

# CRITICAL CARE MEDICINE EXAMINATION

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## Content Outline January 2024

The Critical Care Medicine Content Outline identifies the key topic areas that are assessed on the written Critical Care Medicine Examination. While individual practices may vary with respect to patient populations and different management roles, this examination reflects core concepts in critical care medicine that each candidate is expected to acquire.

The Content Outline is divided into 3 sections, including basic pathophysiology, diagnosis and management of critically ill patients, and additional specialized areas. The examination includes items covering each of these 3 content areas, though is more heavily weighted to clinical management. Specific topics addressing each body system are repeated in the Basic Pathophysiology and Critical Illness Diagnosis and Management sections, but all questions on the exam address basic pathophysiology, clinical knowledge, or decision-making. Specialized areas include ICU management, general principles in critical care medicine, ability of the candidate to critically evaluate literature related to critical care medicine, and other topics related to unique patient populations.



# 1. Basic Pathophysiology

## A. Central Nervous System

1. Altered mental status; encephalopathy; delirium
2. Brain death
3. Cerebral blood flow
4. Degenerative disease of the brain (e.g., Alzheimer disease, Parkinson disease)
5. Traumatic brain injury (TBI)
6. Infection
7. Intracranial compliance, mass lesion
8. Neuromuscular disorders
9. Seizures and status epilepticus
10. Spinal cord injury
11. Stroke
  - a. Hemorrhagic
  - b. Ischemic
12. Vascular malformations (e.g., aneurysms, AV malformations)

## B. Cardiovascular

1. Cardiac transplantation
2. Congenital heart disease in adults
  - a. Eisenmenger syndrome
  - b. Tetralogy of Fallot
  - c. Intracardiac Shunts
  - d. Other
3. Coronary artery disease, myocardial ischemia/infarction
4. Deep Vein Thrombosis (DVT)
5. Hypertension
  - a. Pulmonary hypertension
  - b. Systemic hypertension
6. Infection/inflammation
  - a. Endocarditis
  - b. Myocarditis
  - c. Pericarditis
7. Myocardial function/dysfunction
  - a. Left ventricular
    1. Diastolic dysfunction
    2. Systolic dysfunction
  - b. Right ventricular
8. Peripheral vascular disease
  - a. Aneurysm, abdominal
  - b. Aneurysm, thoracic
  - c. Dissections
9. Rhythm disturbances
  - a. Asystole
  - b. Supraventricular tachyarrhythmias, including atrial flutter, atrial fibrillation
  - c. Heart block, partial or complete
  - d. Junctional or nodal rhythm
  - e. Pulseless Electrical Activity (PEA)
  - f. Ventricular tachycardia/fibrillation
  - g. Other conduction abnormalities (e.g., WPW)

10. Shock states
  - a. Cardiogenic
  - b. Distributive (e.g., sepsis, neurogenic/spinal, anaphylactic/anaphylactoid)
  - c. Hypovolemic (e.g., hemorrhagic shock)
  - d. Obstructive (e.g., pulmonary embolism)
11. Structural
  - a. Pericardial
  - b. Other myocardial
  - c. Valvular
    1. Aortic valve
      - a. Aortic Insufficiency
      - b. Aortic Stenosis
      - c. Hypertrophic cardiomyopathy (HOCM, ASH, IHSS)
    2. Mitral valve
      - a. Mitral Regurgitation
      - b. Mitral Stenosis
    3. Pulmonary valve
      - a. Pulmonic insufficiency
      - b. Pulmonic stenosis
    4. Tricuspid valve dysfunction
12. Oxygen supply and demand
13. Trauma
  - a. Cardiac contusion
  - b. Cardiac tamponade
14. Other (e.g., pulsus paradoxus)

### **C. Pulmonary**

1. Airway diseases
  - a. Obstructive
  - b. Reactive
  - c. Restrictive
2. Aspiration
3. Embolic disorders
4. Infection
  - a. Empyema/abscess
  - b. Mediastinitis
  - c. Pneumonia
    1. Community-acquired
    2. Health-care associated
    3. Ventilator-associated
  - d. Tracheobronchitis
5. Inflammatory and autoimmune diseases
6. Lung transplantation
7. Airway disruption
  - a. Tracheal disruption
  - b. Pneumothorax, volutrauma
  - c. Bronchopleural fistula
8. Pleural effusion
9. Chest trauma (e.g., pulmonary contusion, flail chest)
10. Pulmonary mechanics (including assessment of work of breathing)
11. Respiratory failure

