

CURRICULUM OF CARDIAC CRITICAL CARE

Goals & Objectives

The goal of the cardiac critical care training is to provide the attending doctors with a suitable background in critical care cardiopulmonary medicine. Residents should acquire a sufficient knowledge base to participate as expert anaesthesia consultants in the care of critically ill patients, both in the perioperative period and in general. Residents who complete the curriculum should have the ability to deal with simple and straightforward problems in critical care medicine. The experience should also be sufficient to allow residents to decide whether they would like to pursue a Fellowship in Critical Care Cardiopulmonary medicine. Such a Fellowship is necessary training for those who intend to function full-time as Intensivists.

Patient Care -

Residents are expected to

- To understand Pharmacology, dosing & administration of critical care drugs.
- Become familiar with protocols for managing all types of cardiac, pulmonary & cardiopulmonary emergencies.
- Become familiar with and able to use all of the modes of mechanical ventilation in patients with respiratory failure. Understand the appropriate use and misuse of these modes.
- Understand how to program the controls and interpret displays from the ventilators we use at this hospital.
- Interpret the waveforms and quantitative information derived from pulmonary artery catheterization.
- Provide technical expertise as needed to services like peripheral IVs, central lines, arterial lines, airway management.
- Refine ability to interpret chest X-rays and EKGs

- Appropriately liberate patients from mechanical ventilation.
- Able to perform temporary cardiac pacing
- To learn & excel in cardioversion & defibrillation.
- To get conversant with application of echocardiography in ICCU.
- To able to perform peritoneal dialysis

Medical knowledge -

Residents are expected to understand

- Left ventricular mechanics
- Control of cardiac output by the peripheral vessels
- Basic lung mechanics, particularly with respect to normal states, COPD, and restrictive lung diseases
- Acid-base physiology
- The differential diagnosis of, diagnostic approach to, and treatment of shock states
- The differential diagnosis of, diagnostic approach to, and treatment of respiratory failure
- The differential diagnosis of, diagnostic approach to, and treatment of acid-base disorders
- The differential diagnosis of, diagnostic approach to, and treatment of acute renal failure
- The course of stress response, and how it impacts on the care of postoperative patients for the first 5 days.
- The manifestations of multi-organ system failure

Practice - Based Learning and Improvement

Residents are expected to

- Apply the evolving clinical literature to improve patient care practices,
- Identify areas for improvement and implement strategies to enhance knowledge, judgment, skills, attitudes and processes of care
- Analyze and evaluate practice experiences and implement strategies to continually improve the quality of their clinical practice

- Develop and maintain a willingness to learn from failures and use failures to improve the system or processes of care

Interpersonal & communication skills:

Residents are expected to

- Develop interpersonal interactions and communication skills that enable them to establish and maintain professional relationships with patients, families, and other members of health care teams and
- Learn to provide effective consultation to other physicians and healthcare professionals.
- Interact with consultants and referring physicians in a respectful, appropriate manner
- Maintain comprehensive, timely, and legible medical records
- Complete evaluations of the attending, staff and rotation

Educational Content - pulmonary medicine

Clinical experience in the management of a broad spectrum of pulmonary diseases, including:

1. Obstructive lung diseases, over view
2. Understand the pathophysiology and natural history, treatment and management of obstructive lung disease.
3. Asthma, diagnosis and management
4. Chronic bronchitis, natural history and management
5. Emphysema, natural history, diagnosis and management
6. Bronchiectasis.
7. Bronchoscopy, diagnostic, indications
8. Bronchoscopy, interventional, indications
9. Cystic fibrosis, diagnosis, management, genetics, family counseling
10. Chronic cough

