**Content Outline**

**Continuing Certification in   
Anesthesiology**

January 2025

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# I. FUNDAMENTAL TOPICS IN ANESTHESIOLOGY

## I.A. Anesthesia Machines and Breathing Systems

I.A.1. Components

**TAGS:**

Circuit Types

CO2 Absorbers

High- and Low-Pressure Components

MRI Compatibility

Oxygen Supply Systems

Valves

Vaporizers

Waste Gas Evacuation Systems

I.A.2. Safety Features

**TAGS:**

Troubleshooting

I.A.3. Design and Ergonomics

## I.B. Mechanical or Assisted Ventilation

I.B.1. Classifications

**TAGS:**

High-Frequency Ventilation

Modes of Mechanical Ventilation

Noninvasive Techniques

I.B.2. Parameters

**TAGS:**

Ventilator Settings and Controls

I.B.3. Drug Delivery Systems

**TAGS:**

Inhaled Pulmonary Vasodilators

Inhaled Bronchodilators

Nebulizers

I.B.4. Ventilation Monitors

**TAGS:**

Apnea

FiO2

Airway Pressure Monitoring

## I.C. Monitoring

I.C.1. Basic Physiologic

**TAGS:**

Capnography

ECG

Neuromuscular Blockade

Noninvasive Blood Pressure

Pulse Oximetry

Temperature

I.C.2. Advanced Physiologic

**TAGS:**

Arterial Wave Form Analysis

Cardiac Output

Cerebral Oximetry

EEG

Neurophysiologic Monitors

Point-of-Care Ultrasound

Noninvasive Cardiac Monitoring

TEE

TTE

I.C.3. Intraoperative Blood Monitoring

**TAGS:**

Arterial Blood Gas

Coagulation

Glucose

Point-of-Care Laboratory Testing

## I.D. Electrical and Fire Safety

I.D.1. National Fire Protection Association (NFPA) Standards

I.D.2. Fire and Explosion Hazards

**TAGS:**

Fuels

Oxidizers

Sources of Ignition

I.D.3. Electrical Safety Systems

**TAGS:**

Isolated and Grounded Power Systems

Line Isolation Monitors

I.D.4. Electrical Hazards

**TAGS:**

Electrosurgery and Safety (Macro- and Microshock)

# II. PHARMACOLOGY

## II.A. General Concepts

II.A.1. Pharmacogenetics

**TAGS:**

Butyrylcholinesterase (Pseudocholinesterase) Deficiency

Genetic Factors in Drug Dose-Response Relationships

Malignant Hyperthermia (MH)

Polymorphisms of Drug Metabolism

II.A.2. Drug Interactions

**TAGS:**

Drug-Drug Binding

Enzyme Induction

Enzyme Inhibition

Perioperative Implications of Alternative and Herbal Medicines

Synergistic Drug Interactions

II.A.3. Drug Reactions

**TAGS:**

Anaphylactoid

Anaphylaxis

Idiosyncratic

II.A.4. Substance Use Disorder

**TAGS:**

Anesthetic Implications

Pharmacologic Mechanisms

Physiologic Effects

II.A.5. Agonists and Antagonists

## II.B. Anesthetic Gases and Vapors

II.B.1. Indications and Contraindications

II.B.2. Pharmacokinetics

**TAGS:**

Delivery Systems: Vaporizers

Metabolism and Excretion

Uptake and Distribution

II.B.3. Pharmacodynamics

**TAGS:**

Effects on Central Nervous System

Effects on Circulation

Effects on Other Organs

Effects on Ventilation

II.B.4. Drug Interactions

II.B.5. Side Effects and Toxicity

**TAGS:**

Atmospheric Waste

## II.C. Intravenous Anesthetics: Opioid and Non-Opioid

II.C.1. Indications and Contraindications

II.C.2. Pharmacokinetics

**TAGS:**

Distribution and Redistribution

Metabolism and Excretion

II.C.3. Pharmacodynamics

**TAGS:**

Effects on Circulation

Effects on Other Organs

Effects on the Central Nervous System

Effects on Ventilation

II.C.4. Drug Interactions

II.C.5. Side Effects and Toxicity

**TAGS:**

Shivering

## II.D. Local Anesthetics

II.D.1. Indications and Contraindications

II.D.2. Pharmacokinetics

**TAGS:**

Metabolism and Excretion

Uptake and Distribution

II.D.3. Pharmacodynamics

**TAGS:**

Effects on Circulation

Effects on Other Organs

Effects on the Central Nervous System

Effects on Ventilation

II.D.4. Drug Interactions

II.D.5. Side Effects and Toxicity  
 **TAGS:**

Local Anesthetic Systemic Toxicity

## II.E. Neuromuscular Blocking Agents: Depolarizing and Non-Depolarizing

II.E.1. Indications and Contraindications

II.E.2. Pharmacokinetics

**TAGS:**

Distribution and Redistribution

Metabolism and Excretion

Prolongation of Action

II.E.3. Pharmacodynamics

**TAGS:**

Differential Effects on Muscle Groups

Effects on Neuromuscular Transmission

II.E.4. Drug Interactions

II.E.5. Side Effects and Toxicity

**TAGS:**

Anaphylaxis

Critical Illness Myopathy

II.E.6. Reversal of Blockade

**TAGS:**

Antagonism

Chelation

# III. CLINICAL SCIENCES: ANESTHESIA PROCEDURES, METHODS AND TECHNIQUES

## III.A. Patient Evaluation and Preoperative Preparation

III.A.1. History and Physical Examination

III.A.2. Airway Evaluation

**TAGS:**

Predictors of Difficult Laryngoscopy and Intubation

Predictors of Difficult Mask Ventilation

III.A.3. Standards and Guidelines

**TAGS:**

ACC/AHA Guidelines on Perioperative Cardiovascular Evaluation

ASA Physical Status Classification

Indications for Preoperative Testing

Preoperative Fasting Guidelines

III.A.4. Preoperative Management of Chronic Medications

**TAGS:**

Anticoagulants and Antiplatelet Medications

Antihyperglycemics

Cannabinoids

Cardiovascular Medications

Central Nervous System Medications

III.A.5. Premedication

**TAGS:**

Antibiotics

Anxiolysis

Aspiration Prophylaxis

PONV Prophylaxis

III.A.6. Patients with Specific Disease States

**TAGS:**

Cardiovascular Disease

Morbid Obesity

Pulmonary Disease

## III.B. Perioperative Management of Patients with Chronic Disease States

III.B.1. Central and Peripheral Nervous System

**TAGS:**

Chronic Pain States

Deep Brain and Vagal Nerve Stimulators

Dementia

Multiple Sclerosis

Parkinson

Spinal Cord Injury

III.B.2. Respiratory System

**TAGS:**

Asthma

COPD

Sleep Apnea

Smoking

III.B.3. Cardiovascular System

**TAGS:**

Coronary Artery Disease/Stents

Heart Failure

Pacemakers/Defibrillators

Valvular Disease

III.B.4. Gastrointestinal/Hepatic Systems

**TAGS:**

Eating Disorders

GERD

Liver Failure

III.B.5. Renal and Urinary Systems

**TAGS:**

End-Stage Renal Disease and Dialysis

III.B.6. Hematologic System

**TAGS:**

Anemia

Coagulopathies

Sickle Cell

III.B.7. Endocrine and Metabolic Systems

**TAGS:**

Diabetes

Morbid Obesity

Pheochromocytoma

Thyroid Disease

III.B.8. Neuromuscular Diseases

**TAGS:**

Muscular Dystrophies

Myasthenic Syndromes

Myopathies

III.B.9. Special Problems

**TAGS:**

Allergic Reactions

Chemotherapy

Chronic Alcohol Use

Chronic Cannabinoid Use

Chronic Immunosuppression

Malignancy

Previous Organ Transplant

Substance Use Disorder

## III.C. Regional Anesthesia

III.C.1. General Topics

**TAGS:**

Guidelines and Standards

Indications and Contraindications

Local Anesthetic Systemic Toxicity

Nerve Stimulator Guidance

Ultrasound Guidance

III.C.2. Neuraxial

**TAGS:**

Complications

Factors Influencing Onset and Duration

Indications and Contraindications

Medications: Local Anesthetics, Opioids, Adjuncts

Types: Caudal, Epidural, Spinal, Combined Spinal-Epidural

III.C.3. Regional Blocks

**TAGS:**

Anatomy

Catheters

Complications

Factors Influencing Onset and Duration

Indications and Contraindications

Intraneural Injections

Medications: Local Anesthetics, Opioids, Adjuncts

Specific Blocks: Head and Neck, Upper and Lower Extremity, Truncal

III.C.4. IV Regional

**TAGS:**

Complications

Factors Influencing Onset and Duration

Indications and Contraindications

Medications: Local Anesthetics, Opioids, Adjuncts

## III.D. General Anesthesia

III.D.1. Techniques

**TAGS:**

Combined General/Regional

Inhalational

Total Intravenous

III.D.2. Airway Management

**TAGS:**

Airway Management Devices and Adjuncts

ASA Difficult Airway Algorithm

Complications

Emergency Surgical Airway

Endotracheal Tube Types

Flexible Fiberoptic Bronchoscopy

High-Frequency Jet Ventilation

Postoperative Considerations

Regional Airway Blocks

## III.E. Monitored Anesthesia Care and Sedation

III.E.1. Guidelines and Standards

III.E.2. Levels of Sedation

III.E.3. Sedation Guidelines for Non-Anesthesiologists

## III.F. Asanguineous Intravenous Fluid Therapy during Anesthesia

III.F.1. Indications and Contraindications

**TAGS:**

Colloids

Crystalloids

Hypertonic Saline

III.F.2. Complications

## III.G. Perioperative Complications: Types, Prevention, Treatment

III.G.1. Types

**TAGS:**

Air Embolism

Anaphylaxis

Arterial Thrombosis

Aspiration of Gastric Contents

Bronchospasm

Burns

Cerebrovascular Accident

Corneal Abrasions

Esophageal Injury

Hypothermia and Hyperthermia

Laryngospasm

Myocardial Ischemia/Infarction

Positioning Complications

Postobstructive Pulmonary Edema

Postoperative Visual Loss

Shivering

Tourniquet, Adverse Effects of

Unintended Intraoperative Awareness

Vascular Trauma

Venous Thromboembolism

III.G.2. Prevention and Treatment

**TAGS:**

Aspiration of Gastric Contents

Fire Prevention and Management

Management of Intraoperative Patient Temperature

Perioperative Anticoagulation

## III.H. Postoperative Period

III.H.1. Emergence and Recovery of Airway Reflexes

III.H.2. Acute Pain Management

**TAGS:**

Field Block

Multimodal Analgesia Strategies

Opioids

Patient-Controlled Analgesia (PCA)

Regional Anesthesia/Nerve Blocks

Systemic Local Anesthetics

III.H.3. Respiratory Complications in the PACU

III.H.4. Cardiovascular Complications in the PACU

**TAGS:**

Arrhythmias

Hypertension

Hypotension

Myocardial Ischemia

III.H.5. Nausea and Vomiting

**TAGS:**

Prophylactic Medications

Risk Factors

III.H.6. Residual Neuromuscular Blockade

III.H.7. Neurologic Consequences of Surgery and Anesthesia

**TAGS:**

Cognitive Dysfunction

Delirium

Failure to Emerge from Anesthesia

Stroke

# IV. ORGAN-BASED BASIC AND CLINICAL SCIENCES

## IV.A. Central and Peripheral Nervous Systems

IV.A.1. Anatomy

**TAGS:**

Autonomic Nervous System

Central Nervous System

Peripheral Nervous System

IV.A.2. Physiology

**TAGS:**

Autoregulation

Drug Effects

Intracranial Pressure (ICP)

Metabolism

Spinal Reflexes

Vagal Reflex

IV.A.3. Pharmacology

**TAGS:**

Anticonvulsants

Drug Effects on CNS Blood Flow

Drug Effects on CNS Metabolism

Osmotic Agents

IV.A.4. Clinical Science

**TAGS:**

Abscess

Air Embolism

Airway Management in the Patient with Cervical Spine Disease

Autonomic Dysfunction

Autonomic Hyperreflexia

Cerebrovascular Accident (CVA)

Coma

Drug Intoxication

Fluid Management

Hydrocephalus

Pituitary Adenomas

Postural Orthostatic Hypotension Syndrome (POTS)

Prone and Sitting Positioning: Implications

Seizures

Spinal Shock

Subdural and Epidural Hematomas

Trans-Sphenoidal Hypophysectomy

Ventriculostomy

## IV.B. Respiratory System

IV.B.1. Anatomy

**TAGS:**

Alveoli/ Lung Parenchyma

Innervation

Larynx

Musculoskeletal

Tracheobronchial Tree

Vascular Supply

IV.B.2. Physiology: Lung Functions and Cellular Processes

**TAGS:**

Alveolar-Arterial O2 Gradient (A-aDO2)

Anion Gap

Apneic Oxygenation

Arterial-Alveolar CO2 Gradient (A-aDCO2)

Central and Peripheral Chemoreceptors

CO2 and O2 Response Curves

Dead Space

Diffusion Hypoxia

Hypercarbia and Hypocarbia

Hypoxia and Hyperoxia

Hypoxic Pulmonary Vasoconstriction

Lung Mechanics

Nonrespiratory Functions of Lungs: Immune and Metabolic

Pleural Pressure Gradient

V/Q Mismatch

IV.B.3. Pharmacology

**TAGS:**

Anti-inflammatory Medications

Bronchodilators

IV.B.4. Clinical Science

**TAGS:**

Abdominal Compartment Syndrome

Acute Respiratory Distress Syndrome (ARDS)

Arterial Blood Gas Interpretation

Asthma

Atelectasis

Barotrauma

Bronchiectasis

Bronchitis

Bronchopleural Fistula

Bronchopulmonary Dysplasia

Bronchospasm: Management

Cancer

Chest Trauma

Chest X-Ray: Indications and Interpretation

Complications and Side Effects of Mechanical Ventilation

COPD

Cystic Fibrosis

Empyema

Foreign Body

Hemothorax

Lung Abscess

Mediastinal Masses

Nonventilatory Respiratory Management

Obstructive Sleep Apnea (OSA)

Oxygen Therapy and Toxicity

Pleural Effusion

Pneumonia

Pneumothorax

Postoperative Extubation Criteria

Postoperative Mechanical Ventilation

Pulmonary Fibrosis

Respiratory Distress Syndrome (ARDS)

Respiratory Failure Management

## IV.C. Cardiovascular System

IV.C.1. Anatomy

**TAGS:**

Conduction System

Congenital Heart Disease

Coronary Circulation

Innervation

Transesophageal Echocardiography (TEE) Views

IV.C.2. Physiology

**TAGS:**

Baroreceptor Function

Cardiac Output

Coronary Blood Flow Regulation

Determination of Myocardial Oxygen Demand

Diastolic Dysfunction

Intracardiac Pressures

Mixed Venous Oxygen Tension and Saturation

Rhythm

Systemic and Pulmonary Vascular Resistance

Systolic Dysfunction

Valvular Dysfunction

IV.C.3. Pharmacology

**TAGS:**

Angiotensin Converting Enzyme Inhibitors

Angiotensin Receptor Blockers

Antianginal Drugs

Antiarrhythmics

Beta-Blockers

Calcium Channel Blockers

Chronotropic Agents

Digitalis

Inotropes

Statins

Vasodilators

Vasopressors

IV.C.4. Clinical Management of Disease States

**TAGS:**

Cardiac Ischemia

Cardiac Tamponade and Constrictive Pericarditis

Cardiogenic Shock

Cardiomyopathy

Carotid Artery Disease

Dysrhythmia

Hypertrophic Cardiomyopathy

Intracardiac Defects

Myocardial Infarction and Acute Coronary Syndrome

Myocarditis

Peripheral Vascular Disease

Pulmonary Embolism

Pulmonary Hypertension

Right or Left Ventricular Dysfunction

Valvular Abnormalities

IV.C.5. Special Considerations in Cardiovascular Anesthesia

**TAGS:**

Cardiac Catheterization

Cardiac Implantable Electrical Device Management: AICD and Pacemakers

Electrophysiologic Studies and Procedures

Left Atrial Appendage Occlusion

Left Ventricular Assist Devices

Percutaneous Valvuloplasty and Valve Replacement

Perfusion Studies

## IV.D. Gastrointestinal/Hepatic Systems

IV.D.1. Anatomy

**TAGS:**

Vascular Supply

Innervation: Sympathetic, Parasympathetic, and Enteric

Liver Anatomy

IV.D.2. Physiology

**TAGS:**

Cytochrome P450 Function and Variants

Excretory Functions

Factors Affecting Splanchnic Circulation

Metabolic and Synthetic Functions

Portal Hypertension

IV.D.3. Pharmacology

**TAGS:**

Drug Metabolism/Elimination

Hepatotoxicity

IV.D.4. Clinical Science

**TAGS:**

Acute Hepatitis

Anesthetic Management: Full Stomach

Anesthetic Management: Intestinal Obstruction

Cricoid Pressure

Esophageal Disease

Hepatic Resection

End-Stage Liver Disease

Liver Transplantation

Morbid Obesity/Anesthesia for Bariatric Surgery

Postoperative Hepatic Dysfunction

Postoperative Ileus

## IV.E. Renal and Urinary Systems/Electrolyte Balance

IV.E.1. Clinical Science

**TAGS:**

Factors Affecting Glomerular Filtration

Factors Impacting Renal Blood Flow

Hormonal Regulation of Extracellular Fluid

Hormonal Regulation of Osmolality

Pathophysiology of Renal Disease

Regulation of Acid-Base Balance

Regulation of Blood Volume

Renal Drug Excretion

Renal Function Tests

Tubular Reabsorption and Secretion

Water and Electrolytes: Distribution and Balance

IV.E.2. Pharmacology

**TAGS:**

Diuretics

Drug Effects on Electrolytes and Acid-Base Balance

Pharmacologic Protection and Treatment of Renal Failure

IV.E.3. Clinical Management of Disease States

**TAGS:**

Anesthetic Management for Patients on Renal Replacement Therapy

Arteriovenous (AV) Shunts

Chronic Renal Insufficiency and Renal Failure

Perioperative Oliguria and Anuria

Preservation of Renal Function

Nephrectomy

Renal Transplantation

Risk Factors for Acute Renal Failure

IV.E.4. Special Considerations with the Renal System

**TAGS:**

Transurethral Resection of Prostate (TURP): Complications

Urologic Surgery: Lithotripsy

## IV.F. Hematologic System

IV.F.1. Anatomy

IV.F.2. Physiology

**TAGS:**

Hemostasis

IV.F.3. Pharmacology

**TAGS:**

Anticoagulants and Antagonists

Antifibrinolytics

Antiplatelet Drugs

Blood Substitutes

Coagulation Factor Concentrates

Erythropoietin

Immunosuppressive and Antirejection Drugs

Iron Therapy

IV.F.4. Clinical Science

**TAGS:**

Alternatives to Transfusion

Anemias

Autologous Blood Donation

Blood Products

Carboxyhemoglobinemia

Citrate Toxicity

Congenital and Acquired Factor Deficiencies

Disseminated Intravascular Coagulation (DIC)

