

# Updated NCE/SEE Content Outline

For NCE exams administered ON or AFTER 1/2/2024

## I. Basic Sciences (20%)

### A. Anatomy and physiology

1. Cardiovascular
2. Respiratory
3. Central nervous system
4. Musculoskeletal
5. Endocrine
6. Hepatic and renal
7. Hematologic
8. Gastrointestinal
9. Immune

### B. 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 abnormalities
  - 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 abnormalities
  - e. Altered airway anatomy
3. Central nervous system

- a. Neurodegenerative diseases
  - b. Myelin diseases
  - c. Cerebrovascular diseases
  - d. Neuropathies
  - e. Psychiatric disorders
  - f. Spinal cord disorders
  - g. Intracranial tumor
  - h. Congenital abnormalities (e.g., cerebral palsy)
  - i. Seizure disorders
  - j. Intracranial hypertension
  - k. Thermoregulation
4. Musculoskeletal
- a. Myopathies/metabolic abnormalities (e.g., malignant hyperthermia)
  - b. Neuromuscular diseases
  - c. Skeletal diseases
  - d. Musculoskeletal disorders (genetic and acquired)
5. Endocrine
- a. Thyroid and parathyroid disorders
  - b. Pituitary disorders
  - c. Adrenal disorders
  - d. Pancreatic disorders (endocrine disorders)
  - e. Other endocrine disorders (thymus-, hypothalamus-, androgen-, and metabolic-related disorders)
6. Hepatic
- a. Infectious diseases
  - b. Biliary tract and bilirubin disorders
  - c. Cirrhotic disorders
  - d. Hepatovascular abnormalities
7. Renal
- a. Intrinsic kidney disorders
  - b. Acute kidney injury
  - c. Chronic kidney disease
8. Hematologic
- a. Anemias
  - b. Hemoglobin disorders
  - c. Coagulation disorders
9. Gastrointestinal
- a. Esophageal disorders
  - b. Gastric disorders
  - c. Pancreatic disorders (exocrine disorders)
  - d. Intestinal disorders
  - e. Tumors/secreting lesions
  - f. Malabsorption disorders

10. Immune
  - a. Infectious disorders (e.g., HIV, AIDS)
  - b. Hypersensitivity disorders (Type I-IV)
  - c. Autoimmune diseases
11. Other conditions
  - a. Cancer
  - b. Burns (inhalational, cutaneous)
  - c. Trauma
  - d. Substance use disorder (alcohol, nicotine, other)
  - e. Sepsis

## C. Pharmacology

1. General principles
  - a. Pharmacodynamics
  - b. Pharmacokinetics
  - c. Pharmacology-related mathematics
2. Inhalation anesthetics
3. Intravenous anesthetics and antagonists
  - a. Barbiturates
  - b. Sedative/hypnotics (e.g., propofol, etomidate, ketamine, dexmedetomidine)
  - c. Benzodiazepines and benzodiazepine antagonists
  - d. Opioid agonists, agonist-antagonists, and antagonists
4. Depolarizing and nondepolarizing neuromuscular relaxants and antagonists
5. Local anesthetics
6. Lipid emulsion
7. Regional anesthesia adjuncts (neuraxial and peripheral)
8. Anticholinergics/cholinergic agonists
9. Non-opioid analgesics
10. Cardiovascular medications
  - a. Inotropes
  - b. Phosphodiesterase inhibitors
  - c. Cardiac glycosides (e.g., digitalis)
  - d. Alpha- and beta-receptor agonists and antagonists
  - e. Centrally acting alpha<sub>2</sub>-adrenergic agonists
  - f. ACE inhibitors
  - g. Angiotensin II receptor inhibitors
  - h. Vasodilators
  - i. Nitric oxide
  - j. Antidysrhythmics
  - k. Calcium channel blockers
11. Bronchodilators

12. Psychopharmacologic therapy
  - a. Antidepressants
  - b. Antipsychotics
  - c. Antiparkinsonian drugs
  - d. Others
13. Prostaglandins
14. Histamine receptor antagonists
15. Antiemetics
  - a. 5-HT<sub>3</sub> receptor antagonists
  - b. Gastrointestinal prokinetic medications (metoclopramide)
  - c. Antacids
  - d. Other
16. Insulin
17. Hypoglycemics
18. Diuretics
19. Anticoagulants and antagonists
  - 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
20. Procoagulants (e.g., antifibrinolytics, DDAVP)
21. Antimicrobials and antivirals
22. Antiepileptics
23. Lipid-lowering agents
24. Herbal remedies and dietary supplements
25. Minerals and electrolytes
26. Dantrolene
27. Steroids (e.g., dexamethasone, hydrocortisone)
28. Tocolytics
29. Uterotonics
30. Intravenous dyes
31. Cannabinoids

