

Fellowship in Critical Care Medicine
Department of Anaesthesiology and Critical
Care



All India Institute of Medical Sciences (AIIMS)
Jodhpur, Rajasthan, India

Curriculum for Fellowship in Critical Care Medicine

In the Department of Anaesthesiology and Critical Care

The department of Anaesthesiology and Critical Care is managing a six bedded fully equipped Adult ICU since the IPD services were started in 2014, by AIIMS Jodhpur. The ICU is equipped with ICU beds, high end mechanical ventilator, advanced monitoring including invasive haemodynamic monitoring, blood gas analyser, fiberoptic bronchoscope, bedside ultrasound and transthoracic Echocardiography. Bedside haemodialysis machine is under the process of procurement. Postoperative patients and patients from different medical specialities like general onco and GI surgery, general medicine, pulmonary medicine, cardiology and interventional radiology are being managed. Till now seven hundred and fortyfive (745) patients have been admitted and managed in the present ICU.

General Objectives

1. **Immediate Assessment and Therapy (Resuscitation):** The trainee should be able to make a quick and accurate assessment of the life threatening problems in a critically ill patient and apply life supporting therapy.
2. **Formal Medical Assessment, Problem Solving and Decision Making Following resuscitation:** The trainee should be able to undertake or contribute to the continuing management of the acutely ill patient.
3. **Consultation and Collaboration:** The trainee should understand that consultation with medical, nursing, support staff and family plays a vital role in the management of critically ill patients.
4. **Management of System(s) Failure:** The trainee should be able to manage a patient with a single or multiple systems failure.
5. **Retrieval and Transport:** The trainee should be able to supervise the movement of a critically ill or injured patient to a hospital from another hospital, place of injury or site of a mass disaster.
6. **Disease and Disease Processes - General Medical and Surgical Conditions:** The trainee should have a broad and sound understanding of general medical and surgical conditions together with a detailed knowledge of medical and surgical emergencies.
7. **Paediatric Knowledge and Skills:** The trainee should be able to recognise life threatening conditions in paediatric age group patients, institute basic or advanced life support, carry out transportation, stabilise the child in the intensive care unit or prepare for management during secondary transportation to a paediatric unit.

8. Anaesthesia: The trainee should understand the preoperative, intraoperative and postoperative management of patients receiving general, regional or local anaesthesia.
9. Analgesia: The trainee should be able to provide satisfactory pain relief for patients.
10. Sedation: The trainee should know how to provide adequate rest and sleep for patients in the intensive care ward.
11. Therapeutic Agents: The trainee should understand the principles and practice of the various therapeutic agents used in the critically ill patient.
12. Adverse Reactions to Drugs: The trainee should be able to manage the adverse effects of drugs.
13. Monitoring, Investigations and Interpretation of Data: The trainee should have a detailed knowledge of the investigations and monitoring techniques commonly used in intensive care and a general knowledge of the procedures in medicine and surgery.
14. Principles of Monitoring and patient equipment: The trainee should understand the principles of the measurement of biological variables and have a working knowledge of the practicalities and trouble-shooting of equipment on which critically ill patients have an everyday dependence.
15. Selection of Monitoring Equipment, etc.: The trainee should know the indications for and the selection of suitable methods of monitoring or investigation taking into account their accuracy, convenience, reliability, hazards, cost and servicing and relevance to the patient's condition.
16. Electrical Safety: The trainee should understand the hazards to patients and staff from electrical equipment.
17. Ionising Radiation: The trainee should appreciate its uses and hazards in the practice of intensive care.
18. Interpretation of Data: The trainee should know how to critically evaluate and use the data that he/she collects.
19. Technical Skills: The trainee should know the indications, contraindications and complications of procedures commonly performed in intensive care.
20. Attitudes: The trainee should have those attitudes which cause him/her to act in the best interests of the patients, their relatives and the staff of the intensive care unit.
21. Administration, Organisation and Education: By the end of training, the trainee should have some knowledge and skill of the administration and organisation of an intensive care unit so that clinical care, research and teaching are carried out optimally.

Training schedule:

This is a full time, one-year training programme with emphasis on adult critical care. The training shall comprise of rotation as follows:

ICU (Multispecialty: Surgical/ Medical/ Neuro/ Cardiac) - 9 months
Pulmonary Medicine, and Microbiology - 15 Days each (For Anaesthesiologist)
Anaesthesiology, and Microbiology - 15 Days each (For physicians/Pulmonary Physicians)
Trauma & Emergency area- 30 days
Pediatric and Neonatal ICU- 10 days
Dialysis Unit-10 Days
Radiology - 10 Days

Programme content:

The candidate must gain experience in the diagnosis and treatment of patients with acute, serious, and life-threatening medical and surgical diseases. The present document defines the core curriculum of cognitive knowledge and procedural skills that an intensivist is expected to be equipped with to effectively approach the complex problems encountered in the critically ill patient.