Fibrinolysis

Hemoglobinopathies

Heparin-Induced Thrombocytopenia (HIT)

IgA Deficiency

Massive Transfusion

Methemoglobinemia

Porphyrias

Thrombocytopenia and Thrombocytopathy

Transfusion Complications: TACO/TRALI

Transfusion Indications

Transfusion: Infection Risks (Cytomegalovirus, HIV, Hepatitis)

Viscoelastic Testing

## IV.G. Endocrine and Metabolic Systems

IV.G.1. Anatomy

IV.G.2. Physiology

**TAGS:**

Adrenal Cortex and Pancreas

Adrenal Medulla

Hypothalamus

Parathyroid

Pituitary: Anterior and Posterior

Thyroid

IV.G.3. Pharmacology

**TAGS:**

Antihyperglycemic Drugs

Glucocorticoid Supplementation

Mineralocorticoid Supplementation

Somatostatin/Octreotide

IV.G.4. Clinical Science

**TAGS:**

Acromegaly

Addison Disease

Carcinoid Syndrome

Cerebral Salt-Wasting Syndrome

Cushing Syndrome

Diabetes Insipidus

Diabetes Mellitus

Diabetic Ketoacidosis

Endocrine Tumors

Goiter

Hyperosmolar Coma

Pancreas Transplantation

Parathyroid Disease: Hyper- and Hypoparathyroidism

Pheochromocytoma

Pituitary Disease: Hyper and Hypopituitarism

Primary Aldosteronism

Recurrent Laryngeal Nerve Injury

Syndrome of Inappropriate ADH Secretion

Thyroid Disease: Hyper and Hypothyroidism

Thyroid Storm Management

IV.G.5. Biochemistry of Normal Body Metabolism

**TAGS:**

Fluid Homeostasis

Glucose Homeostasis

Surgical Stress Response

## IV.H. Neuromuscular System

IV.H.1. Anatomy

**TAGS:**

Acetylcholine Receptor

IV.H.2. Physiology

**TAGS:**

Factors Impacting Muscle Strength

Neuromuscular Transmission

IV.H.3. Pharmacology

**TAGS:**

Antagonists: Anticholinesterases

Antagonists: Selective Relaxant Binding Agents

Neuromuscular Blocking Agents: Depolarizing

Neuromuscular Blocking Agents: Nondepolarizing

IV.H.4. Diseases and Disorders: Clinical Science

**TAGS:**

Diseases of the Neuromuscular Junction

Inflammatory Myopathies

Metabolic Diseases of the Muscle

Motor Neuron Diseases

Peripheral Nerve Diseases

# V. CLINICAL SUBSPECIALTIES

## V.A. Pain Management

V.A.1. Pathophysiology

**TAGS:**

Acute Pain

Cancer-Related Pain

Chronic Pain States

Complex Regional Pain Syndrome (CRPS): Types I and II

Diabetic Neuropathy

Neuropathic Pain States

Peripheral Neuropathies

Phantom Limb

Postherpetic Neuralgia

Post-Stroke Pain

Somatic Pain Conditions

Substance Use Disorder

V.A.2. Diagnostic Strategies

**TAGS:**

Diagnostic Blocks

Electromyography (EMG)

Imaging Modalities

V.A.3. Treatment of Painful Disease States

**TAGS:**

Acupuncture

Electrical Stimulation

Neuraxial Analgesia

Neurolytic and Non-Neurolytic Blocks

Patient-Controlled Analgesia

Peripheral Nerve Blockade and Catheters

Pharmacologic Therapy

Sympathetic Nerve Blocks

## V.B. Pediatric Anesthesia

V.B.1. Clinical Science

**TAGS:**

Airway Selection

Behavioral Development

Infants: Fluid and Glucose Management

Infants: Respiratory Physiology

Infants: Thermoregulation

Malignant Hyperthermia: Susceptibility and Management

Neonatal Resuscitation Guidelines

Neonates: Transitional Circulation

Organ Function Changes During Development

Pediatric Advanced Life Support (PALS)

Parental Presence

Upper Respiratory Infections (Colds)

V.B.2. Pharmacology

**TAGS:**

Age-Related Pharmacodynamics and Pharmacokinetics

Anesthetic Drugs and Adjuvants

Induction Techniques

Inhalational Anesthetics

Intravenous Anesthetics

Local Anesthetics

Opioid Tolerance and Sensitivity

Succinylcholine: Complications

V.B.3. Clinical Management of Disease States

**TAGS:**

Anemias: Congenital and Acquired

Bronchopulmonary Dysplasia

Cerebral Palsy

Chromosomal Abnormalities

Coagulopathies: Congenital and Acquired

Congenital Heart Disease

Congenital Tumors: Wilm’s and Neuroblastoma

Cystic Fibrosis

Developmental Abnormalities

Diaphragmatic Hernia

Endocrine Diseases: Childhood Diabetes

Endocrine Diseases: Congenital Adrenal Hyperplasia

Epiglottitis

Hydrocephalus and Shunts

Inborn Errors of Metabolism

Inherited Musculoskeletal Disorders

Juvenile Rheumatoid Arthritis

Laryngotracheobronchitis

Myelomeningocele

Obesity

Obstructive Sleep Apnea

Omphalocele and Gastroschisis

Patent Ductus Arteriosus

Peritonsillar Abscess

Pyloric Stenosis

Scoliosis

Tracheoesophageal Fistula

Trauma

V.B.4. Special Considerations in Pediatric Anesthesia

**TAGS:**

Airway Foreign Bodies

Apnea of Prematurity

Bladder and Urethral Malformations

Bronchoscopy: Flexible and Rigid

Bronchospasm

Cleft Lip and Palate

Congenital Hip Dysplasia

Craniofacial Abnormalities

Difficult Airway Management

Difficult IV Access

Emergence Delirium

Intubation and Extubation Complications

Jet Ventilation

Laryngoscopy Techniques

Laser

Pediatric Regional Anesthetic Techniques

Pediatric Respiratory Adverse Events (PRAE)

Pediatric Sedation

PONV

Postoperative Pain Management: Codeine

Premedication Techniques

Propofol Infusion Syndrome

Strabismus

Stridor

Tonsillectomy and Adenoidectomy

Upper Respiratory Infection

Urologic Procedures

## V.C. Obstetric Anesthesia

V.C.1. Clinical Science

**TAGS:**

Anesthetic Complications

Anesthetic Risks

Coagulation Changes

Neuraxial Anesthetic Techniques: Epidural, Spinal, Combined Spinal-Epidural, and Caudal

Neuraxial Labor Analgesia

Paracervical Block

Physiology of Labor

Pudendal Block

Systemic Labor Analgesia

V.C.2. Pharmacology

**TAGS:**

Anesthetic Drugs and Adjuvants

Drug Effects on Newborn

Drug Metabolism

Fetal Disposition of Drugs

Magnesium Sulfate

Mechanisms of Placental Transfer

Oxytocic Drugs

Protein Binding of Drugs

Tocolytic Drugs

V.C.3. Clinical Management of Disease States

**TAGS:**

Amniocentesis

Amniotic Fluid Embolism

Antepartum Fetal Therapy

Antepartum Hemorrhage

Anticoagulant Therapy

Cardiovascular Disease

Ectopic Pregnancy

Endocrine Disease

Ex-utero Intrapartum Treatment (EXIT)

Fetal Malposition

Fetal Malpresentation

Fever and Infection

Gestational Trophoblastic Surgery Disease

Hematologic Disease

Maternal Cardiopulmonary Resuscitation

Multiple Gestation

Neurologic Disease

Obesity

Placenta Abruption

Placenta Accreta Spectrum

Placenta Previa

Postpartum Hemorrhage

Preeclampsia and Eclampsia

Preterm Labor

Renal Disease

Respiratory Disease

Resuscitation of Newborn

Retained Placenta

Rh and ABO Incompatibility

Spontaneous Abortion

Substance Use Disorder

Trial of Labor after Cesarean (TOLAC)