- a. ARDS
- b. Hypoxemic (acute and chronic)
- c. Hypercapnic (acute and chronic)
- d. Other ventilation-perfusion abnormalities
- e. Transfusion-Related Lung Injury
  - 1. Transfusion-Related Acute Lung Injury (TRALI)
  - 2. Transfusion associated circulatory overload (TACO)
- f. Sleep apnea
  - 1. Obstructive
  - 2. Central
- g. Pulmonary edema
- h. Other

#### **D. Renal**

- 1. Infection
- 2. Renal failure
  - a. Intrinsic renal
  - b. Post-renal
  - c. Pre-renal
- 3. Renal tubular acidosis

#### **E. Hematologic/Oncologic**

- 1. Bone marrow/stem cell transplantation
- 2. Coagulopathies
  - a. Acquired
    - 1. DIC
    - 2. Isolated factor abnormalities
    - 3. Vitamin K dependent coagulopathy
  - b. Congenital
- 3. Fibrinolysis
- 4. Hemoglobin abnormalities
  - a. Anemia
  - b. Polycythemia
  - c. Carboxyhemoglobin
  - d. Methemoglobin
  - e. Other hemoglobinopathies (e.g., sickle cell disease, Thalassemia)
- 5. Platelet abnormalities
  - a. Thrombocytosis
  - b. Thrombocytopenia
    - 1. Heparin-induced thrombocytopenia
    - 2. Other (e.g., thrombotic thrombocytopenic purpura, ITP)
  - c. Dysfunction
- 6. Tumor lysis syndrome
- 7. Leukemia, lymphoma
- 8. Other

#### **F. Obstetric**

- 1. Complications of pregnancy
  - a. Coagulopathy, bleeding disorders
  - b. Emboli (amniotic fluid, thromboemboli, other)
  - c. Liver function abnormalities (e.g., acute fatty liver, HELLP)
  - d. Pre-eclampsia/eclampsia
  - e. Other
- 2. Physiologic changes associated with pregnancy

3. Respiratory physiology of pregnancy

- a. Airway changes
- b. Pulmonary physiology

**G. Endocrine**

1. Adrenal

- a. Adrenal insufficiency
- b. Cushing syndrome
- c. Pheochromocytoma

2. Diabetes mellitus

- a. Hyperglycemia, including diabetic ketoacidosis (DKA), nonketotic hyperglycemic coma (NKHG)
- b. Hypoglycemia

3. Pituitary

- a. Cerebral salt wasting
- b. Diabetes Insipidus, including central, nephrogenic
- c. SIADH
- d. Panhypopituitarism (postpartum, other)

4. Thyroid function abnormalities

- a. Critical illness effects on thyroid function
- b. Hyperthyroidism, including thyroid storm
- c. Hypothyroidism, including myxedema

5. Other (e.g., carcinoid)

**H. Gastrointestinal**

1. Abdominal compartment syndrome/Intra-abdominal hypertension

2. Bowel disorders

- a. Infectious
- b. Perforation, volvulus
- c. Pseudomembranous colitis
- d. Bowel ischemia

3. Gall bladder disease (stones, cholecystitis)

4. Stomach

- a. GI hemorrhage
  - 1. Lower
  - 2. Upper
- b. GI motility dysfunction
  - 1. Diarrhea, nausea, vomiting
  - 2. Ileus
  - 3. Malabsorption
  - 4. Toxic megacolon
  - 5. Other

5. Pancreas

- a. Pancreatitis
- b. Pancreatic cancer

6. Hepatic

- a. Hepatic dysfunction/failure (acute and chronic)
- b. Hepatic encephalopathy
- c. Hepatitis
- d. Hepatocellular carcinoma
- e. Hepatorenal syndrome
- f. Other

**I. Dermatologic**

1. Allergic reactions
2. Pressure injuries
3. Infection
  - a. Cellulitis
  - b. Necrotizing soft tissue infection
  - c. Other
4. Stevens Johnson Syndrome

**J. Immunologic**

1. Autoimmune
  - a. Mixed connective tissue disease
  - b. Rheumatoid arthritis (RA)
  - c. Systemic Lupus Erythematosus (SLE)
  - d. Vasculitides
  - e. Other
2. Immune suppression
  - a. Acquired (e.g., HIV, AIDS)
  - b. Medication related
3. Graft vs. host disease

**K. Acid-base and electrolyte abnormalities**

1. Acid-base abnormalities
  - a. Metabolic
  - b. Mixed
  - c. Respiratory
2. Electrolyte abnormalities
  - a. Calcium
  - b. Chloride
  - c. Magnesium
  - d. Phosphorus
  - e. Potassium
  - f. Sodium
  - g. Other