#### **D. Applied chemistry, biochemistry, physics, and mathematics**

1. Chemistry and biochemistry
  - a. Aqueous solutions and concentrations
  - b. Acids, bases, and salts
  - c. Chemical reactions: oxidation, reduction, hydrolysis, and conjugation
  - d. Metabolism

- e. Cellular mechanisms of action
- f. Drug receptor interaction
- 2. 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 ions
- 3. Nonpharmacology-related mathematics

## **II. Equipment, Instrumentation and Technology (20%)**

### **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. Failsafe devices
- 8. Ventilator
- 9. Carbon dioxide absorbents
- 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. Video laryngoscope
  - c. Optically enhanced scopes
- 3. Flexible fiberoptic bronchoscope
- 4. Endotracheal tube
- 5. Endobronchial tube
  - a. Double-lumen tubes

- b. Bronchial blockers
- 6. Airways
  - a. Oral
  - b. Nasal
- 7. Tracheostomy tubes
- 8. Supraglottic airways (e.g., LMA)
- 9. Intubating supraglottic airways
- 10. Jet ventilation
- 11. Intubating stylets
- 12. Cricothyrotomy (needle and surgical)
- 13. Intubation aids (e.g., bougie, exchange catheter)

### **C. Monitoring devices**

- 1. Central nervous system
  - a. Evoked potential
  - b. Intracranial pressure
  - c. Modified EEG monitor
  - d. Cerebral oximetry
- 2. Cardiovascular
  - a. Electrocardiogram (3-lead and 5-lead)
  - b. Arterial pressure monitoring
  - c. Noninvasive blood pressure monitoring
  - d. Central venous pressure monitoring
  - e. Pulmonary artery pressure monitoring/SvO<sub>2</sub>
  - f. Hemodynamic monitoring
  - g. Precordial/esophageal stethoscope
  - h. Transesophageal echocardiogram
- 3. Respiratory
  - a. Capnography
  - b. Airway gas analysis
  - c. Pulse oximetry
  - d. Airway pressure
  - e. Blood gas analysis
- 4. Others
  - a. Peripheral nerve stimulator (qualitative and quantitative)
  - b. Temperature monitoring
  - c. Maternal/fetal monitoring

### **D. Patient warming equipment**

- 1. Fluid/blood warmers
- 2. Forced air warming devices
- 3. Heat and moisture exchanger (HME)

4. Radiant warmers

#### **E. Infusion devices (e.g., rapid infusers)**

#### **F. Imaging and imaging safety**

1. Ultrasound
2. Fluoroscopy
3. Radiography

### **III. General Principles of Anesthesia (35%)**

#### **A. Ethical considerations**

1. Autonomy, beneficence, nonmaleficence
2. Research ethics

#### **B. Legal issues**

1. Advance healthcare directives
2. Informed consent
3. Disclosure of errors/ injuries
4. Legal doctrines
5. Torts
6. Scope of practice
7. Standards of practice
8. Billing

#### **C. Safety and wellness**

1. Provider substance abuse disorder
2. Issues surrounding patient safety
3. Impaired provider
4. Wellness initiatives and peer assistance

#### **D. Preoperative assessment and preparation of patient**

#### **E. Fluid volume assessment and management**

1. Fluid/blood component therapy replacement (including plasma expanders)
2. Bloodless medicine (including blood salvage devices and hemodilution techniques)
3. Goal-directed fluid management (crossover with equipment)

4. Massive transfusion protocol
5. Thromboelastography

## **F. Positioning**

1. Techniques
2. Physiologic alterations
3. Complications

## **G. Utilization and interpretation of testing data**

1. Lab tests (blood gases, activated clotting time)
2. Diagnostic exams (including basic 12-lead ECG interpretation)

## **H. Airway management**

1. Assessment
2. Techniques, procedures, and devices
3. Complications
4. Difficult airway management (difficult airway algorithm)

## **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
8. Management of complications (e.g., local anesthetic systemic toxicity)

## **J. Light, moderate, and deep sedation (monitored anesthesia care)**

## **K. Total intravenous anesthesia**

## **L. Pain**

1. Pain theory (anatomy, physiology, pathology, and psychodynamics)
  - a. Acute
  - b. Chronic
2. Pain management
  - a. Acute
  - b. Chronic