Umbilical Cord Blood Gas Measurements

Umbilical Cord Prolapse

Uterine Atony

Uterine Rupture

V.C.4. Special Considerations in Obstetric Anesthesia

**TAGS:**

Antepartum Fetal Assessment

Aorto-Caval Compression

Cesarean Delivery: Elective Anesthesia

Cesarean Delivery: Emergency Anesthesia

Difficult Airway

Gastroesophageal Sphincter Function

Influence of Anesthetic Technique on Labor

Neonatal Assessment: Apgar Score

Nonobstetric Anesthesia in Pregnancy

Operative Vaginal Delivery

Pulmonary Aspiration

Regulation of Uterine Blood Flow

Thermoregulation

V.C.5. Maternal Physiology

**TAGS:**

Acid-Base Changes

Airway Changes

Anatomic Position

Barrier Function

Cardiovascular Changes

Coagulation Changes

Gastrointestinal Changes

Hematologic Changes

Nervous System Changes

Renal Changes

Respiratory Changes

V.C.6. Maternal-Fetal Considerations

**TAGS:**

Intrapartum Fetal Monitoring

Intrauterine Fetal Resuscitation

V.C.7. Pathophysiology of Complicated Pregnancy

## V.D. Otorhinolaryngology (ENT) Anesthesia

V.D.1. Surgical Procedures

**TAGS:**

Airway Endoscopy

Microlaryngeal Surgery

Radical Neck Dissection

Sinus Endoscopy

Tonsillectomy

Transoral Robotic Surgery

Uvulopalatopharyngoplasty

V.D.2. Laser Surgery

**TAGS:**

Airway Fires

Lasers: Safety Implications

Laser-Safe Endotracheal Tubes

V.D.3. Anesthetic Management

**TAGS:**

Airway Management

Anesthesia for Vascular Flaps

Effects of Radiation Therapy

Ventilation Strategies, Including Jet Ventilation

## V.E. Anesthesia for Plastic Surgery

V.E.1. Surgical Procedures

**TAGS :**

Breast Surgery

Facial Aesthetic Procedures

Free Flap Reconstruction

Gender-Affirming Surgery

Liposuction

Orthognathic Surgery

V.E.2. Pharmacology

**TAGS:**

Botulinum Toxin

Dermal Fillers

Tumescent: Volume Overload, LAST

V.E.3. Anesthetic Management

V.E.4. Special Considerations in Plastic Surgery

**TAGS:**

Fire Risk

## V.F. Anesthesia for Laparoscopic Surgery

V.F.1. Surgical Procedures

**TAGS:**

Appendectomy

Bariatric Surgery

Cholecystectomy

Gynecologic Procedures

Hiatus Hernia Repair

V.F.2. Anesthetic Management

**TAGS:**

Monitoring

Patient Positioning

Physiology

Robotic Procedures

Ventilation

V.F.3. Risks

**TAGS:**

CO2 Embolism

Hemorrhage

Hypercapnea

Hypotension

Subcutaneous Emphysema

Vascular or Organ Perforation

## V.G. Ophthalmologic Anesthesia

V.G.1. Clinical Science

**TAGS:**

Retrobulbar and Peribulbar Blocks

V.G.2. Pharmacology

V.G.3. Clinical Management of Disease States

**TAGS:**

Open Eye Injuries

V.G.4. Special Considerations in Ophthalmologic Anesthesia

**TAGS:**

ASA Preoperative Testing Guidelines

Preoperative Selection

## V.H. Orthopedic Anesthesia

V.H.1. Tourniquet Management

**TAGS:**

Ischemia

Nerve Injury

Reperfusion

V.H.2. Spine Surgery

**TAGS:**

Anesthetic Technique

Antifibrinolytics

Cervical Spine Disease

Neurophysiologic Monitoring

Postoperative Visual Loss

V.H.3. Complications

**TAGS:**

Blood Loss

Fat Embolism

Methyl Methacrylate

Positioning Injury

Venous Air Embolism

V.H.4. Anesthetic Techniques

**TAGS:**

Regional vs. General Anesthesia

V.H.5. Special Considerations in Orthopedic Surgery

**TAGS:**

Ankylosing Spondylitis

Compartment Syndrome

Postoperative Analgesia

Rheumatoid Arthritis

Scoliosis

Thromboprophylaxis

## V.I. Trauma Anesthesia

V.I.1. Primary Survey and Resuscitation

**TAGS:**

Emergency Airway

Hemorrhagic Shock

Initial Evaluation

Mass Casualty Response

Penetrating vs. Blunt Trauma

Prehospital and EMS

Team Function in Trauma

Triage

V.I.2. Secondary Survey and Stabilization

**TAGS:**

Fluid Management

Hemostatic Resuscitation

Hypothermia

Massive Transfusion

Monitoring

Nuclear, Biological, and Chemical Injury

POCUS

Protection of Cervical Spine

V.I.3. Organ System Trauma

**TAGS:**

Abdominal Trauma

Aortic and Vascular Trauma

Orthopedic and Soft Tissue Trauma

Spinal Cord

Thoracic Trauma

Traumatic Brain Injury

Traumatic Coagulopathy

V.I.4. Thermal and Electrical Injury

**TAGS:**

Airway Management

Carbon Monoxide/Carboxyhemoglobin

Fluids and Electrolytes

Inhalation Injury

Nondepolarizing Muscle Relaxants

Succinylcholine Use

Vasoconstrictor Effects and Complications

V.I.5. Special Considerations in Trauma Anesthesia

**TAGS:**

Decontamination

Exposure/Hypothermia

Geriatrics

Near Drowning

Nuclear, Biological, and Chemical Injury

Pain Management

## V.J. Anesthesia for Ambulatory Surgery

V.J.1. Patient Selection and Preoperative Management

**TAGS:**

ACC/AHA Guidelines on Perioperative Cardiovascular Evaluation

Malignant Hyperthermia

Obesity

Preoperative Selection

Risk Factors for Admission

V.J.2. Anesthetic Management

**TAGS:**

Ambulatory Regional Anesthesia

Continuous Nerve Blocks

V.J.3. Discharge Criteria and Postoperative Follow-Up

**TAGS:**

Discharge Criteria

V.J.4. Office-Based Anesthesia

**TAGS:**

Equipment

Organization

Patient Management

Safety

## V.K. Geriatric Anesthesia/Aging

V.K.1. Preoperative Evaluation

**TAGS:**

Coexisting/Chronic Disease Processes

Medication Management

Risk Reduction and Stratification

V.K.2. Organ Function Changes with Aging

**TAGS:**

Cardiovascular System

Central Nervous System

Endocrine System

Hematologic System

Hepatic System

Renal System

Respiratory System

V.K.3. Pharmacology

**TAGS:**

Adverse Response to Medications

Beers Criteria

Changes in PK/PD with Aging

V.K.4. Anesthetics

**TAGS:**

General

Local

Sedation

Regional

V.K.5. Fluid Management

V.K.6. Pain Management

V.K.7. Thermoregulation

V.K.8. Ethics and Informed Consent

V.K.9. Postoperative Care and Transitions of Care

**TAGS:**

Delirium

Postoperative Cognitive Dysfunction

V.K.10. Patient Safety

## V.L. Critical Care Anesthesia

V.L.1. Central Nervous System Dysfunction

**TAGS:**

Altered Mental Status

Brain Death

Brain Trauma

Delirium

Metabolic Encephalopathy

Neuromuscular Pathology

Spinal Cord Compromise

Stroke: Ischemic or Hemorrhagic

Subarachnoid, Epidural Bleed

V.L.2. Cardiovascular Dysfunction/Failure

**TAGS:**

Cardiac Interventions: Lysis, Catheter, PCI, Pacer

Cardiogenic Shock

Congestive Heart Failure

Device Management

Dysrhythmias

ECMO

Myocardial Ischemia/Infarction

POCUS

Pulmonary Hypertension

Vascular Disease: Aneurysm, Dissection, Thrombosis

V.L.3. Respiratory Dysfunction/Failure

**TAGS:**

Acute Lung Injury/Acute Respiratory Distress Syndrome

Acute or Chronic Respiratory Insufficiency or Failure

Aspiration

ECMO

Mechanical Ventilation

Noninvasive Ventilatory Support

POCUS

Thromboembolic Disease: DVT/PE

V.L.4. Immune Dysfunction/Infection

**TAGS:**

Antimicrobial Resistance

Antimicrobials: Antibiotics, Antivirals, Antifungals, Antiparasitics

Autoimmune Disease

General and Universal Precautions

Hand Washing

Hospital-Acquired Infection

ImmunosuppressionInfection Control

Needle Stick Injury

Sepsis

Septic Shock

V.L.5. Hepatic Dysfunction/Failure

**TAGS:**

Acute Hepatic Failure

Chronic Hepatic Failure

End-Stage Liver Disease

V.L.6. Renal Dysfunction/Failure

**TAGS:**

Acute Kidney Injury

Chronic Kidney Disease

End-Stage Renal Disease

Renal Replacement Therapy

V.L.7. Hematologic Dysfunction

**TAGS:**

Anemia, Neutropenia, Thrombocytopenia, Pancytopenia

Anticoagulation/Antiplatelet/Antifibrinolytic Therapy

Bone Marrow Transplant

Coagulopathy: DIC, Consumptive, Dilutional

Transfusion Therapy

V.L.8. Gastrointestinal Dysfunction

**TAGS:**

Hemorrhage

Ileus

Inflammatory/Infectious

V.L.9. Endocrine Dysfunction

**TAGS:**

Adrenal

Pancreatic

Pituitary

Thyroid

V.L.10. Dermatologic Dysfunction

**TAGS:**

Pressure Injury

V.L.11. Additional Critical Care Topics

**TAGS:**

Drug Overdose

Epidemic Management

ICU Management/Organization

ICU Monitoring

ICU Procedures

Multi-Organ Failure

Nutritional Support

Targeted Temperature Management

Toxicology

Transplantation Management

## V.M. Neuroanesthesia

V.M.1. Clinical Science

**TAGS:**

Cerebral Ischemia

Cerebral Vasospasm

Factors Impacting Cerebral Blood Flow

Factors Impacting Intracranial Pressure

V.M.2. Pharmacology

**TAGS:**

Anesthetics

Anticonvulsants

Anti-Parkinsonian Medications

Diuretics

Fluid Management

Steroids

Vasodilators and Vasoconstrictors

V.M.3. Clinical Management of Disease States

**TAGS:**

Arteriovenous Malformations

Cerebral Herniation

Cervical Spine Disease

Coma

Hydrocephalus, VP Shunts, Ventriculostomy

Intracranial Aneurysm

Intracranial Hypertension

Intracranial Masses

Intracranial Vascular Lesions

Moyamoya Disease

Pituitary Adenomas

Posterior Fossa Procedures

Skull-Base Tumors

Traumatic Brain Injury

V.M.4. Special Considerations in Neuroanesthesia

**TAGS:**

Deep Brain and Vagal Nerve Stimulators

External Ventricular Drains

Interventional Radiology

Intraoperative MRI

Neurophysiologic Monitoring

Patient Positioning

Seizures

Spinal Drains

Venous Air Embolism

## V.N. Thoracic Anesthesia

V.N.1. Clinical Science

**TAGS:**

Anesthetic Techniques for Thoracotomy and Thoracoscopy

Complications: Cardiac Herniation

Hypoxic Pulmonary Vasoconstriction

Lung Separation Techniques: Double-Lumen Tubes and Endobronchial Blockers

One-Lung Ventilation

Preoperative Assessment and Optimization

Pulmonary Function Tests (PFTs)

V.N.2. Pharmacology

**TAGS:**

Bronchodilators

Fluid Management

Pulmonary Vasodilators

V.N.3. Clinical Management of Disease States

**TAGS:**

Bronchopulmonary Fistula

Bullae/Recurrent Pneumothorax

Chronic Obstructive Pulmonary Disease

Empyema

Endocrine-Secreting Tumors

Mediastinal Masses

Myasthenia Gravis/Myasthenic Syndromes

Pleural Disease

Reactive Airways Disease

Restrictive Pulmonary Disease

V.N.4. Special Considerations in Thoracic Anesthesia

**TAGS:**

Esophageal Resection

Jet Ventilation

Lung Resection

Mediastinoscopy

Pain Management

Pneumonectomy

Postoperative Complications

Rigid Bronchoscopy

Thymectomy

Tracheal Resection

## V.O. Cardiac Anesthesia

V.O.1. Clinical Science

**TAGS:**

Factors Impacting Cardiopulmonary Pressures

Factors Impacting Contractile Heart Function

Factors Impacting Coronary Blood Flow

Myocardial Ischemia/Reperfusion

V.O.2. Pharmacology

**TAGS:**

Antiarrhythmics

Antiplatelet Agents

Beta-Adrenergic Blockers

Chronotropic Agents

Heparin and Alternatives

Inotropes

Protamine

Statins

Vasodilators and Vasoconstrictors

V.O.3. Clinical Management of Disease States

**TAGS:**

Aortic Aneurysm: Thoracic

Aortic Dissection

Aortic Insufficiency

Aortic Stenosis

Arrhythmias

Atrial Septal Defects

Carcinoid Heart Disease

Congenital Heart Disease

Congestive Heart Failure

Diastolic Dysfunction/Heart Failure

Endocarditis

Hypertrophic Cardiomyopathy

Ischemic Cardiomyopathy

Ischemic Heart Disease

Mitral Regurgitation

Mitral Stenosis

Nonischemic Cardiomyopathy

Pericardial Effusion/Tamponade

Post-Cardiac Arrest Care/Normothermia/Hypothermia

Pulmonary Valve Disease

Tricuspid Regurgitation

Tricuspid Stenosis

Ventricular Septal Defects

V.O.4. Special Considerations in Cardiac Anesthesia

**TAGS:**

Anticoagulation and Reversal

Blood Conservation

Circulatory Assist Devices

ECMO (VA, VV)

Extracorporeal Circulation

Heparin-Induced Thrombocytopenia

Pacemaker Management

Thoracoabdominal Aortic Aneurysm

Transesophageal Echocardiography

Unintended Intraoperative Awareness

## V.P. Vascular Anesthesia

V.P.1. Clinical Science

**TAGS:**

Cardiac Risk Assessment and Preoperative Optimization

Factors Affecting Organ/Peripheral Perfusion

V.P.2. Pharmacology

**TAGS:**

Heparin

Protamine

Statins

V.P.3. Clinical Management of Disease States

**TAGS:**

Aortic Aneurysm

Carotid Endarterectomy, Stent Procedures

Peripheral Vascular Disease

V.P.4. Special Considerations in Vascular Anesthesia

**TAGS:**

Anticoagulation and Reversal

Aortic Clamping

Carotid Clamping

Endovascular Surgery

Renal Protection

## V.Q. Regional Anesthesia

V.Q.1. General Topics

**TAGS:**

Anticoagulation in Regional Anesthesia

Guidelines and Standards

Indications and Contraindications

Nerve Localization: Nerve Stimulator, Landmarks, Ultrasound

Nerve Structural Anatomy

Sedation and Monitoring

V.Q.2. Pharmacology

**TAGS:**

Liposomal Bupivacaine

Local Anesthetics and Adjuncts

V.Q.3. Neuraxial Anesthesia

**TAGS:**

Anatomy and Sonoanatomy

Caudal Anesthesia

Combined Spinal-Epidural Anesthesia

Complications

Epidural Anesthesia

Epidural Blood Patch

Factors Influencing Onset and Duration

Indications and Contraindications

Medications: Local Anesthetics, Opioids, Adjuncts

Patient-Controlled Epidural Analgesia

Spinal Anesthesia

V.Q.4. Upper Extremity Regional Anesthesia

**TAGS:**

Brachial Plexus Anatomy and Sonoanatomy

Brachial Plexus Blocks: Interscalene, Supraclavicular, Infraclavicular, Axillary

Cervical Plexus Blocks: Superficial, Deep

Other: Musculocutaneous, Wrist Blocks

Suprascapular/Shoulder Blocks

V.Q.5. Lower Extremity Regional Anesthesia

**TAGS:**

Ankle Block and Anatomy

Inguinal Region Nerve Blocks: Femoral, LFCN, Obturator, Fascia Iliaca, 3-in-1

Lumbar Plexus, Femoral, and Saphenous Anatomy and Sonoanatomy

Saphenous, Adductor Canal Blocks

Sciatic Nerve and Sacral Plexus Anatomy and Sonoanatomy

Sciatic Nerve Blocks: Popliteal, Transgluteal, Infragluteal

V.Q.6. Truncal Regional Anesthesia

**TAGS:**

Abdominal Wall Blocks: TAP, Ilioinguinal, Iliohypogastric, Rectus Sheath

Anterior and Lateral Chest Blocks: PECS, Serratus

Paravertebral Anatomy and Sonoanatomy

Paravertebral Blocks

Posterior Truncal Blocks: Quadratus Lumborum, Erector Spinae, Retrolaminar

Truncal Block Anatomy and Sonoanatomy

V.Q.7. Complications and Side Effects

**TAGS:**

Falls

Hematoma

Horner Syndrome

Infection/ Abscess

Intraneural Injections

Local Anesthetic Systemic Toxicity

Neuropraxia, Nerve injury

Opioid

Phrenic Nerve Block

Postdural Puncture Headache

Rebound Pain

V.Q.8. Ultrasound-Guided Regional Anesthesia

**TAGS:**

Image Generation and Display

Needle and Probe Alignment

Ultrasound Artifacts

Ultrasound Physics

V.Q.9. Continuous Regional Anesthesia

**TAGS:**

Indications and Contraindications

Perineural Infusions: Medications, Pumps, Dosing Parameters

V.Q.10. IV Regional

**TAGS:**

Complications

Factors Influencing Onset and Duration

Indications and Contraindications

Medications: Local Anesthetics, Opioids, Adjuncts

## V.R. Acute Pain Management

V.R.1. Analgesic Pharmacology

**TAGS:**

Acetaminophen

Alpha-2 Agonists

Anticonvulsants

Antidepressants

Gabapentinoids

Intravenous Local Anesthetic Infusions

Intravenous Medications

Multimodal Analgesia

Muscle Relaxants

NMDA Antagonists

NSAIDs/COX-2 Inhibitors

Opioid Agonists, Antagonists

Opioids

Oral/Transdermal Opioids

Parenteral Medications

Patient-Controlled Analgesia

Transdermal Medications

V.R.2. Alternative Analgesic Modalities

**TAGS:**

Acupuncture

Complementary Therapies

Hypnosis

TENS Therapy

V.R.3. Acute Pain Evaluation and Treatment

**TAGS:**

Acute on Chronic Pain

Cancer Pain

Discharge Planning

Escalation of Therapy

Inflammatory Pain

Neuropathic Pain

Nociceptive Pain

Opioid Conversion

Opioid Tolerance

Opioid-Induced Hyperalgesia

Oral Therapy

Parenteral Therapy

Patient-Controlled Analgesia

Physical Therapy

Psychiatric Comorbidities

Substance Use Disorder

Transdermal Therapy

Transition to Chronic Pain

V.R.4. Monitoring and Safety

**TAGS:**

Cardiopulmonary Monitoring

Complications and Side Effects

Controlled Substance Prescribing

Drug Testing

Legal Issues

Level of Care

# VI. SPECIAL PROBLEMS OR ISSUES IN ANESTHESIOLOGY

## VI.A. Electroconvulsive Therapy

VI.A.1. Physiology

**TAGS:**

Central Nervous System Effects

Hemodynamic Effects

VI.A.2. Pharmacology

**TAGS:**

Anticholinergics

Beta-Blockers

Sedative-Hypnotics

Vasodilators

## VI.B. Organ Donors

VI.B.1. Pathophysiology

VI.B.2. Clinical Management

**TAGS:**

Criteria for Brain Death

Donation after Cardiac Death

Donation after Brain Death

## VI.C. Non-Operating Room Anesthesia (NORA)

VI.C.1. MRI

**TAGS:**

Anesthetic Management

Monitoring

Risks/Contraindications

VI.C.2. Electrophysiology

**TAGS:**

Ablation Procedures/Cardioversion

Cardiac Implantable Devices

VI.C.3. Interventional Radiology

**TAGS:**

Angiography/Thrombolysis

CT-Guided Procedures

Intravenous Contrast

Transhepatic Intrajugular Portosystemic Shunt

VI.C.4. Gastrointestinal Endoscopy

**TAGS:**

Colonoscopy/Upper Endoscopy

Endoscopic Retrograde Cholangiopancreatography

Invasive Endoscopic Procedures

Monitored Anesthesia Care (MAC) vs. General Anesthesia

VI.C.5. Neurointerventional Procedures

**TAGS:**

Acute Stroke/Cerebral Revascularization

Cerebral Vasospasm

Intracranial Aneurysms

VI.C.6 Bronchoscopy Procedures

**TAGS:**

Endobronchial Ultrasound (EBUS)

Pulmonary Hemorrhage

VI.C.7. Cardiac Catheterization Procedures

**TAGS:**

Left Atrial Appendage Occlusion Procedures

Mitral Valve Repairs

Transfemoral Aortic Valve Replacement (TAVR)

VI.C.8. Transesophageal Echocardiography

VI.C.9. Radiation Therapy

## VI.D. Physician Impairment or Disability

VI.D.1. Substance Use Disorder

VI.D.2. Fatigue

VI.D.3. Aging

VI.D.4. Visual and Auditory Impairment

VI.D.5. Americans with Disabilities Act (ADA)

VI.D.6. Abusive or Disruptive Physicians

VI.D.7. Sexual Harassment

VI.D.8. Physician Burnout and Wellness

## VI.E. Ethics, Practice Management and Medicolegal Issues

VI.E.1. Professionalism and Licensure

VI.E.2. Ethics

**TAGS:**

Do-Not-Resuscitate (DNR) Orders and Advance Directives

End-of-Life Issues (Withholding/Withdrawal)

Jehovah’s Witness Patient Care

Mandatory Reporting

VI.E.3. Informed Consent

**TAGS:**

Components of Informed Consent

Principles

VI.E.4. Malpractice

**TAGS:**

Closed Claims Findings

Legal Actions and Consequences

National Practitioner Data Bank

Professional Liability Insurance

VI.E.5. Practice Management

**TAGS:**

Health Insurance Portability and Accountability Act (HIPAA)

Medicare/Medicaid Requirements

Patient Privacy

VI.E.6. Costs of Medical/Anesthesia Care

**TAGS:**

Operating Room Management

VI.E.7. Patient Safety

**TAGS:**

Disclosure of Errors to Patients

Medication Errors: Assessment and Prevention

VI.E.8. Healthcare Disparities

**TAGS:**

Reducing Disparities

Cultural Competency

Effects of Disparities on Access to and Quality of Care, Outcomes, and Health Status

Social Determinants of Health

VI.E.9. Diversity, Equity, and Inclusion (DEI) in the Healthcare Workplace

**TAGS:**

Approaches to Improving DEI in Healthcare

Equity in the Workplace

Threats to DEI, Including Unconscious Bias, Microaggressions, and Stereotype Threat

# VII. QUALITY IMPROVEMENT

## VII.A. Quality Assurance and Performance Improvement

VII.A.1. Design and Implementation of a QI Project

**TAGS:**

Tools for Process Improvement

QI Methods

VII.A.2. Communication and Reporting

**TAGS:**

Outcomes Registries

Public Reporting

VII.A.3. Analysis/Assessment of Information

**TAGS:**

Artificial Intelligence

Data Analytics

Failure Modes and Effects Analyses

Morbidity and Mortality

Peer Review

Quality Reporting and Dashboards

Root Cause Analyses

VII.A.4. Patient Safety

**TAGS:**

Communication

Culture of Safety

Epidemiology of Error

Evidence-Based Practice

Human Factors

Methods and Tools for Evaluating Safety Events

Outcomes Improvement

Prevention of Harm/Complications

Safety Enhancing Systems, Tools, and Processes

# VIII. OVERVIEW OF ANESTHESIOLOGY TOPICS

## VIII.A. Review of Current Topics in Anesthesiology

# IX. CRITICAL CARE MEDICINE

## IX.A. Basic Pathophysiology

IX.A.1. Central Nervous System

**TAGS:**

Altered Mental Status

Brain Death

Central Pontine Myelinolysis

Cerebral Blood Flow

Embolic/Thrombotic

Hemorrhagic

Infection

Intracranial Compliance, Mass Lesion

Ischemic

Neuromuscular Disorders

Seizures and Status Epilepticus

Spinal Cord Injury

Stroke

Vascular Malformations

IX.A.2. Cardiovascular

**TAGS:**

Aneurysm, Abdominal

Aneurysm, Thoracic

Aortic Insufficiency

Aortic Stenosis

Aortic Valve

Asystole

Cardiac Contusion

Cardiac Transplantation

Cardiogenic

Congenital Heart Disease in Adults

Coronary Artery Disease, Myocardial Ischemia/Infarction

Diastolic Dysfunction

Dissections

Deep Vein Thrombosis

Eisenmenger Syndrome

Endocarditis

Heart Block

Hypertension

Hypertrophic Cardiomyopathy (Hypertrophic Obstructive Cardiomyopathy, Asymmetric Septal Hypertrophy, Idiopathic Hypertrophic Subaortic Stenosis )

