric Anesthesia Care and Research
2. Teaching, Supervision, and the Anesthesia Care Team
3. Practice-based Learning and Improvement
4. Continuous Quality Improvement

C. Principles of Biostatistics and Study Design