11. Dyspnea
12. Cardiopulmonary exercise testing
13. Preoperative assessment of the surgical patient with lung disease
14. Pulmonary malignancy, primary
15. Be familiar with the diagnostic and screening modalities for lung cancer.
16. Pulmonary infections, bacterial
17. Pulmonary infections, fungal
18. Pulmonary infections, mycobacterium tuberculosis.
19. Pulmonary infections, mycobacterium other than tuberculosis
20. Pulmonary infections, viral
21. Pulmonary infections, atypical
22. Pulmonary infections in the immunocompromised host
23. Diffuse interstitial lung disease
24. Pulmonary vasculitis / pulmonary hemorrhage syndrome
25. Pulmonary hypertension, primary
26. Pulmonary hypertension, secondary
27. Occupational and environmental lung disease
28. Drug-induced lung disease
29. Acute lung injury due to radiation, inhalation, or trauma
30. Sarcoidosis
31. Respiratory failure, acute
32. Respiratory failure, chronic
33. Respiratory failure due to adult respiratory distress syndrome
34. Respiratory failure due to neuromuscular disorders

35. Thromboembolic disease, including pulmonary embolus.
36. Understand the clinical presentation, diagnosis and acute management of pulmonary embolus.
37. Understand the principles of thrombosis prevention and DVT prophylaxis.
38. Disorders of pleura
39. Disorders of mediastinum
40. Sleep disorders

Educational content - Critical Care Medicine

Clinical experiences in the management of a broad spectrum of critical care illnesses, including:

a) *Ethics*

- Understand the principles of advanced directives, terminal care, and conflict resolution in the context of the ICU.

b) *Severity of illness*

- Understand the rationale, applications, and limitations of severity of illness evaluation.
- Know the basic components of the common severity of illness scoring systems including APACHE II and III, MPM
- Understand multiple organ failure or dysfunction (MODS) and the relationship of MODS to outcome

c) *Hemodynamic monitoring*

- Know the indications, contraindications, techniques, and potential complications for central venous catheterization
- Know the indications, contraindications, techniques, and potential complications for arterial catheterization

- Know the indications, contraindications, techniques and potential complications for pulmonary arterial catheterization
- Interpret hemodynamic data including waveform analysis, and interpretation of sets of hemodynamic data

d) *Pharmacology in the ICU*

- Understand the basic principles of pharmacokinetics and how organ dysfunction and critical illness can influence it
- Appreciate the relative costs of commonly used medications

e) *Advanced cardiac life support*

- Know basic life support
- Know the management algorithms for shock, myocardial infarction, and cardiac arrhythmias as outlined in current ACLS

f) *Endotracheal intubation, artificial airways, airway management*

- Know the indications, contraindications, techniques and potential complications for oro-tracheal and nasotracheal intubation.
- Be familiar with the indications, contraindications, care and potential complications of tracheostomy
- Know the principles of airway management and emergency alternatives to endotracheal intubation.

g) *Mechanical ventilation*

- Understand the principles of positive pressure ventilation
- Know the common ventilator modes, settings, alarms, and monitors
- Know the principles of mechanical ventilation for ARDS and their rationale
- Know the mechanisms, risk factors, recognition, and management of pneumothorax and barotraumas
- Understand the principles of weaning from mechanical ventilation

- Appreciate the indications, contraindications, techniques, and potential complications for noninvasive mechanical ventilation

h) Arterial blood gas and pulse oximetry interpretation and Acid / base disturbances

- Understand how blood gases are measured
- Understand how oximetry is performed and the limitations of pulse oximetry
- Know the principles of acid-base physiology and acid-base disturbances
- Interpret arterial blood gases and other laboratory measurements for various acid base disturbances.

i) Respiratory failure

- Understand the causes, pathophysiology, and management of various forms of respiratory failure, including hypercapnic and hypoxemic respiratory failure.

j) Acute respiratory distress syndrome

- Understand the defining characteristics, causes and pathophysiology of ARDS
- Know the management principles for ARDS

j) Pneumonia in the ICU

- Understand the pathophysiology, manifestations, prevention, diagnostic tests, and management of ventilator-associated pneumonia.
- Know the agents and antibiotics for severe community acquired pneumonia

k) Life-threatening asthma

- Know the pharmacologic management options for life-threatening asthma
- Understand the principles of mechanical ventilation for life-threatening asthma

l) Shock

- Understand the various mechanisms of shock including hypovolemic, maldistributive, cardiogenic, and obstructive