## 2. Critical Illness Diagnosis and Management

### A. Central Nervous System

#### 1. Diagnoses

- a. Altered mental status
  1. Coma
  2. Delirium
  3. Hallucinations
  4. Other (e.g., hypoxic/metabolic encephalopathy)
- b. Brain death
- c. Degenerative disease of the brain (e.g., Alzheimer disease, Parkinson disease)
- d. Traumatic brain injury (TBI) (subarachnoid, subdural, epidural hematoma)
- e. Infectious
  1. Abscess
  2. Encephalitis
  3. Meningitis/ventriculitis
- f. Neuromuscular disorders
  1. Critical illness polyneuropathy/myopathy
  2. Demyelinating
  3. Guillain-Barré syndrome
  4. Myasthenia gravis
  5. Myopathy
  6. Other
- g. Seizures and status epilepticus
- h. Spinal cord injury
- i. Stroke
  1. Hemorrhagic (Subarachnoid, hypertensive, hemorrhagic conversion)
  2. Ischemic
- j. Tumors (supratentorial, infratentorial, spinal)
- k. Vascular malformations (e.g., aneurysms, AV malformations)
- l. Pituitary disorders (e.g., acromegaly, infarction)
- m. Other psychiatric disorders (e.g., depression, anxiety, PTSD)

#### 2. Diagnostic modalities

- a. Angiography
- b. EEG, processed EEG
- c. Evoked potential
- d. ICP measurement
- e. Other imaging (e.g., CT, CTA, MRI, MRA)
- f. Jugular venous saturation
- g. Lumbar puncture
- h. Nerve conduction studies/EMG
- i. Nuclear medicine studies (e.g., cerebral blood flow)
- j. Transcranial Doppler
- k. Other

#### 3. Management strategies

- a. Anticonvulsants
- b. Antimicrobials
- c. ICP-controlling medications

- d. Interventional radiology (e.g., coiling, clipping, vasospasm therapies)
- e. Neuroprotectants
- f. Steroids
- g. Surgical interventions
- h. Vasoactive drugs
- i. Plasmapheresis/plasma exchange
- j. Other therapies, e.g., CSF drainage
- k. Antidepressants
  - 1. Tricyclic antidepressants
  - 2. SSRIs
  - 3. Lithium
  - 4. Other
- l. Antipsychotics
- m. Neuromuscular blocking drugs
- n. Thrombolytics

## **B. Cardiovascular**

### 1. Diagnoses

- a. Cardiac transplantation, rejection, complications
- b. Congenital heart disease in adults
  - 1. Eisenmenger syndrome
  - 2. Tetralogy of Fallot
  - 3. Other
- c. Coronary artery disease, myocardial ischemia/infarction
- d. Hypertension
  - 1. Pulmonary hypertension
  - 2. Systemic hypertension
- e. Infectious
  - 1. Endocarditis
  - 2. Myocarditis
  - 3. Pericarditis
- f. Myocardial function/dysfunction
  - 1. Left ventricular
    - a. Diastolic dysfunction
    - b. Systolic dysfunction
  - 2. Right ventricular
- g. Peripheral vascular disease
  - 1. Aneurysms, thoracic
  - 2. Aneurysm, abdominal
  - 3. Dissections
  - 4. Other
- h. Rhythm disturbances
  - 1. Asystole
  - 2. Atrial flutter/fibrillation
  - 3. Supraventricular tachyarrhythmias, other
  - 4. Heart block
  - 5. Junctional or nodal rhythm
  - 6. Pulseless Electrical Activity (PEA)
  - 7. Ventricular tachycardia/fibrillation
  - 8. Other conduction abnormalities (e.g., WPW)
- i. Shock states



1. Cardiogenic
2. Distributive (e.g., sepsis, neurogenic/spinal, anaphylactic/anaphylactoid)
3. Hypovolemic (e.g., hemorrhagic shock)
4. Obstructive (e.g., pulmonary embolism)
- j. Structural
  1. Cardiac contusion
  2. Acquired ASD, VSD
  3. Cardiomyopathy
  4. Non-infectious myocarditis
  5. Papillary muscle dysfunction
  6. Stunned myocardium
  7. Stress-induced cardiomyopathy (e.g., Takotsubo cardiomyopathy)
  8. Pericardial
    - a. Pericardial effusion
    - b. Pericarditis
    - c. Tamponade
  9. Systemic oxygen supply and demand
  10. Traumatic
  11. Valvular
    - a. Aortic
      1. Insufficiency
      2. Stenosis
      3. Hypertrophic cardiomyopathy (HOCM, ASH, IHSS)
    - b. Mitral
      1. Regurgitation
      2. Stenosis
    - c. Pulmonic valve disease
      1. Regurgitation
      2. Stenosis
    - d. Tricuspid valve disease
  12. Other (e.g., Noncardiogenic pulmonary edema, pulsus paradoxus)
2. Diagnostic modalities
  - a. Hemodynamic monitoring
    1. Arterial pressure
    2. Cardiac output monitoring
    3. CVP
    4. ECG
    5. Pulse pressure/stroke volume variation
    6. Other
  - b. Imaging
    1. CT, MRI
    2. Interventional imaging
    3. Nuclear imaging
3. Management strategies
  - a. Anticoagulants and antithrombotics
    1. Antiplatelet agents
    2. Heparin

