

NCE Exam Content Outline

For NCE exams administered ON or AFTER 1/1/2018

- I. Basic Sciences (25%)
 - A. Anatomy, physiology and pathophysiology
 1. Cardiovascular
 - a. Ischemic heart disease
 - b. Valvular heart disease
 - c. Congenital heart defects
 - d. Cardiac conduction and rhythm abnormalities
 - e. Cardiovascular and peripheral vascular complications
 - f. Infectious diseases
 - g. Pericardial diseases
 - h. Cardiomyopathy and heart failure
 2. Respiratory
 - a. Obstructive diseases
 - b. Restrictive diseases
 - c. Infectious diseases
 - d. Pulmonary vascular complications
 - e. Altered airway anatomy
 - f. Genetic respiratory disorders
 3. Central nervous system
 - a. Neurodegenerative diseases
 - b. Myelin diseases
 - c. Cerebrovascular diseases
 - d. Neuropathies and myopathies
 - e. Psychiatric disorders
 - f. Spinal cord disorders
 - g. Intracranial tumor
 - h. Congenital anomalies (e.g., cerebral palsy)
 - i. Seizure disorders
 - j. Genetic nervous system disorders
 - k. Intracranial hypertension
 - l. Thermoregulation
 4. Musculoskeletal
 - a. Myopathies/metabolic complications
 - b. Neuromuscular diseases
 - c. Skeletal diseases

- d. Musculoskeletal disorders
- e. Genetic musculoskeletal disorders
- 5. Endocrine
 - a. Thyroid and parathyroid disorders
 - b. Pituitary disorders
 - c. Adrenal disorders
 - d. Pancreatic disorders
 - e. Metabolic disorders
 - f. Genetic endocrine disorders
- 6. Hepatic
 - a. Infectious diseases
 - b. Biliary tract and bilirubin disorders
 - c. Cirrhotic disorders
 - d. Hepatovascular complications
- 7. Renal
 - a. Primary kidney diseases and disorders
 - b. Acute kidney injury
 - c. Chronic kidney injury
- 8. Hematologic
 - a. Anemias
 - b. Hemoglobin disorders
 - c. Coagulation disorders
 - d. Infectious diseases
- 9. Gastrointestinal
 - a. Esophageal disorders
 - b. Gastric disorders
 - c. Pancreatic disorders
 - d. Intestinal disorders
 - e. Tumors/secreting lesions
 - f. Malabsorption disorders
- 10. Immune
 - a. Infectious disorders
 - b. Hyper- and hypo-immune disorders (allergic response)
 - c. Autoimmune diseases
- 11. Other conditions
 - a. Cancer
 - b. Glaucoma
 - c. Burns
 - d. Trauma
 - e. Substance abuse (alcohol, tobacco, other)

- B. Pharmacology
 - 1. General principles
 - a. Pharmacodynamics
 - b. Pharmacokinetics
 - c. Drug interactions
 - 2. Inhalation anesthetics
 - 3. Intravenous agents
 - a. Barbiturates
 - b. Sedative/hypnotics
 - c. Opioid agonists
 - d. Opioid agonist-antagonists
 - e. Opioid antagonists
 - f. Benzodiazepines
 - g. Benzodiazepine antagonists
 - 4. Local anesthetics
 - 5. Muscle paralytics
 - 6. Anticholinesterase agents
 - 7. Selective relaxant binding agents
 - 8. Neuraxial analgesics
 - 9. Anticholinergics/cholinergic agonists
 - 10. Nonsteroidal antiinflammatory drugs
 - 11. Miscellaneous analgesics
 - 12. Sympathomimetics
 - 13. Inotropes
 - 14. PDE inhibitors
 - 15. Digitalis and related drugs
 - 16. Alpha- and beta-receptor antagonists
 - 17. Antihypertensives
 - a. Sympatholytics
 - b. Centrally acting alpha₂-adrenergic agonists
 - c. ACE inhibitors
 - d. Angiotensin II receptor inhibitors
 - e. Nitrovasodilators
 - f. Nitric oxide
 - 18. Antidysrhythmics
 - 19. Calcium channel blockers
 - 20. Bronchodilators
 - 21. Psychopharmacologic therapy
 - a. Selective serotonin reuptake inhibitors
 - b. Tricyclic antidepressants