- Know the principles of resuscitation from shock and monitoring of resuscitation
- Compare the characteristics and indications for common vasopressors and inotropic agents

m) Myocardial infarction

- Know the diagnostic studies and basic management of cardiac ischemia and acute coronary syndrome

n) Cardiac arrhythmias

- Identify atrial and ventricular tachyarrhythmias, heart blocks, and ECG abnormalities associated with electrolyte disturbances.
- Know the anti-arrhythmic agents, including indications, contraindications, potential adverse effects

o) Hypertensive crisis

- Know the criteria for hypertensive urgency and emergency
- Know the medications to treat hypertensive crisis, including indications, contraindications, potential adverse effects

p) Acute renal failure

- Know the differential diagnosis for acute renal failure
- Know the management principles for acute renal failure, including indications for hemodialysis

q) Fluid and electrolyte disorders

- Understand the pathophysiology, manifestations, and management of the following electrolyte disorders
 - Hypokalemia/Hyperkalemia
 - Hyponatremia/Hyponatremia

- Hyperosmolality
- Hypocalcemia/Hypercalcemia
- Hypomagnesemia/Hypermagnesemia
- Hypophosphatemia
- Understand the advantages and disadvantages of various forms of fluid administration (crystalloids / colloids)

r) *Diabetic ketoacidosis*

- Understand the diagnosis and management of DKA
- Appreciate the role of myocardial infarction, infection, and electrolyte disorders in outcome from DKA

s) *Endocrine disorders in the ICU*

- Know the manifestations, diagnostic tests, and management of adrenal insufficiency
- Know the manifestations, diagnostic tests, and management of thyroid storm
- Know the manifestations, diagnostic tests, and management of hypothyroidism

t) *Nutrition*

- Know the principles of enteral nutrition
- Know the principles of parenteral nutrition

u) *Gastrointestinal disorders*

- Know the differential diagnosis, evaluation and management of upper GI bleeding
- Know the differential diagnosis, evaluation and management of lower GI bleeding
- Know the evaluation and management of acute pancreatitis
- Know the evaluation and management of fulminant hepatic failure

- Know the complications, and their management, of cirrhosis

v) *Infectious diseases issues in the ICU*

- Know the principles of infection control and prevention of nosocomial infection
- Appreciate the spectrum of activity and potential adverse effects of antimicrobial agents
- Know the causes and evaluation of fever in the ICU patient
- Know the criteria, causes, evaluation, and management of septic shock

w) *Miscellaneous Critical Care Topics*

- Understand the principles for evaluation of poisoning and drug overdose
- Know the primary manifestations, evaluation, and management of common drug overdoses, including tylenol, salicylate, tricyclic antidepressant, benzodiazepine
- Understand disorders of temperature control such as hypothermia and hyperthermia, including evaluation and management
- Appreciate issues surrounding ICU management, billing and documentation, admission / discharge

x) *Clinical competencies in the following technical skills:*

1. Mechanical ventilation, including volume -cycled, pressure-cycled, time-cycled, and flow-cycled ventilation.
2. Non-invasive mechanical ventilation.
3. Respiratory care, including the oxygen delivery systems, continuous positive airway pressure, nebulizer therapy.
4. Management of pneumothorax, with needle insertion or chest tube drainage techniques
5. Diagnostic and therapeutic procedures, including thoracentesis, pleural biopsy, flexible fiberoptic bronchoscopy.

6. Pulmonary function testing, to assess respiratory mechanics
7. Includes spirometry, flow volume studies, lung volumes, diffusion capacity, arterial blood gas analysis
8. Management of circulation:
9. Arterial puncture and line placement.
10. Insertion of central venous or pulmonary artery balloon floatation catheters.
11. Basic and advanced cardiopulmonary resuscitation.
12. Cardioversion & defibrillation
13. Calibration and operation of hemodynamic monitoring systems.
14. Temporary cardiac pacing
15. Insertion & management of Intra Aortic Balloon Pump (IABP)