TEACHING METHODOLOGIES AND DUTIES

1. Lectures
2. Discussion
3. Student Directed Learning
4. Case Based Learning
5. Role Playing
6. Simulators Based learning
7. Web Based learning

Teaching components will consist of

- 1 Didactic learning (theory lectures, seminar and journal club sessions),
- 2 Non-didactic/practical/clinical learning - (bed-side, treatment procedure, clinical demonstration, case discussion, laboratory observation sessions).
- 3 Combined Round/ Grand round
- 4 Mortality/ Morbidity meetings
- 5 Quality Assurance meeting
- 6 Radiology conferences

CLINICAL POSTING

1. Academic and practical training commences in the Critical Care.
2. Second month of training, identification of project and synopsis submission for Ethics approval.
3. Didactic and clinical training within the unit
4. Learning the good clinical practice skills pertaining to the curriculum
5. Team work, bed-side practice, out-patient care understanding by the end of 8 months duration

CURRICULUM

(A) Theoretical Knowledge

The critical care specialist (Intensivist) must understand the pathophysiology, construct a differential diagnosis and apply the appropriate prophylactic and therapeutic interventions in the following disorders. The list is not comprehensive and can be modified from time to time.

- 1. Cardiovascular Physiology, Pathology, Pathophysiology and Therapy**
 - a. Shock and its complications
 - b. Myocardial infarction and its complications
 - c. Cardiac rhythm and conduction disturbances; indications for and types of pacemakers
 - d. Pulmonary embolism— thrombus, air, fat, amniotic
 - e. Pulmonary edema; cardiogenic, noncardiogenic
 - f. Cardiac tamponade and other acute pericardial diseases
 - g. Acute and chronic life-threatening valvular disorders
 - h. Acute aortic and peripheral vascular disorders, including A-V fistulas
 - i. Acute complications of cardiomyopathies and myocarditis
 - j. Vasoactive and inotropic therapy
 - k. Pulmonary hypertension and cor pulmonale
 - l. Complications of angioplasty
 - m. Principles of oxygen transport and utilization
 - n. Hemodynamic effects caused by ventilatory assist devices
 - o. Thrombolytic and anticoagulant therapy
 - p. Perioperative management of patient undergoing cardiovascular surgery
 - q. Recognition, evaluation, and management of hypertensive emergencies and urgencies

- 2. Respiratory Physiology, Pathology, Pathophysiology, and Therapy**
 - a. Acute respiratory failure
 - i. Hypoxemic respiratory failure including acute respiratory distress syndrome
 - ii. Hypercapnic respiratory failure
 - iii. Acute on chronic respiratory failure
 - b. Status asthmaticus
 - c. Smoke inhalation, airway burns
 - d. Aspiration
 - e. Flail chest, chest trauma, pulmonary contusion
 - f. Bronchopulmonary infections
 - g. Upper airway obstruction
 - h. Near drowning
 - i. Pulmonary mechanics and gas exchange
 - j. Oxygen therapy
 - k. Hyperbaric oxygenation
 - l. Mechanical ventilation
 - i. Pressure and volume ventilators

- ii. Positive end-expiratory pressure, intermittent mandatory ventilation, continuous positive airway pressure, high-frequency ventilation, inverse ratio ventilation, pressure-support ventilation, negative pressure ventilation, differential lung ventilation, pressure control, and noninvasive ventilation
- iii. Indications for and hazards of mechanical ventilation
- iv. Barotrauma and volutrauma
- v. Criteria for weaning and weaning techniques
- vi. Extracorporeal membrane oxygenation
- vii. Permissive hypercapnia
- viii. Liquid ventilation
- m. Airway maintenance
 - i. Emergency airway management
 - ii. Endotracheal intubation
- iii. Tracheostomy – open and percutaneous
 - iv. Long-term intubation vs. tracheostomy
- n. Ventilatory muscle physiology, pathophysiology, and therapy, including polyneuropathy of the critically ill, and prolonged effect of neuromuscular blockers
- o. Pleural diseases
 - i. Empyema
 - ii. Massive effusion
 - iii. Pneumothorax
 - iv. Hemothorax
- p. Pulmonary hemorrhage and massive hemoptysis

3. Renal Physiology, Pathology, Pathophysiology, and Therapy

- a. Renal regulation of fluid balance and electrolytes
- b. Renal failure: Prerenal, renal, and postrenal
- c. Derangements secondary to alterations in osmolality and electrolytes
- d. Acid-base disorders and their management
- e. Principles of hemodialysis, peritoneal dialysis, ultrafiltration, continuous arteriovenous hemofiltration (CAVH), and continuous veno-venous hemofiltration (CVVH)
- f. Interpretation of urine electrolytes
- g. Evaluation of oliguria
- h. Drug dosing in renal failure
- i. Rhabdomyolysis

4. Central Nervous System (CNS) Physiology, Pathology, Pathophysiology, and Therapy

- a. Coma
 - i. Metabolic
 - ii. Traumatic
 - iii. Infectious
 - iv. Mass lesions
 - v. Vascular-anoxic or ischemic
 - vi. Drug induced