- a. Heparinoids
- b. LMWH
- c. Unfractionated
- 3. Thrombin inhibitors (e.g., bivalirudin, argatroban)
- 4. Thrombolytics
- 5. Antifibrinolytics
- 6. Warfarin
- 7. Direct Oral Anticoagulants (DOACs)
- 8. Other
- b. Antidysrhythmics
- c. Antimicrobials
- d. Circulatory support systems
  - 1. ECMO
  - 2. Pacemakers/defibrillators
    - a. AICDs
    - b. External defibrillators
    - c. Transthoracic
    - d. Transvenous/epicardial
  - 3. Left or right ventricular assist device (open or percutaneous)
  - 4. Intraaortic balloon pump
- e. Pericardiocentesis
- f. Vasoactive or modulating drugs
  - 1. Antihypertensives
  - 2. Inotropes/chronotropes/lusitropes
  - 3. Vasoconstrictors
  - 4. Vasodilators (systemic or pulmonary)
- g. Other

### **C. Pulmonary**

- 1. Diagnoses
  - a. Airway diseases
    - 1. Obstructive
    - 2. Reactive
    - 3. Restrictive
  - b. Airway disruption (e.g., pneumothorax, volutrauma)
  - c. Aspiration
  - d. Chest trauma (e.g., pulmonary contusion, flail chest)
  - e. Embolic disorders
    - 1. Air
    - 2. Fat
    - 3. Thromboembolic
    - 4. Other
  - f. Infection
    - 1. Empyema/abscess
    - 2. Mediastinitis
    - 3. Pneumonia
      - a. Community-acquired
      - b. Health care associated
      - c. Ventilator associated
    - 4. Tracheobronchitis
  - g. Inflammatory and autoimmune diseases
  - h. Lung and chest wall tumors

- i. Lung transplantation (rejection, complications)
- j. Pleural effusion
- k. Pulmonary edema
- l. Respiratory failure
  - 1. ARDS
  - 2. Hypercapnic (acute and chronic)
  - 3. Hypoxic (acute and chronic)
  - 4. TRALI
  - 5. Other
- m. Volutrauma/barotrauma
- n. Inhalation injuries
- 2. Diagnostic modalities
  - a. Blood gas (arterial, venous)
  - b. Capnography
  - c. Imaging
    - 1. Chest x-ray
    - 2. CT/MRI
    - 3. Nuclear studies
    - 4. Ultrasound
  - d. Laryngoscopy and bronchoscopy
  - e. Pulmonary function studies/pulmonary mechanics
  - f. Pulse oximetry
  - g. Sleep studies
  - h. Thoracentesis
- 3. Management strategies
  - a. Antimicrobials/antivirals/antifungals
  - b. Management of bronchopleural and bronchocutaneous fistulae
  - c. Pleural drainage and evacuation (e.g., thoracentesis, chest tube placement)
  - d. Pulmonary medications
  - e. Vaccination (Pneumovax)
  - f. Ventilatory support
    - 1. Invasive ventilation modes
      - a. Airway pressure-release ventilation
      - b. Assist control
      - c. High-frequency/oscillation
      - d. PC/volume control
      - e. Pressure-support ventilation
      - f. SIMV
    - 2. Noninvasive
      - a. BiPAP
      - b. CPAP
    - 3. Spontaneous breathing trials
    - 4. Other ventilator strategies
      - a. Differential lung ventilation
      - b. Positioning (e.g., prone)
  - g. Extracorporeal support (e.g., VV ECMO)