Hypovolemic

Infection/Inflammation

Intracardiac Shunts

Junctional or Nodal Rhythm

Left Ventricular

Mitral Regurgitation

Mitral Stenosis

Mitral Valve

Myocardial Function/Dysfunction

Myocarditis

Obstructive

Other Conduction Abnormalities

Other Myocardial

Oxygen Supply and Demand

Pericarditis

Peripheral Vascular Disease

Pulmonary Hypertension

Pulmonary Valve

Pulmonic Insufficiency

Pulmonic Stenosis

Pulseless Electrical Activity (PEA)

Rhythm Disturbances

Right Ventricular

Shock States

Supraventricular Tachyarrhythmias, Including Atrial Flutter, Fibrillation

Systemic Hypertension

Systolic Dysfunction

Tetralogy of Fallot

Trauma

Tricuspid Valve Dysfunction

Valvular

Ventricular Tachycardia/Fibrillation

IX.A.3. Pulmonary

**TAGS:**

Airway Diseases

ARDS

Aspiration

Bronchopleural Fistula

Chest Trauma

Community-Acquired

Embolic Disorders

Empyema/Abscess

Hypercapnic (Acute and Chronic)

Hypoxic (Acute and Chronic)

Infection

Inflammatory and Autoimmune Diseases

Lung and Chest Wall Tumors

Lung Transplantation

Mediastinitis

Obstructive

Other Ventilation-Perfusion Abnormalities

Pleural Effusion

Pneumonia

Pneumothorax, Volutrauma

Pulmonary Mechanics

Reactive

Respiratory Failure

Restrictive

Sleep Apnea

Tracheal Disruption

Tracheobronchitis

Transfusion-Related Acute Lung Injury

Ventilator-Associated

IX.A.4. Renal

**TAGS:**

AKI

Infection

Intrinsic Renal

Postrenal

Prerenal

Renal Tubular Acidosis

IX.A.5. Hematologic/Oncologic

**TAGS:**

Anemia

Bone Marrow/Stem Cell Transplantation

Carboxyhemoglobin

Coagulopathies

Disseminated Intravascular Coagulation

Fibrinolysis

Methemoglobin

Polycythemia

Platelet Abnormalities

Thrombocytopenia

Thrombocytosis

Tumor Lysis Syndrome

Vitamin K Dependent Coagulopathy

White Blood Cell Disorder

IX.A.6. Obstetric

**TAGS:**

Coagulopathy, Bleeding Disorders

Complications of Pregnancy

Emboli

Liver Function Abnormalities

Pre-Eclampsia/Eclampsia

IX.A.7. Endocrine

**TAGS:**

Adrenal

Adrenal Insufficiency

Cerebral Salt Wasting

Critical Illness Effects on Thyroid Function

Cushing Syndrome

Diabetes Insipidus, Including Central, Nephrogenic

Diabetes Mellitus

Hyperglycemia, Diabetic Ketoacidosis (DKA), Nonketotic Hyperglycemic Coma (NKHC)

Hyperthyroidism, Including Thyroid Storm

Hypoglycemia

Hypothyroidism, Including Myxedema

Pheochromocytoma

Pituitary

SIADH

Thyroid Function Abnormalities

IX.A.8. Gastrointestinal

**TAGS:**

Abdominal Compartment Syndrome

Bowel Disorders

Diarrhea, Nausea, Vomiting

Gall Bladder Disease (Stones, Cholecystitis)

Gastrointestinal Hemorrhage

Gastrointestinal Motility Dysfunction

Hepatic

Hepatic Dysfunction/Failure (Acute and Chronic)

Hepatic Encephalopathy

Hepatitis

Hepatocellular Carcinoma

Hepatorenal Syndrome

Ileus

Infectious

Malabsorption

Pancreas

Pancreatic Cancer

Pancreatitis

Perforation, Volvulus

Pseudomembranous Colitis

Stomach

Toxic Megacolon

Vascular Diseases

IX.A.9. Dermatologic

**TAGS:**

Allergic Reactions

Infection

Inflammatory Diseases of the Skin

Necrotizing Fasciitis

Stevens-Johnson Syndrome

IX.A.10. Immunologic/Infectious Disease

**TAGS:**

Acquired

Autoimmune

Graft vs. Host Disease

HIV/AIDS

Immune Suppression

Mixed Connective Tissue Disease

Sepsis

Systemic Inflammatory Response Syndrome

Therapeutic

Vasculitides

IX.A.11. Acid-base and Electrolyte Abnormalities

**TAGS:**

Acid-Base Abnormalities

Calcium

Chloride

Electrolyte Abnormalities

Magnesium

Metabolic

Mixed

Phosphorus

Potassium

Respiratory

Sodium

## IX.B. Critical Illness Diagnosis and Management

IX.B.1. Central Nervous System

**TAGS:**

Abscess

Altered Mental Status

Angiography

Anticonvulsants

Antimicrobials

Brain Death

Coma

Critical Illness Polyneuropathy

Degenerative Disease of the Brain

Delirium

Diagnoses

Diagnostic Modalities

EEG, Processed EEG

Embolic/Thrombotic

EMG/NCS

Encephalitis

Guillain-Barré Syndrome

Head Injury, Closed or Open

Hemorrhagic (Subarachnoid, Subdural, Epidural Hematoma)

ICP Measurement

ICP-Controlling Medications

Infectious

Interventional Radiology

Ischemic

Jugular Venous Saturation

Lumbar Puncture

Management Strategies

Meningitis/Ventriculitis

Myasthenia Gravis

Myopathy

Neuromuscular Disorders

Nuclear Medicine Studies

Other Therapies

Pituitary Disorders

Plasmapheresis/Plasma Exchange

Seizures and Status Epilepticus

Spinal Cord Injury

Steroids

Stroke

Subarachnoid, Subdural, Epidural Hematoma

Surgical Interventions

Transcranial Doppler

Vascular Malformations

Vasoactive Drugs

IX.B.2. Cardiovascular

**TAGS:**

Automatic Implantable Cardioverter Defibrillators

Aneurysm, Thoracic

Anticoagulants and Antithrombotics

Antidysrhythmics

Antifibrinolytics

Antihypertensives

Antimicrobials

Antiplatelet Agents

Arterial Pressure

Asystole

Atrial Flutter/Fibrillation

Biomarkers

Cardiac Contusion

Cardiac Output Monitoring

Cardiac Transplantation, Rejection, Complications

Cardiac Ultrasound (TTE, TEE)

Cardiogenic

Cardiomyopathy

Circulatory Support Systems

Congenital Heart Disease in Adults

Coronary Artery Disease, Myocardial Ischemia/Infarction

CVP

Diagnostic Modalities

Diastolic Dysfunction

ECG

ECMO

Eisenmenger Syndrome

Endocarditis

External Defibrillators

Heart Block

Hemodynamic Monitoring

Heparin

Heparinoids

Hypertension

Hypertrophic Cardiomyopathy (Hypertrophic Obstructive Cardiomyopathy, Asymmetric Septal Hypertrophy, Idiopathic Hypertrophic Subaortic Stenosis)

Hypovolemic

Imaging

Infectious

Inotropes/Chronotropes/Lusitropes

Intra-Aortic Balloon Pump

Junctional or Nodal Rhythm

Left or Right Ventricular Assist Device

Left Ventricular

Low Molecular Weight Heparin

Management Strategies

Myocardial Function/Dysfunction

Myocarditis

Noninfectious Myocarditis

Obstructive

Other Bedside Ultrasound

Pacemakers/Defibrillators

Papillary Muscle Dysfunction

Pericardial Effusion

Pericardiocentesis

Pericarditis

Peripheral Vascular Disease

Pulmonary Hypertension

Pulmonic Valve Disease

Pulseless Electrical Activity (PEA)

Regurgitation

Rhythm Disturbances

Right Ventricular

Shock States

Stenosis

Stress-Induced Cardiomyopathy

Stunned Myocardium

Supraventricular Tachyarrhythmias, Other

Systolic Dysfunction

Tamponade

Tetralogy of Fallot

Thrombin Inhibitors

Thrombolytics

Transthoracic

Transvenous/Epicardial

Traumatic

Tricuspid Valve Disease

Valvular

Vasoconstrictors

Vasodilators

Ventricular Tachycardia/Fibrillation

Warfarin

IX.B.3. Pulmonary

**TAGS:**

Airway Diseases

Airway Pressure-Release Ventilation

Antimicrobials/Antivirals

ARDS

Arterial Blood Gas

Aspiration

Assist Control

BiPAP

Capnography

Chest Trauma

Chest X-ray

Community-Acquired

CPAP

CT/MRI

Diagnoses

Diagnostic Modalities

Differential Lung Ventilation

Embolic Disorders

Empyema/Abscess

High-Frequency/Oscillation

Hypercapnic (Acute and Chronic)

Hypoxic (Acute and Chronic)

Imaging

Infection

Inflammatory and Autoimmune Diseases

Invasive Ventilation Modes

Laryngoscopy and Bronchoscopy

Lung and Chest Wall Tumors

Lung Transplantation, Rejection, Complications

Management of Bronchopleural and Bronchocutaneous Fistulae

Management Strategies

Mediastinitis

Noninvasive

Nuclear Studies

Obstructive

Other Ventilator Strategies

Pressure Control/Volume Control

Pleural Effusion

Pneumonia

Positioning

Pressure-Support Ventilation

Pulmonary Function Studies/Pulmonary Mechanics

Pulmonary Medications

Pulse Oximetry

Respiratory Failure

Synchronized Intermittent Mandatory Ventilation

Spontaneous Breathing Trials

Thoracentesis

Thromboembolic

Tracheobronchitis

Transfusion-Related Acute Lung Injury

Ultrasound

Ventilator-Associated

Ventilatory Support

Volutrauma/Barotrauma

IX.B.4. Renal

**TAGS:**

Angiography

Antimicrobials/Antifungals

Biomarkers

Buffers

Continuous Renal Replacement Therapies Including Ultrafiltration

Contrast-Induced Nephropathy

CT/MRI

Diagnostic Modalities

Diagnostic X-ray

Diuretic Therapy

Electrolytes, Osmolarity, and Specific Gravity (Serum, Urine)

Fluid and Electrolyte Management

Imaging

Infection

Intermittent Hemodialysis

Intrinsic Renal

Management Strategies

N-Acetylcysteine

Pharmacologic Therapies

Postrenal

Prerenal

Renal Failure

Renal Replacement Therapies

Renal Transplantation

Renal Trauma

Renal Tubular Acidosis

Ultrasound

IX.B.5. Hematologic/Oncologic

**TAGS:**

Anemia

Anticoagulants

Antiplatelet Agents

Carboxyhemoglobin

Coagulopathies

Congenital

Diagnoses

Diagnostic Modalities

Disseminated Intravascular Coagulation

Erythropoietin, G-CSF

Fibrinolysis

Hemoglobin Abnormalities

Heparin

Heparinoids

Hypercoagulable State

Isolated Factor Abnormalities

IVC Filters, Other Mechanical Devices

Low-Molecular-Weight Heparin

Management Strategies

Methemoglobin

Other Hemoglobinopathies

Plasmapheresis/Plasma Exchange

Platelet Abnormalities

Polycythemia

Reversal Agents

Routine Blood Studies

Thrombin Inhibitors

Thrombocytopenia, Including Heparin-Induced

Thrombocytosis

Thrombolytics

Transfusion and Factor Replacement

Tumor Lysis Syndrome

Vitamin K Dependent

Warfarin

IX.B.6. Obstetric

**TAGS:**

Anticoagulants

Anticonvulsants

Antihypertensive Therapy

Antimicrobials

Coagulopathy, Bleeding Disorders

Delivery

Diagnoses

Diagnostic Modalities

Emboli (Amniotic Fluid, Thromboemboli, Other)

Liver Function Abnormalities

Management Strategies

Peripartum Infection

Preeclampsia/Eclampsia

IX.B.7. Endocrine

**TAGS:**

Adrenal

Adrenal Insufficiency

Antihypertensives

Cerebral Salt Wasting

Critical Illness Effects on Thyroid Function

Cushing Syndrome

Diabetes Insipidus Including Central, Nephrogenic

Diabetes Mellitus

Diagnoses

Diagnostic Modalities

Desmopressin

Glucose Management

Hyperglycemia, Diabetic Ketoacidosis (DKA), Non-Ketotic Hyperglycemic Coma (NKHC)

Hyperthyroidism, Including Thyroid Storm

Hypoglycemia

Hypothyroidism, Including Myxedema

Insulin

Laboratory Studies (Serum, Urine)

Management Strategies

Oral Hypoglycemic Agents

Other Therapies

Pheochromocytoma

Pituitary

SIADH

Steroids (Glucocorticoid and Mineralocorticoid)

Thyroid Function Abnormalities

Ultrasound

IX.B.8. Gastrointestinal

**TAGS:**

Abdominal Compartment Syndrome

Abdominal Pressure Measurement

Antimicrobials

Assessment of Bowel Motility

Bowel Disorders

Coagulation Parameters

Diagnoses

Diagnostic Modalities

Diuretics, Renal Replacement Therapies

Dysfunction/Failure, Acute and Chronic

Endoscopy, Upper, Lower

Endoscopy, Upper, Lower with Therapeutic Intervention

Endoscopy, Upper, Lower; Endoscopic Retrograde Cholangiopancreatography

Gall Bladder Disease (Stones, Cholecystitis)

Gastritis

Gastrointestinal Hemorrhage

Gastrointestinal Motility Dysfunction, Gastroesophageal Reflux Disease

Hepatic

Hepatic Encephalopathy

Hepatitis

Hepatocellular Carcinoma

Hepatorenal Syndrome

Imaging

Interventional Radiology (Embolization, Coiling)

Lactulose, Rifaximin

Liver Transplantation, Rejection, Complications

Management of Increased ICP

Management Strategies

MRI

Nuclear Medicine Studies

Nutritional Assessment (Albumin, Prealbumin)

Nutritional Support (Enteral, Parenteral)

Pancreatic Cancer

Pancreatitis

Paracentesis

Pharmacologic Management

Stool Assessment (Occult Blood, *C. Diff* Toxin)

Surgical Intervention (Timing, Therapeutic Options)

Ulcer

Ultrasound

Urine Electrolytes (Fractional Excretion of Sodium)

X-ray

IX.B.9. Dermatologic

**TAGS:**

Allergic Reactions

Antimicrobials, Antihistamines

Complete Blood Count with Differential

Diagnoses

Diagnostic Modalities

Immunologic Studies

Infection

Inflammatory Diseases of the Skin

Management Strategies

Necrotizing Fasciitis

Other Topical Medications

Pharmacologic

Steroids, Systemic and Topical

Stevens-Johnson Syndrome

IX.B.10. Immune/Infectious Disease

**TAGS:**

Antimicrobials (Including Prophylaxis)

Autoimmune

Biomarkers

Biopsy, Selective Aspiration

Congenital

Cultures

Diagnoses

Diagnostic Modalities

Graft vs. Host Disease

Highly Active Antiretroviral Therapy

HIV/AIDS

Immune Suppression

Immunologic Studies

Laboratory Studies

Management Strategies

Neutropenia

Pharmacologic

Sepsis

Systemic Inflammatory Response Syndrome

Systemic Lupus Erythematosus

Steroids

IX.B.11. Acid-base and Electrolyte Abnormalities

**TAGS:**

Acid-Base Abnormalities

Albumin

Appropriate Renal and Endocrine Strategies

Arterial Blood Gas

Calcium

Chloride

Diagnostic Modalities

Electrolyte Abnormalities

Electrolyte Replacement as Appropriate

Electrolytes, Osmolarity, and Specific Gravity (Serum, Urine)

Magnesium

Management Strategies

Metabolic

Phosphorus

Potassium

Respiratory

Sodium

Ventilatory Support

## IX.C. Specialized Areas

IX.C.1. Biostatistics

**TAGS:**

Chi-Squared

Kaplan-Meier

Meta-Analysis

Number Needed to Treat

Odds Ratio

Propensity Score

Regression Analysis

Relative Risk

Receiver Operating Characteristic Curve

Sample Size Estimate

Sensitivity, Specificity

Statistical Significance (P-Value)

Study Design

IX.C.2. Burns

**TAGS:**

Airway Management

Antimicrobials

Complications

Electrical Burns

Fluids and Resuscitation

Inhalation Injury

Management

IX.C.3. Disaster Management

**TAGS:**

Biologic, Chemical, and Nuclear Exposures

Epidemic

IX.C.4. Drowning, Fatal, Near-drowning

**TAGS:**

Fresh Water

IX.C.5. ICU Ethics

**TAGS:**

Brain Death

End-of-Life, Futility

Impaired Providers

Informed Consent

Living Will/Durable Power of Attorney/Healthcare Surrogate

Organ Donation

Palliative Care, Hospice

Patient Autonomy

IX.C.6. ICU Management and Organization

**TAGS:**

Clinical Care Bundles

Daily Wake-Up Test

Handover/Communication

Health Insurance Portability and Accountability Act (Privacy and Security)

Quality Assurance/Quality Improvement (Patient Safety)

Scoring Systems

Sedation/Analgesia/Delirium Assessment

Triage and Resource Utilization

IX.C.7. Infection Control

**TAGS:**

Catheter-Associated Infections

Environmental Exposures

General/Universal Precautions

Isolation Techniques

Nosocomial Infections

Pneumonia (Ventilator-Associated, Hospital-Associated, Etc.)