- c. MAO inhibitors
 - d. Lithium
- 22. Prostaglandins
- 23. Histamine receptor antagonists
- 24. Serotonin antagonists
- 25. Insulin
- 26. Oral hypoglycemic
- 27. Diuretics
- 28. Antacids
- 29. Gastrointestinal prokinetic medications (metoclopramide)
- 30. Anticoagulants
 - a. Heparin and low-molecular-weight heparins
 - b. Heparin reversal—protamine
 - c. Antiplatelet medications
 - d. Oral anticoagulants
 - e. Oral anticoagulant reversal
 - f. Thrombolytics
 - g. Thrombin inhibitors
- 31. Antimicrobials
- 32. Chemotherapeutics
- 33. Antiepileptic drugs
- 34. Antiparkinsonian drugs
- 35. Lipid-lowering agents
- 36. Herbal remedies and dietary supplements
- 37. Minerals and electrolytes
- 38. Dantrolene
- 39. Corticosteroids
- 40. Tocolytics
- 41. Uterotonics
- 42. Antifibrinolytics
- 43. Intravenous dyes
- C. Applied chemistry, biochemistry, physics
 - 1. Chemistry
 - a. Aqueous solutions and concentrations
 - b. Acids, bases, and salts
 - c. Chemical reactions: oxidation, reduction, hydrolysis, and conjugation
 - 2. Biochemistry
 - a. Metabolism
 - b. Cellular mechanisms for action
 - c. Drug receptor interaction

3. Physics
 - a. Units of measurement
 - b. Gases and gas laws
 - c. Solubility, diffusion and osmosis
 - d. Pressure and fluid flow
 - e. Electricity and electrical safety
 - f. Vaporization and humidification
 - g. Measurement of oxygen, carbon dioxide, and hydrogen ion
- II. Equipment, Instrumentation and Technology (15%)
 - A. Anesthetic delivery systems
 1. High/low pressure gas sources
 2. Regulators/manifolds
 3. Flowmeters, valves, floats
 4. Vaporizers
 5. Proportioning systems
 6. Pressure failure safety devices
 7. Fail-safe devices
 8. Ventilator
 9. Carbon dioxide absorbent
 10. Anesthetic circuits
 - a. Rebreathing, circle system
 - b. Nonrebreathing
 - c. Modified nonrebreathing
 11. Pneumatic and electronic alarm devices
 - B. Airway equipment
 1. Face masks
 2. Laryngoscope
 - a. Rigid
 - b. Videoscope
 - c. Optically enhanced scopes
 3. Flexible fiberoptic bronchoscope
 4. Endotracheal tube
 5. Endobronchial tube
 - a. Including double lumen tubes
 6. Airways
 - a. Oral
 - b. Nasal
 7. Tracheostomy tubes
 8. Supraglottic airways (i.e., LMA)
 9. Intubating supraglottic airways

10. Jet ventilation
 11. Intubating stylets
 12. Lighted stylet
 13. Cricothyrotomy (needle and surgical)
 14. Other
 - a. Eschmann catheter (i.e., "bougie")
 - b. Combitube
 - c. Exchange catheter
- C. Monitoring devices
1. Central nervous system
 - a. Evoked potential
 - b. Intracranial pressure
 - c. Modified EEG monitor (BIS, PSArray)
 - d. Cerebral oximetry
 2. Cardiovascular
 - a. Electrocardiogram
 - b. Arterial pressure monitoring
 - c. Noninvasive blood pressure monitoring
 - d. Central venous pressure monitoring
 - e. Pulmonary artery pressure monitoring/SvO₂
 - f. Cardiac output
 - g. Precordial/esophageal stethoscope/Doppler
 3. Pulmonary/airway monitoring
 - a. Capnography
 - b. Airway gas analysis
 - c. Pulse oximetry
 - d. Airway pressure
 - e. Blood gas analysis
 4. Peripheral nerve stimulator
 5. Urinary output monitoring
 6. Temperature monitoring
 7. Maternal/fetal monitoring issues
 8. Others
 - a. Fluid/blood warmers
 - b. Forced air warming blanket
 - c. Heat and moisture exchanger (HME)
 - d. Blood salvage (cell saver)
- D. Imaging
1. Ultrasound
 2. Fluoroscopy

- 3. Radiography
- III. General Principles of Anesthesia (30%)
 - A. Ethical considerations
 - B. Legal issues
 - C. Safety and wellness
 - 1. Substance abuse (impairment, disorder, and other considerations)
 - 2. Issues surrounding patient safety
 - D. Preoperative assessment and preparation of patient
 - E. Fluid volume assessment and management
 - 1. Fluid/blood component therapy replacement
 - 2. Bloodless medicine (including cell saver and hemodilution techniques)
 - F. Positioning
 - 1. Techniques
 - 2. Physiological alterations
 - 3. Complications
 - G. Utilization and interpretation of data
 - 1. Lab tests
 - 2. Diagnostic exams
 - 3. Intraoperative monitoring data
 - H. Airway management
 - 1. Assessment
 - 2. Techniques, procedures, and devices
 - 3. Complications
 - 4. Difficult airway management
 - 5. Retrograde intubation
 - I. Local/regional anesthetics (technique, physiologic alterations, complications)
 - 1. Anatomy
 - 2. Infiltration
 - 3. Topical
 - 4. Neuraxial blocks
 - 5. Peripheral blocks
 - 6. Other blocks (airway, retrobulbar)
 - 7. Ultrasound and/or nerve stimulator guided concepts and techniques
 - J. Light, moderate, and deep sedation (monitored anesthesia care)
 - K. Pain management
 - 1. Acute
 - 2. Chronic (pathophysiology, techniques, management of patients)
 - a. Pathophysiology
 - b. Techniques
 - c. Management of patients