#### **D. Renal**

- 1. Diagnoses
  - a. Infection
  - b. Renal failure

1. Contrast induced-nephropathy
2. Intrinsic renal
3. Post-renal
4. Pre-renal
5. Renal tubular acidosis
6. Hepatorenal syndrome
7. Rhabdomyolysis
- c. Renal trauma
- d. Renal transplantation (e.g., rejection)
2. Diagnostic modalities
  - a. Electrolytes, osmolarity, and specific gravity (serum, urine)
  - b. Imaging
    1. Angiography
    2. CT/MRI
    3. Diagnostic x-ray
    4. Ultrasound
  - c. Renal biopsy
3. Management strategies
  - a. Fluid and electrolyte management
  - b. Pharmacologic therapies
    1. Antimicrobials/antifungals
    2. Buffers
    3. Diuretic therapy
    4. *N*-acetylcysteine
  - c. Renal replacement therapies
    1. Continuous renal replacement therapies including ultrafiltration
    2. Intermittent hemodialysis
    3. Peritoneal dialysis

## **E. Hematologic/Oncologic**

1. Diagnoses
  - a. Bone marrow/stem cell transplantation (rejection, complications)
  - b. Coagulopathies
    1. Acquired
      - a. DIC
      - b. Isolated factor abnormalities
      - c. Vitamin K dependent
    2. Congenital
  - c. Fibrinolysis
  - d. Hemoglobin abnormalities
    1. Anemia
    2. Polycythemia
    3. Carboxyhemoglobin
    4. Methemoglobin
    5. Other hemoglobinopathies (e.g., sickle cell disease, Thalassemia)
  - e. Hypercoagulable state
  - f. Platelet abnormalities
    1. Thrombocytopenia (including HIT)
    2. Thrombocytosis
    3. Other (e.g., thrombocytopenic purpura, ITP)

- g. Tumor lysis syndrome
- h. White blood cell disorder
- i. Leukemia, lymphoma
- j. Other
- 2. Diagnostic modalities
  - a. Bone marrow biopsy, culture
  - b. Coagulation studies (e.g., PT, PTT, TEG, ROTEM, factor levels)
  - c. Routine blood studies (e.g., CBC, platelets)
- 3. Management strategies
  - a. Anticoagulants
    - 1. Heparin
      - a. LMWH
      - b. Unfractionated
    - 2. Warfarin
    - 3. Antiplatelet agents
    - 4. Thrombin inhibitors (e.g., argatroban)
    - 5. Thrombolytics
    - 6. Factor Xa inhibitors
  - b. Erythropoietin, GCSF
  - c. Plasmapheresis/plasma exchange
  - d. Transfusion and factor replacement
  - e. IVC filters, other mechanical devices
  - f. Other

## **F. Obstetric**

- 1. Diagnoses
  - a. Coagulopathy, bleeding disorders
  - b. Emboli (amniotic fluid, thromboemboli, other)
  - c. Liver function abnormalities (e.g., acute fatty liver, HELLP)
  - d. Pre-eclampsia/eclampsia
  - e. Peripartum infection
  - f. Trauma in obstetric patients
  - g. Other
- 2. Diagnostic modalities
  - a. Laboratory studies (serum, urine)
  - b. Ultrasound
  - c. Cardiotocography
- 3. Management strategies
  - a. Anticoagulants
  - b. Anticonvulsants
  - c. Antihypertensive therapy
  - d. Antimicrobials
  - e. Delivery

## **G. Endocrine**

- 1. Diagnoses
  - a. Adrenal
    - 1. Adrenal insufficiency
    - 2. Cushing syndrome
    - 3. Pheochromocytoma
  - b. Diabetes mellitus
    - 1. Hyperglycemia [diabetic ketoacidosis (DKA), non-ketotic hyperglycemic coma (NKH)]

- 2. Hypoglycemia
- c. Pituitary
  - 1. Cerebral salt wasting
  - 2. Diabetes insipidus (central, nephrogenic)
  - 3. SIADH
- d. Thyroid function abnormalities
  - 1. Critical illness effects on thyroid function
  - 2. Hyperthyroidism, including thyroid storm
  - 3. Hypothyroidism, including myxedema
- e. Other
- 2. Diagnostic modalities
  - a. CT
  - b. Laboratory studies (serum, urine)
  - c. Ultrasound
- 3. Management strategies
  - a. Antihypertensives
  - b. Hormone replacement therapy
  - c. Glucose management
    - 1. Insulin
    - 2. Oral hypoglycemic agents
    - 3. Other therapies
  - d. Steroids (glucocorticoid and mineralocorticoid)
  - e. Vasodilators
  - f. Vasopressin/DDAVP