Reverse Isolation

Urinary Tract Infection (UTI), Catheter-Associated UTI

IX.C.8. Life Support and Resuscitation

**TAGS:**

ACLS

Other

IX.C.9. Nutrition Management

**TAGS:**

Enteral and Parenteral Nutrition (Formula, Caloric Intake)

Enteral Tubes

Refeeding Syndrome

IX.C.10. Assessment and Management of Pain, Sedation, and Delirium

**TAGS:**

Multimodal Analgesia

Opiate Management

Regional Analgesia Techniques

Sedation/Analgesia/Pain/Delirium Assessment

IX.C.11. Pharmacology (Indications, Contraindications, and Complications)

**TAGS:**

Anaerobes

Antibiotics

Antidepressants

Antifungal

Antimicrobial Resistance

Antimicrobials

Antiparasitic

Antipsychotics

Antiviral

Genetic Considerations

Gram-Negative Organisms

Gram-Positive Organisms

Lithium

Neuromuscular Blocking Drugs

Pharmacokinetics, Pharmacodynamics, and Drug Metabolism

Prophylactic Antimicrobials

Sedatives/Hypnotics

Spirochetal and Rickettsial

SSRIs

Tuberculosis

Tricyclic Antidepressants

IX.C.12. Poisonings, Toxic Ingestion, Overdoses, and Withdrawal

IX.C.13. Procedures

**TAGS:**

Airway

Arterial

Chest Tubes

Complications

Intraosseous

Laryngeal Mask Airways/Others

Physics of Ultrasound

Tracheostomy

Ultrasound

Vascular Access

IX.C.14. Thermoregulation

**TAGS:**

Environmental

Fever

Heat Stroke

Hyperthermia

Hypothermia

Malignant Hyperthermia

Neuroleptic Malignant Syndrome

# X. PAIN MEDICINE

## X.A. Background Concepts

X.A.1. Anatomy and Physiology: Mechanisms of Nociceptive Transmission

**TAGS:**

Autonomic Nervous System

Central Mechanisms: Spinal and Medullary Dorsal Horns

Central Mechanisms: Segmental and Brain Stem

Central Mechanisms: Thalamocortical

Peripheral Mechanisms: Somatosensory, Somatic, Visceral

X.A.2. Mechanisms of Pain Transmission and Modulation

**TAGS:**

Central Mechanisms and Implications for Treatment of Pain

Descending Inhibition and Facilitation, Pain Modulation

Mechanisms and Physiology of Somatic and Visceral Pain

Mechanisms of Acute Pain, Inflammatory, and Neuropathic Pain

Neurotransmitters Involved in Pain Modulation

Peripheral and Central Sensitization: Mechanisms and Implications

Peripheral Mechanisms of Pain Transmission and Modulation

Referred Pain

Synaptic Transmission of Pain in the Dorsal Horn

X.A.3. Interpreting Clinical Research Studies about Treatments for Pain

**TAGS:**

Epidemiology: Measurement of Burden in a Population, Including Epidemiologic Measures of Occurrence (Prevalence, Incidence)

Epidemiology: Use of Data from Epidemiologic Studies of Pain

Epidemiology: Use of Risk Factors to Guide Treatment

Evaluating Study Results: Basic Concepts, Statistical Analysis, Reliability and Validity, Sensitivity and Specificity

Evaluating Study Results: Minimal Clinically Important Difference, Meta-Analysis, Confounding Variables, Grades of Evidence, Influence of Bias

Principles of Clinical Trial Design: Inclusion/Exclusion Criteria, Use of Study Instruments, Development of Hypothesis

Research Study Design - Cohort Studies: Use to Determine Natural History and Predictors of Outcome

Research Study Design - Correlational Studies, Case Reports, Retrospective Studies, Cross-Sectional Surveys

Research Study Design - Observational Studies: Uses and Limitations (e.g., Measurement of Strength of Association Between Risk Factors and Pain); Known Major Risk Factors for Development of Chronic Pain

Research Study Design - Randomized Controlled Trials, Prospective, Experimental

X.A.4. Ethical Standards in Pain Management and Research

**TAGS:**

Conflicts of Interest and Financial Disclosure

Ethics of Pain Management and Research: Principles of Justice, Autonomy, Beneficence, Nonmaleficence

Informed Consent

Professionalism

X.A.5. Teamwork and Care Coordination

**TAGS:**

Importance of Coordination of Care

Participation in Quality Assurance, Identifying System Errors

Transitions of Care, Hand-Off Procedures

X.A.6. Legal and Regulatory Issues

**TAGS:**

Elements of Medical Malpractice: Duty, Breach of Duty, Causation, Damages

Legal Actions and Consequences: National Practitioner Data Bank, Closed Claims

Patient Privacy, Confidentiality, Health Insurance Portability and Accountability Act

Requirements for Reporting Impaired Healthcare Professionals

Understanding Laws Related to Controlled Substances

Workers Compensation, Disability Evaluations

## X.B. Assessment of Pain

X.B.1. Assessment of Pain

**TAGS:**

Components of Pain Assessment: Basic Examination, Assessment of Function, Biopsychosocial Assessment

Measurement of Pain: Direct Pain Measurement - Self-Report, Indirect Pain Measurement - Observations

Pain Sensory Testing: Mechanical Allodynia, Cold and Warm Allodynia

Pain Sensory Testing: Pain Threshold, Pain Tolerance

Pain Sensory Testing: Quantitative Sensory Testing

Terminology: Hyperalgesia, Paresthesia, Spontaneous Pain, Evoked Pain, Allodynia, Anesthesia Dolorosa

X.B.2. Placebo and Pain

**TAGS:**

Ethics of Placebo in Clinical Trials and Clinical Practice

Nocebo Effect

Placebo as Treatment Modality

Placebo Response: Mechanisms and Interpretation

Placebo: Definition and Incidence

Role of Placebo in Clinical Trials: Response Bias, Regression to Mean, Open-Hidden Paradigm

X.B.3. Assessment of Functional Outcomes and Disability

**TAGS:**

Environmental Factors: Social Attitudes, Workplace

Functioning and Disability: Body Functions, Impairment, Limitations and Restrictions

Personal Factors: Role of Family, Cultural Background, Social Factors

Validated Tools to Assess Functional Status

X.B.4. Psychosocial and Cultural Aspects of Pain

**TAGS:**

Common Emotional Problems and Psychiatric Disorders Associated with Pain

Coping Styles: Definition and Effect on Pain Experience and Response to Treatment

Cultural, Environmental, and Racial Variations in Experience and Expression of Pain

Expectations, Coping, Cultural and Environmental Factors: Effect on Treatment Outcome, Maintenance of Treatment Effects

Individual Differences in Affective, Cognitive, and Behavioral Responses to Pain

Measurement: Screening Questionnaires, Validated Tools for Older or Cognitively Impaired Adults

Pain as a Biopsychological Experience: Definition and Measurement

Psychological Assessment: Role of Family, Financial Status, Cultural Beliefs

Role of Care Givers in Promoting Illness and Well Behavior

Role of Psychology, Physical and Occupational Therapy, Social Work

X.B.5. Sex, Gender, and Race Issues in Pain

**TAGS:**

Analgesic Response: Differences Between Sexes and Within the Same Sex

Definition of Sex and Gender

Sex Differences: Biologic and Psychosocial Contributions to Pain Response

Sex Differences: Nociceptive Response and Pain Perception

Sex Differences: Role in Epidemiology of Pain in Relation to Age and Reproductive History

Sex Differences: Role in Treatment Seeking, Delivery and Effectiveness of Treatment

X.B.6. Imaging and Electrodiagnostic Evaluation

**TAGS:**

Electrical Nerve Stimulation (EMG/NCV/Evoked Potentials): Uses and Limitations

Electroencephalography (EEG, MEG): Uses and Limitations

Laser-Evoked Potentials: Uses and Limitations

MRI, Functional MRI, and Magnetic Resonance Spectroscopy: Uses and Limitations

Nuclear Medicine Bone Scan: Uses and Limitations

Positron Emission Tomography (PET) Scan: Uses and Limitations

Quantitative Sensory Testing: Uses and Limitations

Skin Punch Biopsy: Assessment of Innervation Density

## X.C. Treatment of Pain – Pharmacology: Pharmacokinetics, Pharmacodynamics, Adverse Effects, Drug Interactions, and Indications/Contraindications

X.C.1. Opioids

**TAGS:**

Adverse Effects: Opioid-Induced Hyperalgesia, Opioid Tolerance, Cognitive Effects, Impact on Driving, Effects on Endocrine, Immune, Cardiac, and Respiratory Systems

Effectiveness of Opioids: Evidence Base, Effect on Function

Federal Regulations Regarding Prescribing of Controlled Substances

Mechanism of Action on Pain Transmission and Modulation

Pharmacokinetics, Pharmacodynamics, Adverse Effects, Drug Interactions, and Indications/Contraindications: Metabolism and Genetic Variability

Rationale for Opioid Rotation, Discontinuation of Opioids

Risk Assessment and Management of the Patient Taking Chronic Opioid Therapy

Route of Administration: Oral, Rectal, Transdermal, IV, Epidural, Spinal

Specific Drugs: Buprenorphine, Methadone, Morphine, Synthetic and Semi-Synthetic Opioids

X.C.2. Antipyretic Analgesics: Nonsteroidals, Acetaminophen, and Phenazone Derivatives

**TAGS:**

Adverse Effects

Drug Interactions and Indications/Contraindications

Mechanism of Action

Pharmacokinetics, Pharmacodynamics, Pharmacogenomics

Specific Drugs

X.C.3. Antidepressants and Anticonvulsants

**TAGS:**

Anticonvulsants: Mechanism of Action

Anticonvulsants: Pharmacokinetics, Pharmacodynamics, Adverse Effects, Drug Interactions, Indications/Contraindications

Anticonvulsants: Specific Drugs

Antidepressants: Mechanism of Action

Antidepressants: Pharmacokinetics, Pharmacodynamics, Adverse Effects, Drug Interactions, Indications/Contraindications

Antidepressants: Specific Drugs

X.C.4. Other Analgesic Pharmacotherapy: Mechanism of Action, Pharmacokinetics, Pharmacodynamics, Adverse Effects, Drug Interactions, Indications/Contraindications

**TAGS:**

Alpha-2 Adrenergic Drugs (Clonidine, Tizanidine)

Antihistamines

Benzodiazepines

Botulinum Toxin

Cannabinoids

CNS Stimulants

Corticosteroids

Ketamine and NMDA-Receptor Antagonists

Local Anesthetics and Membrane-Stabilizing Drugs

Miscellaneous Analgesic Agents

Muscle Relaxants and Antispasticity Drugs

Neuroleptic Drugs

Other Vasoactive Drugs (Terazosin, Verapamil)

Sympatholytic Drugs

TRPV1 Agonists, Capsaicin and its Analogs

Ziconotide and Other Calcium Channel Blocking Drugs

## X.D. Treatment of Pain: Procedural Treatments

X.D.1. General Considerations

**TAGS:**

Assessment of Infection Risk, Antibiotic Prophylaxis, Sterile Technique

Drug Selection: Steroids and Contrast Agents

Fluoroscopic Imaging and Radiation Safety

Indications and Appropriateness for Interventional Therapy

Preprocedural Factors and Evaluation of Health Status

Ultrasound Guidance: Basics, Techniques, Risks

X.D.2. Nonsurgical Stimulation-Produced Analgesia

**TAGS:**

Clinical Applications and Efficacy

Mechanisms

Peripheral Stimulation Techniques: TENS, Acupuncture, Vibration

X.D.3. Interventional Pain Management Including Nerve Blocks and Lesioning

**TAGS:**

Cranial Nerve Blocks and Ablation

Diagnostic and Treatment Purpose, Clinical Indications, Risks, Anatomy, Pharmacology, and Use of Drugs

Facet Joint and Zygapophyseal Injectionsa

Intrathecal Blocks and Neurolysis

Musculoskeletal: Tendon, Ligament, and Intra-Articular Injections

Nerve Blocks and Neurolytic Techniques: Risks, Side Effects, Management of Anticoagulation

Neuraxial Injections: Spinal, Epidural, Nerve Root Injections

Other Procedural Treatments for Pain

Peripheral Nerve Blocks (Including Genicular Nerve Blocks)

Radiofrequency Ablation: Lumbar, Cervical Indications

Radiofrequency Ablation: Lumbar, Cervical Techniques

Regional Tissue Plane Blocks: Transversus Abdominis, Erector Spinae, Serratus Plane, Pectoralis Blocks, and Others

Sympathetic Ganglion and Plexus Blocks

Vertebral Augmentation: Indications, Risks, Benefits, Complications

X.D.4. Neuromodulation (Implanted Devices): Indications, Risks, Benefits, Complications

**TAGS:**

Implanted Stimulation Devices: Spinal Cord Stimulations, Dorsal Root Ganglion Stimulation, Peripheral Nerve Stimulation

Other Neuromodulation Treatment of Pain

Spinal Drug Delivery Systems: Intrathecal Pumps and Infusions, Epidural Implants and Infusions

X.D.5. Neuroablative Pain Management: Indications, Risks, Benefits, Complications

**TAGS:**

Ablative Procedures: Cordotomy, Dorsal Root Entry Zone Lesioning, Neurolytic Blocks

Brain, Brain Stem, Spinal Cord, Cervical/Thoracic/Lumbar, and Peripheral Nerve Procedures

Intrathecal, Visceral, and Peripheral Nerve Neurolysis: Techniques, Drugs

Other Neuroablative Procedures for Pain

X.D.6. Regenerative Medicine: Clinical Uses and Evidence Base

**TAGS:**

Cellular Products (Lipoaspirate, Bone Marrow Aspirate, Umbilical Stem Cells, Platelet-Rich Plasma)

Environmental Products (Hyaluronic Acid, Tissue Engineering, Prolotherapy, Replacement Discs)

Other Regenerative Pain Medicine

## X.E. Treatment of Pain: Psychological, Physical, and Integrative Therapies

X.E.1. Cognitive Behavioral and Behavioral Interventions

**TAGS:**

Cognitive and Behavioral Strategies: Application to Specific Pain Syndromes (e.g., Temporomandibular Joint Pain, Neck and Back Pain, Fibromyalgia, Arthritis Pain, Burn Pain, Postoperative Pain)

Common Process Factors: Rapport, Engendering Hope, Therapeutic Alliance

Integration of Approaches: Cognitive Behavioral Treatments, Combined Behavioral and Drug Treatments; Economic Benefits of Integrating Treatment

Other Behavioral Interventions

Stages of Behavioral Change and Effect on Readiness to Adopt Self-Management

Therapies: Solution-Focused, Mindfulness, Family, Hypnosis, Biofeedback

X.E.2. Mental Health Treatment

**TAGS:**

Anger in Chronic Pain Patients and Relation to Perceived Pain

Coping Styles: Definition and Effect on Pain Experience and Response to Treatment

Differential Diagnosis of Anxiety Disorders that May Augment Pain and Suffering

Pharmacotherapy for Treatment of Comorbid Conditions: Antidepressants, Mood- Stabilizing Agents, Anxiolytics, Antipsychotics

Psychiatric and Psychologic Morbidities of Chronic Pain (e.g., Depressive Disorders, Anxiety Disorders, Substance-Related and Addictive Disorders, Somatic Symptom and Related Disorders, Bipolar and Related Disorders)

Psychotherapy for Depressive Disorders: Cognitive Behavioral, Marital, Family, Interpretive, Group Therapy

Role of Biofeedback, Operant Therapy, Mindfulness, Cognitive Behavioral Therapy, Hypnosis, Relaxation

Role of Cultural and Environmental Factors: Effect on Treatment Outcome, Maintenance of Treatment Effects

Role of Education, Fear Avoidance, Self-Esteem, Self-Efficacy, Self-Control, Sick Role, Illness Behavior, and Individual Differences in Affective, Behavioral Response to Pain

Role of Family and Other Caregivers: Importance of Interviewing and Training Patient and Relatives; Evaluating Information from Relatives

Role of Patient Beliefs and Expectations in Pain and Disability; Coping Strategies

Sleep Disorders in Chronic Pain: Diagnosis and Evaluation

Somatic Complaints in Chronic Pain: Conversion (Functional Neurological Symptom) Disorder, Somatic Symptom Disorder, and Illness Anxiety Disorder

Work History and Education in Evaluation of Chronic Pain

X.E.3. Physical Medicine and Rehabilitation

**TAGS:**

Exercise Therapy

Orthosis Used for Pain Control: Peripheral Joints and Spine

Other Treatment of Pain (Methods): Physical Medicine and Rehabilitation

Physical Modalities: Manipulation, Mobilization, Massage, Traction

Role of Physiotherapy, Principles of Pacing, Graded Activity, Passive and Active Therapy, Manual Therapy

Temperature Modalities (e.g., Heat, Cold, Ultrasound)

X.E.4. Work Rehabilitation

**TAGS:**

Components of Successful Comprehensive Rehabilitation Program (General Exercise, Cognitive Therapy, Vocational Elements)

Functional Capacity Evaluation: Definition, Usefulness, and Limitations

Identification of Obstacles to Recovery (e.g., Fear of Reinjury, Low Expectations of Recovery, Low Mood, Anxiety, Withdrawal from Social Interaction); Reliance on Passive Treatments; Negative Attitude to Physical Activity and Self-Management

Importance of Early Intervention and Early Return to Work in Reducing Absence

Multidisciplinary Approaches for Those Who Do Not Return to Work Within a Few Weeks (Active Exercise, Addressing Distorted Beliefs About Pain, Enhancing Coping Strategies, Promoting Self-Management)

Psychosocial Factors as the Main Determinants of Disability and as Predictors of Prolonged Work Absence, Work Rehabilitation, and Management of Return to Work

X.E.5 Complementary Therapies (CAM)