- L. Pain theory (anatomy, physiology, pathology, and psychodynamics)
- M. Other techniques
 - 1. Hypotensive
 - 2. Enhanced recovery after surgery (ERAS)
- N. Postanesthesia care/respiratory therapy
- IV. Anesthesia for Surgical Procedures and Special Populations (30%)
 - A. Surgical and diagnostic anesthesia, including management of complications
 - 1. Intraabdominal-laparoscopic versus open
 - a. Hepatobiliary system
 - b. Gastrointestinal tract procedures
 - c. Endocrine organ procedures
 - d. Renal/genitourinary
 - e. Gynecologic procedures
 - f. Peritoneal procedures (including hernia repair)
 - 2. Extrathoracic
 - a. Breast
 - b. Plastics and/or reconstructive
 - 3. Head
 - a. Extracranial
 - 1) Otolaryngological
 - 2) Ophthalmologic
 - 3) Nasal
 - 4) Craniofacial
 - 5) Plastics and/or reconstructive
 - 6) Orthodontic/dental
 - b. Intracranial
 - 1) Decompression (burr holes, ventriculoperitoneal shunt)
 - 2) Space-occupying lesion
 - 3) Vascular
 - 4) Transsphenoidal hypophysectomy
 - 5) Stereotactic procedures
 - 4. Intrathoracic (including open and thoracoscopic approach)
 - a. Diaphragm
 - b. Endoscopic procedures (bronchoscopy, mediastinoscopy)
 - c. Esophagus
 - d. Heart
 - e. Lung
 - f. Mediastinal
 - 5. Neck
 - a. Larynx/trachea (including tracheostomy)

- b. Lymph node biopsies
- c. Parathyroid/thyroid
- d. Neck tumors
- e. Radical neck dissection
- 6. Neuroskeletal
 - a. Cervical spine (anterior and posterior approach)
 - b. Laminectomy/discectomy fusions at all levels
 - c. Pain management procedures
 - d. Spinal cord procedures
 - e. Surgical sympathectomy
 - f. Vertebroplasty
 - g. Scoliosis repair
- 7. Orthopedic
 - a. Arthroscopic procedures
 - b. Closed reduction
 - c. Fractures
 - d. Total joint replacements/arthroplasty
 - e. Procedures of the hand and foot
- 8. Perineal and pelvic procedures
 - a. Gynecologic
 - b. Genitourinary
 - c. Anal/rectal
- 9. Vascular (open versus endovascular)
 - a. Carotid
 - b. Thoracic
 - c. Abdominal (including renal)
 - d. Extremity
 - 1) Occlusive disease
 - 2) Vascular access
 - 3) Vein stripping
 - e. Thromboembolic prevention
 - f. Surgical management of portal hypertension
- 10. Diagnostic/therapeutic
 - a. Venous/arterial catheterization
 - b. Interventional cardiology
 - 1) Cardioversion
 - 2) Defibrillation (including AED)
 - 3) Pacemakers
 - 4) Automated internal cardiac defibrillator devices
 - c. Diagnostic imaging

- d. Electroconvulsive therapy
- e. Interventional radiology
- f. Radiation therapy
- g. Endoscopy
- 11. Other surgical procedures
 - a. Trauma
 - b. Burns
 - c. Resuscitation
 - d. Organ transplants (including management of posttransplant patient for nontransplant surgery)
 - e. Organ procurement
 - f. Laser procedures
- B. Anesthesia for special populations
 - 1. Pediatrics
 - a. Anatomy, physiology, and pathophysiology
 - 1) Normal
 - 2) Prematurity
 - 3) Congenital anomalies
 - b. Pharmacology
 - c. Anesthesia techniques/procedures
 - d. Management of complications
 - 2. Obstetrics
 - a. Anatomy, physiology, and pathophysiology
 - b. Pharmacology
 - c. Anesthesia techniques/procedures
 - d. High-risk parturients
 - e. Nonobstetric surgery in the parturient
 - f. Management of complications
 - 3. Geriatrics
 - a. Anatomy, physiology, and pathophysiology
 - b. Pharmacology
 - c. Anesthesia techniques/procedures
 - d. Management of complications
 - 4. Obesity
 - a. Anatomy, physiology, and pathophysiology
 - b. Pharmacology
 - c. Anesthesia techniques/procedures (including bariatric)
 - d. Management of complications

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