## H. Gastrointestinal

- 1. Diagnoses
  - a. Abdominal compartment syndrome
  - b. Bowel disorders
  - c. Gall bladder disease (stones, cholecystitis)
  - d. Stomach
    - 1. Gastritis
    - 2. Ulcer
  - e. GI hemorrhage (upper, lower)
  - f. GI motility dysfunction, GERD
  - g. Pancreas
    - 1. Pancreatitis
    - 2. Pancreatic cancer
  - h. Hepatic
    - 1. Dysfunction/failure, acute and chronic
    - 2. Hepatic encephalopathy
    - 3. Hepatitis
    - 4. Hepatocellular carcinoma
    - 5. Hepatorenal syndrome
    - 6. Liver transplantation, rejection, complications
  - i. Abdominal trauma (i.e., splenic, liver, bowel injuries)
  - j. Other
- 2. Diagnostic modalities
  - a. Abdominal pressure measurement (bladder pressure, other)
  - b. Assessment of bowel motility
  - c. Endoscopy, upper, lower
  - d. Imaging (CT, MRI, x-ray, nuclear medicine studies, ultrasound)

- e. Interventional radiology
- f. Laboratory Studies
  - 1. Coagulation parameters
  - 2. Immunologic studies
  - 3. Nutritional assessment (albumin, prealbumin)
  - 4. Routine blood studies (CBC, electrolytes, renal function)
  - 5. Stool assessment (occult blood, C. diff toxin)
  - 6. Serology (hepatitis, HIV)
  - 7. Additional relevant studies (e.g., amylase, lipase)
  - 8. Other
- g. Biopsy (e.g., liver)
- h. Endoscopy (upper, lower); ERCP
- i. Imaging (x-ray, CT, MRI, ultrasound)
- j. Paracentesis, diagnostic
- 3. Management strategies
  - a. Blood product selection and administration
  - b. Diuretics, renal replacement therapies
  - c. Endoscopy, upper, lower with therapeutic intervention
  - d. Immunotherapy (e.g., IgG)
  - e. Interventional radiology (embolization, coiling)
  - f. Management of increased intra-abdominal pressure
  - g. Nutritional support (enteral, parenteral)
  - h. Paracentesis, therapeutic
  - i. Pharmacologic management
    - 1. Antimicrobials
    - 2. GI blood flow modulators
    - 3. Immunologic therapy, steroids
    - 4. Lactulose, rifaximin
    - 5. Other
  - j. Surgical intervention (timing, therapeutic options)
  - k. Vaccination (e.g., hepatitis)

## **I. Dermatologic**

- 1. Diagnoses
  - a. Allergic reactions
  - b. Disruption of the skin barrier, including decubiti, Stevens-Johnson syndrome
  - c. Infection
    - 1. Cellulitis
    - 2. Necrotizing soft tissue infection
    - 3. Other
  - d. Inflammatory diseases of the skin
  - e. Stevens Johnson Syndrome
  - f. Burns
- 2. Diagnostic modalities, laboratory studies
  - a. CBC with differential
  - b. Immunologic studies
  - c. Sedimentation rate
- 3. Management strategies
  - a. Pharmacologic
    - 1. Antimicrobials
    - 2. Antihistamines

- 3. Immunotherapies (systemic and topical)
- 4. Other
- b. Fluids and resuscitation
- c. Wound care (surgical and other)
- d. Hyperbaric therapy

## **J. Immunologic**

- 1. Diagnoses
  - a. Autoimmune
    - 1. Mixed connective tissue disease
    - 2. RA
    - 3. SLE
    - 4. Vasculitides
    - 5. Other
  - b. Graft vs. host disease
  - c. Immune suppression (e.g., HIV, AIDS)
- 2. Diagnostic modalities
  - a. Biopsy, selective aspiration
  - b. Laboratory studies
    - 1. Immunologic studies
    - 2. Routine (CBC, etc.)
    - 3. Serologies
- 3. Management strategies
  - a. Pharmacologic
    - 1. Antimicrobial therapy
    - 2. Antimicrobial prophylaxis
    - 3. HAART
    - 4. Immunosuppression (glucocorticoids, antimetabolites, calcineurin inhibitors)
    - 5. Other

## **K. Acid-base and electrolyte abnormalities**

- 1. Diagnoses
  - a. Acid-base abnormalities
    - 1. Metabolic
    - 2. Mixed
    - 3. Respiratory
  - b. Electrolyte abnormalities
    - 1. Calcium
    - 2. Chloride
    - 3. Magnesium
    - 4. Phosphorus
    - 5. Potassium
    - 6. Sodium
    - 7. Other
- 2. Diagnostic modalities
  - a. Laboratory studies
    - 1. Albumin
    - 2. Arterial blood gas
    - 3. Electrolytes, osmolarity, and specific gravity (serum, urine)
  - b. Selective imaging
- 3. Management strategies
  - a. Appropriate renal and endocrine strategies