**TAGS:**

Acupuncture: Clinical Outcomes and Evidence Base

Acupuncture: Techniques and Indications

Acupuncture: Treatment Principles and Practical Skills

CAM: Alternative Medical Systems (e.g., Traditional Eastern Medicine, Homeopathy, Acupuncture, Acupressure)

CAM: Biologically Based Therapies (e.g., Herbs, Foods, Vitamins), Energy Therapy

CAM: Manipulative Methods (e.g., Osteopathy, Chiropractic)

Evidence-Based CAM

Implications, Costs, and Side Effects (Including Drug Interactions) of CAM

Mind-Body Interventions (e.g., Yoga, Mindfulness, Meditation, Tai Chi)

Prevalence and Patient Reasons for Use of CAM

## X.F. Clinical States: Taxonomy

X.F.1. Taxonomy of Pain Systems

**TAGS:**

Application and Definition of Pain Terms

International Association for the Study of Pain (IASP) Classification of Chronic Pain Syndromes

X.F.2. Chronic Pain as a Symptom or a Disease

**TAGS:**

Chronic Primary Pain: Definition, Diagnostic Entities, Etiology

Chronic Secondary Pain: Definition, Diagnostic Entities, Etiology

Current Procedural Terminology (CPT): Basis of Reporting Medical Services

Location: Body System, Body Site

Pain Qualifiers: Severity, Interference, Psychological and Social Factors, Disability

## X.G. Clinical States: Widespread Pain

X.G.1. Complex Widespread Pain

**TAGS:**

Central Sensitization Disorder

Chronic Pain Disorder with Somatic and Psychological Features

Illness Anxiety Disorder

Mechanisms: Somatization and Hypervigilance, Caused by Injury, Psychological, Infection, Immune System Disorder, Malingering

Somatic Symptom Disorder

X.G.2. Fibromyalgia

**TAGS:**

Associated Conditions: Irritable Bowel Syndrome, Headache, Cystitis, Chronic Fatigue

Criteria for Diagnosis: Tender Points, Fatigue, Sleep Problems, Mood Disturbance

Definition of Fibromyalgia, Myofascial Pain

## X.H. Clinical States: Acute Pain, Pain due to Trauma, Postoperative Pain

X.H.1. Assessing and Monitoring Efficacy and Safety in the Postoperative Period

**TAGS:**

Clinical Outcomes to be Evaluated in an Organized Approach to Acute Pain Management

Epidemiology of Inadequate Control of Acute Pain

X.H.2. Central, Perineural, and Infiltrative Techniques

**TAGS:**

Neuraxial Opioids and Local Anesthetics

Regional Anesthetic Techniques

Use of Adjuvant Agents

X.H.3. Development of Chronic Post-Surgical Pain or Post-Traumatic Pain

**TAGS:**

After Amputation

After Burn Injury

After Nerve or Spinal Cord Injury

After Spinal Surgery

After Thoracotomy or Other Specified Area (Herniorrhaphy, Breast Surgery, etc.)

X.H.4. Interventions to Prevent the Development of Chronic Pain after Acute Pain

**TAGS:**

Epidemiology of Transition from Acute to Chronic Pain

Role of Regional or Neuraxial Analgesia

Role of Perioperative Opioid Management

X.H.5. Multimodal Analgesia for Optimal Perioperative Pain Management

**TAGS:**

Based on Available Expertise and Technology

Based on Patient Preference

Based on Physical and Mental Status

Formulation Based on Type and Cause of Pain

X.H.6. Nonpharmacologic Treatment

**TAGS:**

Role of Coping Skills

Role of Hot and Cold Packs

Role of Patient and Family Education

Role of TENS, Stimulation-Based Approaches

X.H.7. Pharmacologic Properties of Major Classes of Drugs Used for Acute Pain Management

**TAGS:**

Opioids, NSAIDs, Adjuvant Drugs, Local Anesthetics

Physiologic and Psychologic Effects: Identification and Control

Role of Acute Pain Management in Enhanced Recovery (ERAS) Pathways

X.H.8. Tools for Assessment and Management of Acute Pain

**TAGS:**

Assessment and Management of Older Patients, Delirium

Assessment and Management of Pain in Children

Assessment and Management of Vulnerable Populations

Outcome Measures

X.H.9. Treatment of Special Populations for Acute Pain

**TAGS:**

Opioid-Tolerant Patients

Patients with Chronic Pain

Patients with Renal/Hepatic Comorbidities

Pregnant or Breastfeeding

Spinal Cord Injury

Treatment of Nonsurgical Pain: Burns, Sickle Cell Disease

## X.I. Clinical States: Musculoskeletal Pain

X.I.1. Cervical Spinal Pain

**TAGS:**

Anatomy

Causes and Differentiation from Neck Pain and Somatic Nerve Pain

Central Neuromodulation and Intrathecal Drug Delivery

Electrodiagnostic Studies: Reliability and Validity

Evidence for Commonly Used Treatments

History Taking and Physical Examination: Role and Limitations

Injection Therapy: Indications, Use, and Complications

Interventions Commonly Used for Acute and Chronic Neck Pain: Evidence for Efficacy

Mechanisms of Referred Pain: Cervicogenic Headache

Medical Imaging: Uses, Limitations, Reliability and Validity

Natural History and Relevance to Management, Including Whiplash Injury

Nonsurgical Intervention: Evidence for Efficacy of Reassurance, Maintaining Activity, and Exercises – Psychological, Physical and Multidisciplinary Therapy, Complementary Therapies

Pharmacotherapy: Uses and Limitations

Public Health Dimensions: Prevalence, Demography, Personal and Societal Costs

Risk Factors: Transition to Chronic Pain, Predictors of Chronicity

Surgical Treatment: Indications and Use, Including Indications for Urgent Surgical Referral

X.I.2. Lumbar Spinal Pain

**TAGS:**

Anatomy

Causes and Differentiation of Low Back Pain and Referred Somatic Pain from Radicular Pain, Radiculopathy, and Sciatica; Relevance to Investigation and Treatment

Central Neuromodulation and Intrathecal Drug Delivery

Electrodiagnostic Studies: Reliability and Validity

Evidence for Commonly Used Treatments

History Taking and Physical Examination: Role and Limitations

Injection Therapy: Indications, Use, and Complications

Interventions Commonly Used for Acute and Chronic Low Back Pain: Evidence for Efficacy

Mechanisms of Referred Pain: Radicular Pain

Medical Imaging: Uses, Limitations, Reliability and Validity

Natural History and Relevance to Management: Etiologic and Prognostic Risk Factors

Nonsurgical Intervention: Evidence for Efficacy of Reassurance, Maintaining Activity, and Exercises – Psychological, Physical and Multidisciplinary Therapy, Complementary Therapies

Pharmacotherapy: Uses and Limitations

Psychosocial and Occupational Factors Related to Low Back Pain and Chronicity

Public Health Dimensions: Prevalence, Demography, Personal and Societal Costs

Risk Factors: Transition to Chronic Pain, Predictors of Chronicity

Surgical Treatment: Indications and Use, Including Indications for Urgent Surgical Referral

X.I.3. Musculoskeletal Pain

**TAGS:**

Anatomy and Biomechanics of Joints and Muscles

Anatomy and Physiology

Autoimmune and Rheumatic Disorders Including Assessment of Activity and Severity of Rheumatic Disease

Classification and Clinical Characteristics of Musculoskeletal Diseases: Chronic Musculoskeletal Pain Due to Inflammation, Associated with Structural Changes, Associated with Diseases of the Nervous System

Examination: Multidisciplinary Assessment, Functional Assessment

Mediators of Inflammation, Tissue Destruction, and Repair

Natural History and Relevance to Management: Etiologic and Prognostic Risk Factors

Public Health Dimensions: Prevalence, Demography, Personal and Societal Costs

Risk Factors: Transition to Chronic Pain, Predictors of Chronicity

Treatment and Rehabilitation of Musculoskeletal Pain/Disability: Self-Management, Exercise and Rehabilitation, Pharmacologic and Nonpharmacologic Approaches

X.I.4 Hereditary Connective Tissue Diseases

**TAGS:**

Anatomy: Connective Disease Structures, Mechanisms of Pain

Clinical Characteristics and Assessment: Dislocation, Trauma, Tissue Fragility

Diagnosis: Ehlers-Danlos Syndrome, Joint Hypermobility Syndrome, Marfan Syndrome

Examination: Gait Analysis, Orthostatic Blood Pressure, Joint/Muscle Exam

Natural History and Relevance to Management: Predictors of Chronicity

Prevalence and Epidemiology of Conditions

Risk Factors: Etiologic and Prognostic

Treatment of Pain: Self-Management, Exercise, Pharmacologic, Nonpharmacologic

## X.J. Clinical States: Cancer Pain

X.J.1. Analgesic Approach: Indications, Risks, Pharmacologic Properties, Therapeutic Guidelines

**TAGS:**

Adjuvant Analgesics: Bisphosphonates, Steroids, Ketamine, Anticonvulsants, Antidepressants, Barbiturates, Cannabinoids

Adverse Effects of Analgesics, Medication Interactions

Route of Administration: Oral, Transdermal, IV, Intrathecal

WHO Ladder: Choice of Analgesics, Limitations

X.J.2. Chronic Cancer Pain: Diagnosis, Etiology, Mechanisms

**TAGS:**

Bone Cancer Pain

Neuropathic Cancer Pain

Visceral Cancer Pain

X.J.3. Chronic Cancer Pain Due to Treatment

**TAGS:**

Chemotherapy-Induced Polyneuropathy

Mucositis

Post-Cancer Surgery Pain

Radiation-Induced Neuropathy

X.J.4. Palliative Care: Definition and Scope

**TAGS:**

Advance Care Directives

Barriers to Treatment

Frequency of Pain and Multiple Sites of Pain

Hospice and Multidimensional Treatments

Importance of Development of Evidence-Based Practice

X.J.5. Comprehensive Evaluation of Patients with Cancer Pain: Needs and Approaches

**TAGS:**

Addressing End-of-Life Symptoms: Nausea, Respiratory Distress, Fatigue

Social and Cultural Influences

Value of Interdisciplinary Teams

X.J.6. Principles of Treatment

**TAGS:**

Integration of Other Modalities: Physical, Psychological, and Anesthetic

Management of Acute Cancer Pain

Treatment of Underlying Disease

X.J.7. Interventional Approaches: Indications, Risks, Practical Implications

**TAGS:**

Injections and Neurolysis

Intrathecal Therapy

Role of Primary Cancer Therapy

Surgical Approaches

X.J.8. Multidisciplinary Management and Special Situations

**TAGS:**

Needs of Special Populations: Children, Patients with Learning Disabilities, Older Adults

Pain Treatment in the Cancer Patient with Coexisting Substance Use Disorder or Other Psychiatric Disorder

Physical Therapy: Indications, Utility, and Effectiveness

Psychological Approaches: Indications, Utility, and Effectiveness

Treatment of Persistent Pain in Cancer Survivors

X.J.9. Ethical Issues in Cancer Pain Management

**TAGS:**

Benefit to Burden Ratio: Variation According to Stage

Prognosticating Life Expectancy

Physician-Assisted Suicide, Euthanasia, Double Effect, Intent

## X.K. Visceral Pain

X.K.1. Chronic Abdominal Pain

**TAGS:**

Anatomy: Organization of Peripheral and Central Visceral Innervation, Properties of Visceral Nociceptors, and Mechanisms of Visceral Nociceptor Sensitization

Classification of Chronic Visceral Pain Disorders: From Persistent Inflammation, Vascular Mechanisms, and/or Mechanical Factors

Clinical Differentiation of Gastrointestinal, Urologic, Gynecologic, and Musculoskeletal Pain

Diagnostic Evaluation and Treatment

Distinct Clinical Features, e.g., Chronic Pancreatitis, Irritable Bowel Syndrome, Inflammatory Bowel Disease, Functional Abdominal Pain

Epidemiology

Management of Visceral Pain: Pharmacotherapy, Physical Therapy, Psychological Therapies, Interventional Techniques

Peripheral and Central Mechanisms of Visceral Pain Modulation

Psychological Principles in Clinical Assessment, Explanation, and Treatment

X.K.2. Chronic Pelvic Pain

**TAGS:**

Anatomy

Clinical Differentiation of Gastrointestinal, Urologic, Gynecologic, and Musculoskeletal Pain

Common Causes, Diagnostic Evaluation, and Treatment in Men

Common Causes, Diagnostic Evaluation, and Treatment in Women

Epidemiology

Management of Pelvic Pain: Pharmacotherapy, Physical Therapy, Psychological Therapies, Interventional Techniques

Psychological Principles in Clinical Assessment, Explanation, and Treatment

## X.L. Headache and Orofacial Pain

X.L.1. Headache

**TAGS:**

Anatomy and Physiology

Classification of Headache Disorders: Primary Headache (Migraine, Tension, Cluster, Paroxysmal Hemicrania, Hemicrania Continua)

Classification of Headache Disorders: Secondary Headache (Trauma, Vascular Disorder, Non-Vascular Intracranial Disorder, Due to Substance or its Withdrawal, Infection)

Critical Factors for Life-Threatening Headache

Diagnosis and Management of Post Dural Puncture Headache

Evaluation: Systematic Case History, Use of Headache Diary, Selection of Appropriate Examination Based on History

Indications for Further Investigation of Headache

Internationally Accepted Diagnostic Criteria for Classification of Headache Disorders Major Hypotheses About Mechanisms

Mechanisms and Pathophysiology

Pharmacologic Treatment and Alternatives

Physical, Psychological, and Social Factors Contributing to Headache; Role of Counseling and Other Nonpharmacologic Treatment (e.g., Botulinum Toxin)

Role of Medication Overuse

Treatment and Management of Headache: Pharmacologic, Nonpharmacologic, Prophylaxis, Interventional Techniques, Multidisciplinary Management

X.L.2. Orofacial Pain (e.g., Trigeminal Neuralgia, Post Herpetic Neuralgia, Atypical Facial Pain)

**TAGS:**

Anatomic, Physiologic, Psychosocial Aspects

Classification of Orofacial Pain: Primary (Temperomandibular Disorders, Trigeminal Neuralgia, Atypical Facial Pain, Burning Mouth Syndrome)

Classification of Orofacial Pain: Secondary (Disorders of the Cranium, Dental Pain, Neuropathic Pain, Secondary Temperomandibular Disorders)

Evidence-Based Treatment Options

History Taking, Physical Examination, and Diagnostic Studies

Treatment and Management: Pharmacologic, Surgical Options, Ablation and Stimulation Techniques, Cognitive Behavioral Therapy, Physiotherapy, Brain Stimulation

## X.M. Neuropathic Pain

X.M.1. Peripheral Neuropathic Pain (e.g., Diabetic Peripheral Neuropathy, Post Herpetic Neuralgia, Peripheral Nerve Injuries)

**TAGS:**

Clinical Characteristics

Common Neuropathic Pain Syndromes: Differential Diagnosis, Natural Course

Definition, Anatomy, and Epidemiology

Evaluation: Clinical, Electrodiagnostic, Laboratory, and Radiographic Findings

Evaluation: Differential Diagnosis, Assessment Tools

Mechanisms and Pathophysiology: Peripheral Nerve Injury, Compression Neuropathy, Amputation

Therapeutic Modalities: Pharmacologic, Interventional, Rehabilitative

X.M.2. Complex Regional Pain Syndrome

**TAGS:**

Definition, Anatomy, and Epidemiology

Evaluation and Clinical Assessment

Mechanisms and Pathophysiology

Therapeutic Modalities: Pharmacologic, Interventional, Rehabilitative

X.M.3. Central Pain Syndromes (e.g., Post Stroke Pain, Phantom Limb Pain, Pain after Spinal Cord Injury)

**TAGS:**

Clinical Characteristics

Common Central Pain Syndromes: Differential Diagnosis, Natural Course

Definition, Anatomy, and Epidemiology

Evaluation: Differential Diagnosis, Assessment Tools

Evaluation: Clinical, Electrodiagnostic, and Radiographic Findings

Mechanisms and Pathophysiology: Pathologic Mechanisms in Nervous System

Therapeutic Modalities: Pharmacologic, Interventional, Rehabilitative

## X.N. Special Cases

X.N.1. Pain in Infants, Children, and Adolescents

**TAGS:**

Acute and Chronic Pain in Children and Adolescents: Special Considerations in Management/Palliative Care

Consequences of Pain in Infancy and Childhood

Differences Among Infants, Children, Adolescents, and Adults

Ethics of Treatment of Pain and Research in Children and Adolescents

Factors Affecting Pain Perception in Children and Adolescents (e.g., Development Level, Family Beliefs, Past Pain Experience, Abuse/Trauma)

Pain Assessment Tools in Children and Adolescents: Use and Limitations

Pain Syndromes Commonly Seen in Children and Adolescents (e.g., Functional Abdominal Pain, Sickle Cell Disease, Muscle Skeletal Pain, Headache)

Treatment of Pain in Children and Adolescents: Pharmacologic and Nonpharmacologic (e.g., Counseling, Guided Imagery, Hypnosis, Biofeedback)

X.N.2. Pain in Older Adults

**TAGS:**

Access to Care

Age-Related Changes: Ischemia, Degeneration, Dementia

Age-Related Changes in Pharmacology (e.g., Drug-Drug Interactions, Clearance, Coexisting Disease)

Common Conditions: Bone Pain, Neuralgic Pain, Visceral Pain

Epidemiology: Prevalence, Onset, Burden, Risk Factors, Prognosis

Ethics of Treatment of Pain in Older Adults

Heterogeneity in Physiologic, Psychological, and Functional Capacity of Persons of the Same Chronologic Age