- c. Multimodal pain therapy

### **M. Enhanced recovery after surgery (ERAS)**

### **N. Hypotensive technique and risks**

### **O. Postanesthesia care/respiratory therapy**

### **P. Infection control**

1. Provider (e.g., personal protective equipment, room air handling, ultraviolet sanitizers)
2. Patient (e.g., aseptic technique, workstation cleanliness, needle safety)

### **Q. Intraoperative fire safety**

## **IV. Anesthesia for Surgical Procedures and Special Populations (25%)**

### **A. Surgical and diagnostic anesthesia, including management of complications**

1. Intra-abdominal
  - 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
    - i. Otolaryngological
    - ii. Ophthalmologic
    - iii. Nasal
    - iv. Craniofacial
    - v. Plastics and/or reconstructive
    - vi. Orthodontic/dental
  - b. Intracranial
    - i. Decompression (burr holes, ventriculoperitoneal shunt)
    - ii. Space-occupying lesion

- iii. Vascular
- iv. Transsphenoidal hypophysectomy
- v. Stereotactic procedures
- 4. Cardiac anesthesia
  - a. Open procedures (e.g., coronary artery bypass grafting)
  - b. Minimally invasive procedures (e.g., transcatheter aortic valve replacement/implantation [TAVR/TAVI], left atrial appendage closure implant, mitral clips)
  - c. Interventional cardiology (e.g., pacemakers, automated internal cardiac defibrillator devices, electrophysiology cases)
  - d. Management of patients with cardiac devices (e.g., ventricular assist device, extracorporeal membrane oxygenation, intraarterial balloon pump)
- 5. Noncardiac intrathoracic (including open and thoroscopic approach)
  - a. Diaphragm
  - b. Endoscopic procedures (bronchoscopy, mediastinoscopy)
  - c. Esophagus
  - d. Lung
  - e. Mediastinum
- 6. Neck
  - a. Larynx/trachea
  - b. Lymph node biopsies
  - c. Parathyroid/thyroid
  - d. Neck tumors
- 7. Neuroskeletal
  - a. Cervical spine (anterior and posterior approach)
  - b. Laminectomy/discectomy fusions at all levels
  - c. Pain management procedures
  - d. Other
- 8. Orthopedic
  - a. Arthroscopic procedures
  - b. Closed reduction
  - c. Fractures
  - d. Total joint replacements/arthroplasty
  - e. Procedures of the hand and foot
- 9. Perineal and pelvic procedures
  - a. Gynecologic
  - b. Genitourinary
  - c. Anal/rectal
- 10. Vascular (open versus endovascular)
  - a. Carotid
  - b. Thoracic
  - c. Abdominal (including renal)

- d. Extremity
  - i. Occlusive disease
  - ii. Vascular access
- e. Thromboembolic prevention
- f. Surgical management of portal hypertension
- 11. Non-operating-room anesthesia (NORA)
  - a. Diagnostic imaging and radiology
  - b. Electroconvulsive therapy
  - c. Interventional radiology
  - d. Radiation therapy
  - e. Endoscopy
- 12. Robotic/laparoscopic surgery
- 13. Other surgical procedures
  - a. Trauma
  - b. Burns
  - c. Organ transplants (including management of posttransplant patient for nontransplant surgery)
  - d. Organ procurement
  - e. Laser procedures

## **B. Anesthesia for special populations**

- 1. Pediatrics
  - a. Anatomy, physiology, and pathophysiology
    - i. Normal
    - ii. Prematurity
    - iii. Congenital abnormalities
  - 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 (e.g., amniotic fluid embolism, HELLP syndrome)
  - g. Postpartum hemorrhage
- 3. Geriatrics
  - a. Anatomy, physiology, and pathophysiology
  - b. Pharmacology
  - c. Anesthesia techniques/procedures

- d. Management of complications (e.g., postoperative cognitive dysfunction)
- 4. Obesity
  - a. Anatomy, physiology, and pathophysiology
  - b. Pharmacology
  - c. Anesthesia techniques/procedures (including bariatric)
  - d. Management of complications
- 5. Substance use disorder population
  - a. Medication-assisted therapy (MAT) (e.g., methadone, buprenorphine)
  - b. Pharmacologic interactions (e.g., acute intoxication)
  - c. Pain management
  - d. Management of complications
- 6. Immune compromised and oncology patients
  - a. Pharmacology
  - b. Anesthesia techniques/procedures
  - c. Management