- b. Electrolyte management
- c. Ventilatory support

### **3. Specialized Areas**

#### **A. Biostatistics**

1. Number needed to treat
2. Odds ratio
3. Regression analysis
4. Relative risk
5. ROC
6. Positive Predictive Value/Negative Predictive Value
7. Sensitivity, specificity
8. Statistical significance (p-value)
9. Confidence Interval
10. Statistical tests
  - a. Non-parametric (e.g., Wilcoxon, Mann Whitney U test, Chi squared, Kaplan Meier curve)
  - b. Parametric (e.g., t-test, ANOVA)
11. Type 1 and type 2 errors

#### **B. Disaster Management**

1. Triage
2. Biologic, chemical, and nuclear exposures
3. Epidemic (e.g., COVID-19, SARS, bird flu, toxic exposures)

#### **C. Drowning**

1. Fresh water
2. Salt water

#### **D. ICU Ethics**

1. Brain death
2. End-of-life, futility
3. Impaired providers
4. Informed consent
5. Living will/DPOA/Healthcare surrogate
6. Organ donation
7. Palliative care, hospice
8. Patient autonomy

#### **E. ICU Management and Organization**

1. Clinical care bundles and guidelines (e.g., sepsis, catheter management)
2. Compliance
3. Daily wake-up test
4. HIPAA (privacy and security)
5. ICU transport
6. Outcome and performance measures (HCAPS)
7. Regulatory requirements
8. Scoring systems (e.g., APACHE, SOFA)
9. Sedation/analgesia/delirium assessment (e.g., CAM-ICU, RASS)
10. Triage and resource utilization
11. Telemedicine

#### **F. Infection Control**

1. Environmental exposures
2. Isolation techniques
  - a. General/universal precautions
  - b. Reverse isolation
  - c. Specific isolation procedures
3. Needle stick injuries

4. Nosocomial infections
  - a. Catheter associated infections
  - b. Pneumonia (ventilator associated, hospital associated, etc.)
  - c. UTI, catheter-associated UTI
  - d. Other

**G. Life Support and Resuscitation**

1. ACLS
2. ATLS
3. Other

**H. Nutrition Management**

1. Enteral and parenteral nutrition (formula, caloric intake)
2. Metabolic assessment (basal and stress energy requirements)
  - a. Indirect calorimetry
  - b. Nitrogen balance
  - c. Other
3. Re-feeding syndrome

**I. Pain and Sedation Management**

1. Systemic analgesia (indications, contraindications, complications)
2. Regional analgesia (indications, contraindications, complications)

**J. Pharmacology (Indications, Contraindications, and Complications)**

1. Antidepressants
  - a. Tricyclic antidepressants
  - b. SSRIs
  - c. Lithium
  - d. Other
2. Antimicrobials
  - a. Antibiotics
    1. Anaerobes
    2. Gram-negative organisms
    3. Gram-positive organisms
    4. Spirochetal and rickettsial
    5. TB
    6. Other
  - b. Antifungal
  - c. Antimicrobial resistance
  - d. Antiparasitic
  - e. Antiviral
  - f. Prophylactic antimicrobials
3. Antipsychotics
4. Genetic considerations
5. Pharmacokinetics and pharmacodynamics and drug metabolism
6. Neuromuscular blocking drugs
7. Sedatives/hypnotics
8. Immunosuppressants
9. Other

**K. Poisonings, Toxic Ingestion, Overdoses**

**L. Procedures**

1. Airway
  - a. LMA/others
  - b. Tracheostomy and cricothyrotomy
  - c. Transtracheal tubes

2. Monitoring techniques and troubleshooting (e.g., cardiac, neurologic, etc.)
3. Ultrasound (indications, physics and interpretation)
  - a. Cardiac (transthoracic, transesophageal)
  - b. Thoracic
  - c. Vascular
  - d. Abdominal, including gastric
  - e. Ocular
  - f. Other
4. Vascular access
  - a. Arterial
  - b. Intraosseous
  - c. Venous

#### **M. Thermoregulation**

1. Hyperthermia
  - a. Heat stroke
  - b. Fever
  - c. Malignant hyperthermia
  - d. Neuroleptic malignant syndrome
  - e. Serotonin syndrome
2. Hypothermia
  - a. Environmental

#### **N. Diversity, Equity, and Inclusion (DEI) in health care**

1. Barriers
  - a. Systematic racism, colorism/shadeism, sexism, discrimination against sexual orientation, gender identity, language, national origin, ethnicity, religion, immigration/citizenship status, age, familial status, and disability
  - b. Bias; Implicit bias, microaggression, stereotype threat
2. Approaches to improvement; interventions at individual, inter-personal, community, organizational and policy levels; cultural and gender competency, upstander vs. bystander, allyship vs. performative action, tokenism vs. representation, assortativity vs. homophily
3. DEI in the workplace
4. DEI in academia
  - a. Leadership
  - b. Scholarship; Representation of diversity and race related topics in research, Importance of language in reports discussing racial inequities