Issues Related to Age Differences

Pain Assessment: Tools and Limitations, Assessment of Physical Activity, Quality of Life

Procedural Techniques: Evidence Base

Psychosocial Interventions: Cognitive Behavior Therapy in Older Adults

X.N.3. Pain Issues in Individuals with Limited Ability to Communicate Due to Neurocognitive Impairments

**TAGS:**

Conditions Leading to Limitations in Ability to Communicate

Difficulties in Assessment and Treatment of Pain

Role of Caregivers and Social Context in Assessment and Treatment of Pain

X.N.4. Pain Relief in Persons with Opioid Tolerance, Substance Use, and/or Addictive Disorders

**TAGS:**

Acute Pain Management of Patients with Substance Use Disorder

Biopharmacologic and Neurophysiologic Basis of Addiction

Definitions: Tolerance, Dependence, Addiction, Dual Diagnosis, Substance Use Disorder

Description of Impact of Misuse: Intoxication and Withdrawal

Interactions Between Addiction, Substance Use Disorder, and Pain

Interpretation of Drug Toxicology Testing

Legal, Regulatory, and Reimbursement Issues When Prescribing Controlled Substances to Patients with Pain and Substance Use Disorder

Needs of Special Populations: Pregnant Women, Neonates, Cancer Patients

Pharmacologic Treatment of Patients with Substance Use Disorder

Principles of Comprehensive Approach to Pain Management in Patients with Substance Use Disorder

Recognition of Aberrant Drug-Related Behavior Including Diversion and Misuse

Risks and Benefits of Opioid Use in Treatment of Chronic/Cancer Pain in Patients with Substance Use Disorder or Who Take Other Psychoactive Substances

Risk Assessment for Substance Use Disorder and Addiction in Patients with Pain

Screening and Referral for Substance Use Disorder in Patients with Pain

X.N.5. Chronic and Acute Pain in Pregnancy and Lactation

**TAGS:**

Causes of Pain during Pregnancy

Factors Influencing Perception of Pain in Pregnancy

Management of Opioids During Pregnancy Including Neonatal Abstinence

Pharmacologic Management of Pain in Pregnancy and Lactation

Principles of Pain Management in Pregnancy

X.N.6. Pain Relief in Areas of Deprivation and Conflict

**TAGS:**

Access to Analgesic Drugs and Palliative Care Worldwide

Causes of Pain Worldwide

Education, Training, and Knowledge of Pain Worldwide

Ethical and Political Issues in Pain Management Worldwide

Spectrum of Providers Caring for Patients with Pain Worldwide

Variability of Availability and Access to Pain Treatment Worldwide

X.N.7. Pain Assessment and Management in Special Populations

**TAGS:**

Patients from Diverse Socioeconomic, Ethnic, Cultural Backgrounds

Patients with Hepatic or Renal Function Impairment

Patients with Mental Health Diseases

Patients with Physical Disabilities

X.N.8. Diversity, Equity, and Inclusion (DEI) in Health Care

**TAGS:**

Approaches to Improvement: Individual, Community, Policy

Barriers: Systematic Discrimination, Bias, Implicit Bias

DEI in the Workplace and in Academia

X.N.9. Healthcare Disparities

**TAGS:**

Child and Adolescent Healthcare Disparities

Maternal Healthcare Disparities

Social Determinants of Health: Race, Language, Education Status, and Others

X.N.10. Ethics and Medicolegal Issues in Clinical Practice

**TAGS:**

Clinician Wellness and Self-Care: Burnout, Sleep Deprivation, Adaptations for Disability, Substance Use

Healthcare Provider Certification, Maintenance of Certification, Professional Standing, Clinical Practice Assessment

Patient Autonomy and Decision-Making: Principles of Informed Consent, Advance Directives, Do-Not-Resuscitate Orders, Health Care Proxy, Patient Refusal of Treatment

Professionalism: Disclosure of Errors, Recognizing Limitations, Reporting Unsafe Conditions, Responding to Unprofessional Behavior

Research Ethics: Standards in Research Design, Informed Consent, Financial Disclosure, and Conflicts of Interest

X.N.11. Practice Management

**TAGS:**

Clinical Informatics: Electronic Medical Record Systems, Artificial Intelligence

Costs of Healthcare: Understanding Funding and Payment, Cost-Conscious Practice

Documentation, Coding, and Billing: Compliance, Accuracy, Coding Integrity

Efficient Practice Staffing and Scheduling

Population Health: Resources to Improve Access

X.N.12. Quality Improvement and Patient Safety

**TAGS:**

Barriers to Patient Safety and Quality Improvement (QI) Implementation

Change Management Methods: Peer Review, Morbidity and Mortality Conferences, Lean Six Sigma, QI Process, Value Stream Mapping, Failure Mode, and Root Cause Analysis

Crisis Management and Teamwork: Simulation Training, Handoffs, Checklists

Definitions: Medical Error, Adverse Events, Sentinel Events

Medication Errors: Assessment and Prevention, Reconciliation, Use of Technology

Performance Assessment: Individual Benchmarks, Facility Scorecards, Public Reporting

QI Basics: Design and Implementation, QI Metrics, Patient Satisfaction Measurement, Value-Based Care and Incentives

# XI. PEDIATRIC ANESTHESIOLOGY

## XI.A. Basic Science

XI.A.1. Anatomy

**TAGS:**

Airway

Airway Management

Anatomy for Procedures

Atresias, Stenoses and Webs

Body Habitus

Central Neuraxial Blockade

General Development

Peripheral Nerve Blockade

Vascular Cannulation

Water, Volume, and Blood Composition

XI.A.2. Physics and Anesthesia Equipment

**TAGS:**

Brain, Spinal Cord, and Neuromuscular Function

Breathing Circuits

Cardiac Rhythm and Vascular Pressures

Methods for Monitoring

Oxygenation, Gas Concentration, and Ventilation

Point-of-Care Ultrasound

Respiration

Temperature

Ventilation Devices and Techniques

XI.A.3. Anesthetic Pharmacology: Physiologic States, Pathophysiologic States and Adverse Effects

**TAGS:**

Agents Affecting Coagulation

Anti-Emetics

Biotransformation and Excretion

Blood-Brain Barrier

Drug Absorption

Drug Distribution

Inhalation Anesthetics

Local Anesthetics

Neuromuscular Blocking and Reversal Agents

Non-Opioid Analgesics

Opioid Analgesics

Pharmacogenetics

Pharmacokinetics and Pharmacodynamics

Sedative and Anxiolytic Agents

Sympathetic and Parasympathetic Agents

## XI.B. Organ-Based Basic and Clinical Sciences

XI.B.1. Respiratory System

**TAGS:**

Acute Respiratory Distress Syndrome (ARDS)

Adaptive-Pressure Control Ventilation (APCV)

Airway-Pressure Release Ventilation (APRV)

Anatomy and Physiology

Anesthesia for Thoracic Procedures

ARDS: Barotrauma and Volutrauma

ARDS: Berlin Criteria

ARDS: Clinical Phases

ARDS: Etiology, Infectious and Noninfectious

ARDS: Oxygenation Index

ARDS: Permissive Oxygenation

ARDS: Treatment

Chest Wall Surgery/Reconstruction

Clinical Sciences

Congenital Pulmonary Airway Malformation (CPAM)

CPAP

Heliox

High-Flow Nasal Canula

High-Flow Oscillatory Ventilation (HFOV)

Lung Physiology

Mediastinal Masses

Musculoskeletal

Nitric Oxide

Noninvasive Positive-Pressure Ventilation (PPV)

Obstructive Disease

One Lung Ventilation

Oxygen Transport

Oxygenation Index

Parenchymal

Pleural

Prenatal and Postnatal Development

Respiratory Mechanics, Ventilation, and Lung Volumes

Restrictive Disease

Surfactant and Surface Tension

Tracheobronchial

Upper Airway

Ventilation

Ventilation/Perfusion Matching

Video-Assisted Thoracoscopy

XI.B.2. Cardiovascular System

**TAGS:**

Acyanotic Lesions

Anatomy and Physiology

Anesthesia for Cardiac Patients

Anesthesia for Diagnostic, Interventional and Electrophysical Procedures

Anesthesia in Patient with Pacemaker or AICD

Anesthetic Effects on the Cardiovascular System

Arrhythmic Lesions

Cardiogenic Shock

Cardiomyopathies

Cardiopulmonary Resuscitation and PALS

Cardiovascular Effects on Anesthetic Uptake and Delivery

Clinical Science

Cyanotic Lesions

Disease States

Dissociative Shock: Azotemia, Hyperlactatemia, and Metabolic Acidosis

Distributive Shock

Fetal, Transitional, and Adult Circulation

Fluid Resuscitation

General Considerations

Heart Transplantation

Hypertensive Crisis

Hypovolemic Shock

Infectious Diseases

Inotropic Medication

Intracardiac Masses

Mechanical Circulatory Support- ECMO

Obstructive Shock

Palliative Procedures

Pericardial Disease

Postcardiac Arrest Syndrome

Postcardiac Arrest Syndrome: Metabolic Abnormalities

Prenatal and Postnatal Development

Pulmonary Hypertension

Return of Spontaneous Circulation (ROSC)

Vasoactive Medications

XI.B.3. Central and Peripheral Nervous Systems

**TAGS:**

Anatomy and Physiology

Anesthesia for Neurosurgical Procedures

Clinical Science

Complications: Seizures and Level of Consciousness (LOC)

Craniofacial Reconstruction/Cranioplasty

EEG Changes

General Considerations

Intracranial Pressure and Blood Flow

Intracranial Tumors and Vascular Lesions

Meningomyelocele/Spinal Surgery

Myelinization, Autonomic Nervous Systems, and Pain Pathways

Neurocognitive and Behavioral Changes after Anesthesia

Neurologic Imaging

Pharmacology of Diuretics, Steroids, and Anticonvulsant Medications

Prenatal and Postnatal Development

Preoperative Anxiety, Postoperative Behavior, and Emergence Delirium

Seizure Surgery

Serotonin Syndrome

SMART Tots Consensus Statement And Animal Studies

XI.B.4. Gastrointestinal System

**TAGS:**

Abdominal Wall Defects

Atresias, Stenoses and Webs

Clinical Science

Esophageal/Gastrointestinal Foreign Bodies

Esophageal, Stomach and Intestine Disorders

Hernias

Liver, Biliary Tract and Spleen Disorders

Morbid Obesity/Bariatric Surgery

Necrotizing Enterocolitis

XI.B.5. Renal/Urinary

**TAGS:**

Clinical Science

Prenatal and Postnatal Development

Renal Failure

XI.B.6. Endocrine/Metabolic

**TAGS:**

Adrenal Disorders

Clinical Science

Diabetes Insipidus

Diabetes Mellitus

DiGeorge Syndrome

Disorders of Sodium Regulation

Pheochromocytoma

Thyroid Disorders

XI.B.7. Hematology/Oncology

**TAGS:**

Anemias

Anterior Mediastinal Mass

Bone Marrow and Stem Cell Transplants

Chemotherapeutic Agents and Side Effects

Clinical Science

Coagulation Disorders

Hematology

Oncology

Radiation Therapy

Sickle Cell Disease

Tumor Lysis Syndrome

XI.B.8. Genetics

**TAGS:**

Clinical Sciences

Craniofacial Syndromes

Genetic Abnormalities

Inborn Errors of Metabolism

Malignant Hyperthermia

Mitochondrial Myopathies

Muscular Dystrophies

Myopathic Disorders and Myotonias

Osteochondrodysplasia Symptoms

Skin and Connective Tissue Disorders

Trisomy 21

## XI.C. Clinical Subspecialties

XI.C.1. Neonatal

**TAGS:**

Apnea and Bradycardia

Clinical Science

Congenital Cystic Adenomatoid Malformation

Congenital Diaphragmatic Hernia

General Considerations

Medical Disease States

Neonatal Resuscitation

Retinopathy of Prematurity

Surgical Disease States

XI.C.2. Painful Disease States

**TAGS:**

Chronic Pain States

Neonatal Anesthesia for NICU Procedures

Pain Management in the NICU

Pathophysiology

Pharmacologic and Non-Pharmacologic Techniques of Pain Management

Regional Analgesia

Treatment

XI.C.3. Otolaryngology

**TAGS:**

Airway Procedures

Bronchoscopic Procedures

Choanal Atresia Repair

Cochlear Implant, Tympanoplasty, and Mastoidectomy

Laser Procedures

Myringotomy and Tubes

Obstructive Sleep Apnea (OSA)

Otologic Procedures

Tonsillectomy, Adenoidectomy, and Abscess Drainage

Tracheotomy

XI.C.4. Plastic and Oral-Maxillary Facial Surgery

**TAGS:**

Cleft Repairs

Clinical Science

Mandibular Repairs

Vascular Malformations

XI.C.5. Ophthalmology

**TAGS:**

Clinical Science

General Considerations

Pharmacology of Ophthalmologic Medications

Strabismus Repair

Trauma

XI.C.6. Orthopedic Surgery

**TAGS:**

Anterior, Posterior, and Combined Spine Fusion

Clinical Science

XI.C.7. Trauma and Burns

**TAGS:**

Anesthetic and Pain Management of the Burn Patient

Burns

Dressing Changes

Fluid Resuscitation and Calculating Burn Surface Area

Hypothermia and Submersion Injury

Incidence, Patterns, Implications of Abuse

Inhalation Injuries/Airway Management

Management of the Polytrauma Victim

Trauma

Types, Mechanisms, Locations and Implications of Injuries

XI.C.8. Nutritional Support in the PICU

**TAGS:**

Electrolyte Disorders

Enteral Feedings: Gastric and Post-Pyloric

Free Fatty Acid Deficiency

Glycemic Control in the PICU

Hyperglycemia

Line-Associated Infections

Liver Dysfunction

NPO for Children on Enteral Feedings

Risk of Aspiration

Total Parenteral Nutrition (TPN)

XI.C.9. Liver Dysfunction

**TAGS:**

Biochemical Guidance of Liver Injury

Coagulopathy

Hepatic Encephalopathy

Hepatorenal Syndrome

Hyperdynamic Circulatory Failure

Liver Transplantation

Pediatric Acute Liver Failure (PALF)

Rapidly Progressive Multisystem Organ Failure

Systemic Inflammatory Response Syndrome (SIRS)

XI.C.10. Acute Kidney Injury

**TAGS:**

Acute Hyperkalemia

Acute Tumor Lysis Syndrome

Biomarkers

Continuous Renal Replacement Therapy

Continuous Venovenous Hemofiltration (CVVH)

Intermittent Hemodialysis

Peritoneal Dialysis

Renal Replacement Therapy (RTT)

XI.C.11. Transfusion Practices

**TAGS:**

Anemia

Hemolytic Transfusion Reactions

Transfusion Related Acute Lung Injury (TRALI)

Transfusion Triggers

Transfusion-Associated Circulatory Overload (TACO)

Transfusion-Associated Risks

## XI.D. Clinical Science of Anesthesia

XI.D.1. Evaluation and Preoperative Preparation of the Pediatric Patient (See Specific Disease States)

**TAGS:**

Autism Spectrum Disorders

Concussion

Evaluation of Coexisting Disease

Fasting Requirements

General Considerations

Informed Consent

Laboratory Testing

Normal Developmental Milestones

Parental Presence and Pharmacologic Preparation for Anesthetic Induction

Physical Examination

Psychosocial Preparation of the Patient and Family

Upper Respiratory Tract infections

XI.D.2. General Considerations of the Perioperative Period

**TAGS:**

Fluid, Electrolyte, and Glycemic Management

Thermoregulation

Transfusion Therapy and Blood Conservation Techniques

XI.D.3. Regional Anesthesia and Analgesia

**TAGS:**

Central Neuraxial Blockade: Indications, Contraindications, Techniques, Adjuvants, and Controversies

Peripheral Nerve Blockade: Indications, Contraindications, Techniques, Adjuvants, and Controversies

Pharmacology and Toxicity of Local Anesthetics

XI.D.4. General Anesthesia

**TAGS:**

Management of the Difficult Airway

XI.D.5. Complications of Anesthesia

**TAGS:**

Airway Obstruction

Anaphylactic and Anaphylactoid Reactions

Awareness and Recall under Anesthesia

Cardiopulmonary Resuscitation

Dysrhythmias

Iatrogenic Drug Errors

Iatrogenic Trauma/Positioning Injury

Inadequate Vascular Access

XI.D.6. Special Techniques and Situations

**TAGS:**

Non-Operating Room Anesthesia (NORA)

Transition of Patient Care

XI.D.7. Postoperative Period

**TAGS:**

Management and Diagnosis of Pain, Anxiety and Emergence Agitation

Post-operative Nausea and Vomiting

XI.D.8. Acute and Chronic Pain Management

**TAGS:**

Enhanced Recovery after Surgery (ERAS)

Opioid Induced Hyperalgesia

Opioid Tolerance

## XI.E. Special Problems or Issues

XI.E.1. Professional Issues

**TAGS:**

Continuous Quality Improvement

Ethical and Legal Obligations of Pediatric Anesthesia Care and Research

Practice-Based Learning and Improvement

Teaching, Supervision, and the Anesthesia Care Team

XI.E.2. Principles of Biostatistics and Study Design

XI.E.2

# XII. ADULT CARDIAC ANESTHESIOLOGY

## XII.A. Foundations of Adult Cardiac Anesthesiology

XII.A.1. Anatomy and Physiology

**TAGS:**

Anatomical Landmarks for Regional Anesthesia (e.g., PECS or ESP Blocks)