#### **O. Healthcare Disparities**

1. 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
2. Maternal healthcare disparities; Maternal mortality and morbidity, Pain management
3. Child and adolescent healthcare disparities
4. ICU disparities and outcomes

#### **P. Ethics and Medico-Legal Issues**

1. Professionalism: definitions and teaching
  - a. Disclosure of errors or adverse events

- b. Professional behavior: honesty, integrity, compassion, respect, altruism, conflicts of interest, response to marketing
  - c. Recognizing limitations in expertise and need to seek guidance
  - d. Personal role in reporting unsafe conditions and fitness for work
  - e. Recognizing and responding to unprofessional behavior
  - f. Evidence-based practice
- 2. Patient autonomy and decision making
  - a. Principles of informed consent and shared decision making
  - b. Advance Directives, Do Not Resuscitate (DNR) Orders, medical orders for life-sustaining treatment
  - c. Health care proxy laws and limitations
  - d. Patients Refusing Transfusion or Other Treatments
- 3. Legal and regulatory issues
  - a. Elements of medical malpractice: duty, breach of duty, causation, damages
  - b. Legal actions and consequences, National Practitioner Data Bank, Closed Claims findings, professional liability insurance
  - c. Understanding laws related to controlled substances, including opioids and cannabinoids
  - d. Patient privacy issues: principles of confidentiality, access to records, protected health information
  - e. The Health Insurance Portability and Accountability Act (HIPAA)
- 4. Primary Certification, Recertification, Maintenance of Certification and Related Issues (Professional Standing, Lifelong Learning, Cognitive Knowledge, Clinical Practice Assessment, Systems-Based Practice)
- 5. Research ethics
  - a. Principles of justice, autonomy, beneficence, nonmaleficence
  - b. Ethical standards in research design: scientific validity, fair subject selection, favorable risk-benefit profile
  - c. Review and implementation of trials, the institutional review board
  - d. Informed consent in research
  - e. Conflicts of interest and financial disclosure
- 6. Clinician wellness and self-care
  - a. Diagnosis and treatment of burnout
  - b. Sleep deprivation
  - c. Adaptations for clinical disability
  - d. Substance abuse

#### **Q. Practice Management**

- 1. Costs of medical/anesthesia care
  - a. Understanding principles of healthcare funding and payment
  - b. Cost-conscious practice
- 2. Efficient OR staffing and scheduling
  - a. Subspecialization issues: pediatrics, cardiac, regional, obstetric coverage
  - b. Anesthesia care team and scope of practice
- 3. Population health: perioperative surgical home and enhanced recovery
  - a. Population based health determinants, resources to improve access
  - b. Health care disparities between populations
- 4. Clinical informatics
  - a. Electronic medical record systems: costs and benefits

- b. Artificial intelligence and machine learning
- 5. Documentation, coding, and billing
  - a. Compliance with documentation requirements
  - b. Accuracy, clarity, specificity of medical records
  - c. Coding integrity, audits, and insurance denials

## **R. Quality Improvement and Patient Safety**

- 1. Definitions
  - a. Medical error, adverse events, sentinel events, misuse of medications and technology
  - b. Human factors and mindfulness
  - c. Systems thinking and technology design
- 2. Medication errors: assessment and prevention
  - a. Medication reconciliation
  - b. Information technology to reduce medication errors
- 3. Crisis Management and Teamwork
  - a. Simulation training
  - b. Crisis manuals and other cognitive aids
  - c. Teamwork training
  - d. Handoff communication
  - e. Preoperative and procedural checklists
- 4. Quality Improvement (QI) Basics
  - a. Design, Analysis, and implementation of QI projects
  - b. Data collection
  - c. QI metrics
  - d. Patient satisfaction measurement
  - e. Value-based care incentives, pay-for-performance
- 5. Performance Assessment
  - a. Individual benchmarking
  - b. Group and facility scorecards
  - c. Public reporting
    - 1. Federal Quality Payment Program
    - 2. Anesthesia registries
- 6. Change Management Methods
  - a. Peer review and morbidity and mortality Conferences
  - b. Lean Six Sigma
  - c. QI and the 5S process
  - d. Value stream mapping
  - e. Failure mode and effects analysis
  - f. Root cause analysis
- 7. Barriers to QI