Baroreceptor Function

Blood Pressure

Blood Volume and Distribution

Cardiac Conduction

Cardiac Output Measurements (e.g., PA, TEE, Fick Principle)

Central: Vasomotor Center/Hypothalamic-Pituitary-Adrenal Axis

Coronary Circulation

Myocardial Contractility

Myocardial Oxygen Utilization and Balance

Peripheral: Receptors and Reflexes

Regulation of Circulation and Blood Volume

Synchronicity of Pressure, Flow, ECG, Valvular Function

Systemic and Pulmonary Vascular Resistance

Systolic, Diastolic, Mean and Perfusion Pressures

Vascular Compliance/Venous Capacitance

Venous Return

Ventricular Function

## XII.B. Cardiothoracic Diseases (Pathophysiology, Pharmacology, and Clinical Management)

XII.B.1. Cardiac Disease

**TAGS:**

Acquired (e.g., Aortic Sclerosis)

Acute Heart Failure

Acute vs. Chronic Heart Failure

Amyloidosis

Anatomy of the Cardiac Conduction System

Anesthetic Considerations

Anesthetic Management and Goals

Aortic Stenosis/Insufficiency: Risk Factors, Pathophysiology, Pharmacological

Management, Interventional Cardiology Management, Surgical Management

Arrhythmia Classification: Atrioventricular Nodal Reentrant Tachycardia, Focal Atrial Tachycardia; Atrial Fibrillation, Atrial Flutter; Supraventricular Tachycardia; Ventricular Tachycardia; Ventricular Fibrillation

Arrhythmogenic Right Ventricular Dysplasia

AV Junction

Cardiac Masses

Carcinoid

Cardiac Catheterization

Cardiac Enzymes

Cardiac Imaging: MRI/CT

Cardiac Resynchronization Therapy/Pacemaker/ICD

Cardiac Tamponade

Cardiomyopathy

XII.B.1

Chronic Heart Failure

Clinical Presentation

Common Congenital Lesions (e.g., Tetralogy of Fallot, Bicuspid Aortic Valve, ASD, VSD)

Congenital (e.g., Bicuspid Aortic Valve, Ebstein Anomaly)

Congenital Heart Disease

Determinants of Myocardial Oxygen Requirements and Delivery, Silent Ischemia, Postoperative Ischemia

Diagnosis (e.g., TEE, POCUS, CVP, PAC, CXR, Cardiac MRI, Laboratory Markers)

Diagnosis of Severity of Myocardial Infarction and Acute Coronary Syndrome

Diastolic (Heart Failure with Preserved Ejection Fraction)

Dilated Cardiomyopathy

Drug Related (e.g., Anthracycline, Serotonin, Ergotamine)

ECG, Holter, Implantable Loop Recorder

Echocardiographic Findings in Heart Failure with Preserved/Reduced Ejection Fraction

Echocardiography

Electrophysiologic Disturbances and EP Studies

Fabry Disease

Fatty Infiltration

Fontan Physiology

Glycogen Storage Disease

Hemochromatosis

Hypereosinophilic Disease

Hypertrophic Obstructive Cardiomyopathy

Implantable Cardioverter-Defibrillators, Pacemakers: Guidelines for Insertion

Indications for: Revascularization/Valvular Surgery, Mechanical Circulatory Support (e.g., IABP, VAD, etc.), Heart Transplant

Intraventricular Conduction

Ischemic Heart Disease

Ischemic v. Nonischemic

Left Bundle Branch (Anterior/Posterior Fascicles)

Mechanical Circulatory Support – Durable and Percutaneous

Mechanisms of Arrhythmias

Medical/Interventional Management

Mitral Stenosis/Insufficiency: Risk Factors, Pathophysiology, Pharmacological Management, Interventional Cardiology Management, Surgical Management

Neoplastic Diseases

Normal and Abnormal Embryological Development

Noncompaction Cardiomyopathy

Nuclear Techniques

Others (e.g., Idiopathic, Peripartum)

Perioperative Management of the Adult with Congenital Heart Disease: Corrected, Uncorrected

Pharmacological Interventions

Pulmonary Hypertension

Pulmonic Stenosis/Insufficiency: Risk Factors, Pathophysiology, Pharmacological Management, Interventional Cardiology Management, Surgical Management

Radiation

Rare Cardiac Diseases (e.g., Infiltrative, Storage, Endomyocardial Disease)

Restrictive

Right Bundle Branch

XII.B.1

Risk Factors

Sarcoidosis

Septal Ablation/Myomectomy

Sinus Node

Stress Tests

Surgical Intervention: Pericardiocentesis, Pericardial Window

Surgical Interventions

Systolic (Heart Failure with Reduced Ejection Fraction)

TEE Findings and Assessment of Valvular Heart Disease

TEE Findings Associated with Cardiomyopathy

Toxicity

Transplant

Treatment: Pharmacological, Interventional Cardiology Procedures, Surgical Revascularization, Mechanical Circulatory Support (e.g., IABP, VAD), Ablations, Transplant

Tricuspid Stenosis/Insufficiency: Risk Factors, Pathophysiology, Pharmacological Management, Interventional Cardiology Management, Surgical Management

Valvular Heart Disease

Viral

XII.B.2. Thoracic Vascular Disease

**TAGS:**

Aneurysmal Disease

Arterial Insufficiency/Thoracic Outlet Obstruction

Atherosclerotic Disease

Cerebrospinal Fluid Drains

Dissection/Disruption

Endovascular Procedures

Lung Isolation

Open Surgical Procedures

Others

Pathophysiology/Classification

Postoperative Complications

Recurrent Laryngeal Nerve Injury

Renal Failure

Specific Anesthetic Considerations

Spinal Cord Ischemia

SSEP Monitoring

XII.B.3 Esophageal Disease

**TAGS:**

Impact for Echocardiography

## XII.C. Patient Evaluation

XII.C.1. Noninvasive Cardiovascular Evaluation

**TAGS:**

Cardiovascular Imaging (e.g., MRI, CT)

Electrocardiography

Myocardial Nuclear Scintigraphy

Stress Testing (e.g., Exercise, Dobutamine)

XII.C.2. Cardiac Catheterization Procedures and Diagnostic Interpretation

**TAGS:**

XII.C.2

Invasive Cardiac Catheterization Procedures

XII.C.3. Pre-anesthetic Evaluation and Preparation of Adult Cardiothoracic Patients

TAGS:

Risk Models (e.g., STS)

Specific Risk Conditions

## XII.D. Perioperative Imaging and Monitoring

XII.D.1. Transesophageal Echocardiography

**TAGS:**

3-Dimensional Imaging

Artifact Recognition

Complications and Safety

Echocardiographic Anatomy: Chambers, Valves, Great Vessels, Pericardium

Properties and Physics of Ultrasound and Doppler

Standard TEE Views and Comprehensive Examination

Structural Heart Interventions

TEE Image Acquisition and Optimization

Vascular Anatomy and Pathology

XII.D.2. Transthoracic Echocardiography and POCUS

XII.D.3. Vascular Pressures

**TAGS:**

Arterial

Central Venous (CVP)

Invasive/Noninvasive Differences

Left Atrial (LAP)

Left Ventricular End-Diastolic (LVEDP)

Pulmonary Arterial (PAP)

Pulmonary Artery Occlusion (PAOP)

Pulse Pressure Variation

Site Specific Indications/Contraindications and Limitations

XII.D.4. Heart Function

**TAGS:**

Cardiac Catheterization, Cardiac MRI

Cardiac Output

Cardiac Preload Assessment and Monitoring

Cardiac Valve Anatomy and Function

Doppler

Echocardiography

Electrocardiogram (ECG)

Esophageal Doppler

Ischemic Changes

PAC

Regional and Global Myocardial Function

TEE

Thoracic Impedance

XII.D.5. Mixed Venous Oxygen Saturation (SvO2)

XII.D.6. Cerebral Oximetry

XII.D.7. Peripheral Oximetry

XII.D.8 Coagulation

XII.D.9 Temperature

**TAGS:**

Cardiopulmonary Bypass Considerations

XII.D.10. Urine Output

XII.D.10

XII.D.11. ABG Interpretation

**TAGS:**

Anion Gap

Temperature Effect on Blood Gases: Alpha-Stat vs. pH-Stat

XII.D.12. Cerebrospinal Fluid Pressure

## XII.E. Pharmacodynamics and Pharmacokinetics

XII.E.1. Preoperative Medications

XII.E.2. Anesthetic Induction Agents in Patients with Cardiac Disease

XII.E.3. Medications Prescribed for Management of Hemodynamic Instability

**TAGS:**

ACE-I/ARBs

Beta-Blockers

Calcium Channel Blockers

DiureticsInhaled (e.g., Nitric Oxide, Prostaglandin)

Inotropes

Intravenous (e.g., Nitrates, Phosphodiesterase Inhibitors)

Vasodilators

Vasopressors

XII.E.4. Other Perioperative Medications

TAGS:

GLP-1 Agonists

SGLT-2 Inhibitors

## XII.F. Devices

XII.F.1. Cardiopulmonary Bypass (CPB)

**TAGS:**

Cardiothoracic Effects

Cardioplegia

Circulatory Arrest

Coagulation/Anticoagulation Before, During, and After CPB

CPB on Pharmacokinetics and Pharmacodynamics

Endocrine Effects

Hematological Effects

Metabolic Effects

Myocardial Preservation

Neurological Effects

Renal Effects

Respiratory Effects

Thermoregulatory Effects

XII.F.2 Circulatory Assist Devices

**TAGS:**

Anesthetic Management

Anticoagulation Considerations

Complications

Contraindications

Extracorporeal Membrane Oxygenation (ECMO)

Indications

Initiation

Intra-Aortic Balloon Counterpulsation

Left and Right Ventricular Assist Devices

Percutaneous Devices

Perioperative Evaluation (e.g., TEE Exam Findings to Guide Management)

VA vs. VV ECMO

XII.F.2

Weaning

XII.F.3. Pacemakers

**TAGS:**

Biventricular Pacing

Implantable Cardioverter Defibrillators (ICD)

Indications and Insertion

Leadless Pacemakers

Modes of Operation

Perioperative Management of ICD and S-ICD

Subcutaneous Implantable Cardioverter Defibrillators (S-ICD)

## XII.G. Surgical Procedures

XII.G.1 Cardiac

**TAGS:**

ASDs/VSDs

Coronary Revascularization

Heart Transplant

Hypertrophic Obstructive Cardiomyopathy

Mechanical Circulatory Support

Minimally Invasive Valve Supply

Neoplastic

Pericardial

Rhythm Disturbances

Valve Repair and Replacement

XII.G.2 Thoracic Aortic

**TAGS:**

Ascending/Arch Aortic Surgery with Circulatory Arrest

CPB Employing Low Flow and/or Retrograde Cerebral Perfusion

Descending Aortic Surgery

Pharmacologic

Spinal Cord Protection, including CSF Drainage and Management

XII.G.3. Lung Transplant

XII.G.4. Noncardiac Surgery in the Patient with Cardiac Disease – Congenital, Valvular, Coronary

**TAGS**:

Mitral and Tricuspid Transcatheter Edge-to-Edge Repair

Transcatheter Aortic Valve Replacement

Percutaneous Left Atrial Appendage Closure

## XII.H. Postoperative and Perioperative

XII.H.1. Perioperative Ventilator Management

**TAGS:**

Critical Care Unit Ventilators and Techniques

Intraoperative Anesthetics

Postoperative Sedation Considerations

Weaning and Discontinuation of Mechanical Ventilation

XII.H.2. Perioperative Pain Management

**TAGS:**

Postoperative Pain Management

Regional Anesthesia for Cardiac Surgical Patients

XII.H.3. Postanesthetic Critical Care of Adult Cardiothoracic Surgical Patients

**TAGS:**

Diagnosis and Management of Postoperative Complications

Delayed Emergence/Neurologic

Hemorrhagic

Interpretation and Management of Mechanical Support of Circulation

LV, RV, or Biventricular Failure

Tamponade

Vasoplegic

XII.H.4. Point-of-Care Ultrasound (POCUS)

TAGS:

FAST Exam

Gastric

Identifying Shock (Distribution, Cardiogenic, Hypovolemic, Obstructive)

Lung

## MonitoringXII.I. Other Topics

XII.I.1. Research Methodology/Statistical Analysis

**TAGS:**

Fundamentals of Research Design and Conduct

Interpretation of Data

XII.I.2. Practice Management

**TAGS:**

Accuracy, Clarity, Specificity of Medical Records

Anesthesia Care Team and Scope of Practice

Artificial Intelligence and Machine Learning

Clinical Informatics

Coding Integrity, Audits, and Insurance Denials

Compliance with Documentation Requirements

Economics of Anesthesia Practice

Costs of Medical/Anesthesia Care

Documentation, Coding, and Billing

Efficient OR Staffing and Scheduling

Electronic Medical Record Systems: Costs and Benefits

Health Care Disparities Between Populations

Population Health: Perioperative Surgical Home and Enhanced Recovery

Population-Based Health Determinants, Resources to Improve Access

Subspecialization Issues: Pediatrics, Cardiac, Regional, Obstetric Coverage

Payment for Anesthesia Services

XII.I.3. Quality Improvement and Patient Safety

**TAGS:**

Anesthesia Registries

Barriers to QI

Change Management Methods

Crisis Management and Teamwork

Crisis Manuals and Other Cognitive Aids

Data Collection

Definitions

Design, Analysis, and Implementation of QI Projects

Failure Mode and Effects Analysis

Federal Quality Payment Program

Group and Facility Scorecards

Handoff Communication

Human Factors and Mindfulness

Individual Benchmarking

Information Technology to Reduce Medication Errors

Lean Six Sigma

Medical Error, Adverse Events, Sentinel Events, Misuse of Medications and Technology

Medication Errors: Assessment and Prevention

Medication Reconciliation

Patient Satisfaction Measurement

Peer Review and Morbidity and Mortality Conferences

Performance Assessment

Preoperative and Procedural Checklists

Public Reporting

QI and the 5S Process

QI Metrics

Quality Improvement (QI) Basics

Root Cause Analysis

Simulation Training

Systems Thinking and Technology Design

Teamwork Training

Value Stream Mapping

Value-Based Care Incentives, Pay-For-Performance

XII.I.4. Diversity, Equity, and Inclusion (DEI) in Health Care

**TAGS:**

Ageism

Approaches to Improvement; Interventions at Individual, Interpersonal, Community, Organizational and Policy Levels; Cultural and Gender Competency, Upstander vs. Bystander, Allyship vs. Performative Action, Tokenism vs Representation, Assortativity vs. Homophily

Barriers

Bias

Colorism/Shadeism

DEI in Academia

DEI in the Workplace

Discrimination Against Disability

Discrimination Against Ethnicity

Discrimination Against Familial Status

Discrimination Against Gender

Discrimination Against Gender Identity

Discrimination Against Immigration/Citizenship Status

Discrimination Against Language

Discrimination Against National Origin

Discrimination Against Religion

Implicit Bias

Importance of Language in Reports Discussing Racial Inequities

Leadership

Microaggressions

Representation of Diversity and Race-Related Topics in Research

Scholarship

Sexism

Stereotype Threat

Surgical Outcomes

Systematic Racism

XII.I.5. Healthcare Disparities

**TAGS:**

ICU Disparities and Outcomes

Maternal Healthcare Disparities; Maternal Mortality and Morbidity, Pain Management

Social Determinants of Health Considerations in Assessment and Management of Patients – Race, Language, Education Status, Religion, Housing, Nutrition, Geographic Location, Rural vs. Urban, Access to and Quality of Care, Health Coverage

XII.I.6. Ethics and Medico-Legal Issues

**TAGS:**

Adaptations for Clinical Disability

Advance Directives, Do Not Resuscitate (DNR) Orders, Medical Orders for Life-Sustaining Treatment

Clinician Wellness and Self-Care

Conflicts of Interest and Financial Disclosure

Diagnosis and Treatment of Burnout

Disclosure of Errors or Adverse Events

Elements of Medical Malpractice: Duty, Breadth of Duty, Causation, Damages

Ethical Standards in Research Design: Scientific Validity, Fair Subject Selection, Favorable Risk-Benefit Profile

Evidence-Based Practice

Health Care Proxy Laws and Limitations

Informed Consent in Research

Legal Actions and Consequences, National Practitioner Data Bank, Closed Claims Findings, Professional Liability Insurance

Legal and Regulatory Issues

Patient Autonomy and Decision Making

Patient Privacy Issues: Principles of Confidentiality, Access to Records, Protected Health Information

Patients Refusing Transfusion or Other Treatments

Personal Role in Reporting Unsafe Conditions and Fitness for Work

Primary Certification, Recertification, Maintenance of Certification and Related Issues (Professional Standing, Lifelong Learning, Cognitive Knowledge, Clinical Practice Assessment, Systems-Based Practice)

Principles of Informed Consent and Shared Decision Making

Principles of Justice, Autonomy, Beneficence, Nonmalfeasance

Professional Behavior: Honesty, Integrity, Compassion, Respect, Altruism, Conflicts of Interest, Response to Marketing

Professionalism: Definitions and Teaching

Recognizing and Responding to Unprofessional Behavior

Recognizing Limitations In Expertise and Need to Seek Guidance

Research Ethics

Review and Implementation of Trials, The Institutional Review Board

Sleep Deprivation

Substance Use Disorder

The Health Insurance Portability and Accountability Act (HIPAA)

Understanding Laws Related to Controlled Substances, Including Opioids and Cannabinoids