- b. Hydrocephalus
- c. Psychiatric emergencies
- d. Perioperative management of patient undergoing neurologic surgery
- e. Brain death evaluation and certification
- f. Diagnosis and management of persistent vegetative states
- g. Management of increased intracranial pressure (ICP), including ICP monitors
- h. Status epilepticus
- i. Neuromuscular disease causing respiratory failure
 - i. Guillian-Barré
 - ii. Amyotrophic Lateral Sclerosis
 - iii. Myasthenia Gravis
- j. Nontraumatic intracranial bleed: Subarachnoid, Intracerebral and Others

5. Metabolic and Endocrine Effects of Critical Illness

- a. Colloid osmotic pressure
- b. Alimentation
 - i. Enteral and parenteral
 - ii. Evaluation of nutritional needs including indirect calorimetry
- c. Endocrine
 - i. Disorders of thyroid function (thyroid storm, myxedema coma, sick euthyroid syndrome)
 - ii. Adrenal crisis
 - iii. Disorders of antidiuretic hormone metabolism
 - iv. Diabetes mellitus
 - (1) Ketotic and nonketotic hyperosmolar coma
 - (2) Hypoglycemia
 - v. Pheochromocytoma
 - vi. Insulinoma
 - vii. Disorders of calcium and magnesium balance

6. Infectious Disease Physiology, Pathology, Pathophysiology, and Therapy

- a. Antibiotics
 - i. Antibacterial agents
 - ii. Antifungal agents
 - iii. Antituberculosis agents
 - iv. Antiviral agents
 - v. Agents for parasitic infections
- b. Infection control for special care units
 - i. Development of antibiotic resistance
 - ii. Universal precautions
 - iii. Isolation and reverse isolation
- c. Anaerobic infections
- d. Systemic Inflammatory Response Syndrome (SIRS)
- e. Tetanus
- f. Hospital acquired and opportunistic infections in the critically ill
- g. Adverse reactions to antimicrobial agents
- h. Intensive care unit (ICU) support of the immunosuppressed patient
 - i. Acquired Immunodeficiency Syndrome (AIDS)
 - ii. Transplant

- iii. Oncologic
 - i. Infectious risks to healthcare workers
- J Evaluation of fever in the ICU patient

7. Physiology, Pathology, Pathophysiology and Therapy of Acute Hematologic and Oncologic Disorders

- a. Acute defects in hemostasis
 - i. Thrombocytopenia/thrombocytopeny
 - ii. Disseminated intravascular coagulation
- b. Anticoagulation; fibrinolytic therapy
- c. Principles of blood component therapy
 - i. Platelet transfusion
 - ii. Packed red blood cells
 - iii. Fresh frozen plasma
 - iv. Specific coagulation factor concentrates
 - v. Albumin, plasma protein fraction
 - vi. Stroma-free hemoglobin
 - vii. White blood cell transfusion
 - viii. Cryoprecipitate
- d. Acute hemolytic disorders including thrombotic microangiopathies
- e. Acute syndromes associated with neoplastic disease and antineoplastic therapy
- f. Sickle cell crisis
- g. Plasmapheresis
- h. Prophylaxis against thromboembolic disease

8. Physiology, Pathology, Pathophysiology, and Therapy of Acute Gastrointestinal (GI), Genitourinary (GU), and Obstetric-Gynecological (Ob-Gyn) Disorders

- a. Acute pancreatitis with shock
- b. Upper gastrointestinal bleeding including variceal bleeding
- c. Lower gastrointestinal bleeding
- d. Acute and fulminant hepatic failure
- e. Toxic megacolon
- f. Acute perforations of the gastrointestinal tract
- g. Ruptured esophagus
- h. Acute inflammatory diseases of the intestine
- i. Acute vascular disorders of the intestine, including mesenteric infarction
- j. Obstructive uropathy, acute urinary retention
- k. Urinary tract bleeding
- l. Toxemia of pregnancy; amniotic fluid embolism, HELLP (hemolysis, elevated liver function tests, and low platelet count) syndrome, ovarian hyperstimulation
- m. Hydatidiform mole
- n. Perioperative management of surgical patients
- o. Stress ulcer prophylaxis
- p. Drug dosing in hepatic failure
- q. Acalculous cholecystitis
- r. Postoperative complications including fistulas, wound infection, and evisceration

9. Intensive care management of polytrauma patients

10. Environmental Hazards

- a. Drug overdose and withdrawal
 - i. Barbiturates
 - ii. Narcotics
 - iii. Insecticides and pesticides
 - iv. Alcohols
 - v. Cocaine
 - vi. Tricyclic Antidepressants
 - vii. Acetaminophen
 - viii. Others
- b. Temperature-Related Injuries
 - i. Hyperthermia
 - ii. Hypothermia

c. Envenomations

11. Immunology and Transplantation

- a. Principles of transplantation (organ donation, procurement, maintenance of organ donors, preservation, transportation, allocation, implantation, national organization of transplantation activities)
- b. Immunosuppression
- c. Organ transplantation: Indications and postoperative care

12. Monitoring, Bioengineering, Biostatistics

- a. Prognostic indices, severity, and therapeutic intervention scores
- b. Principles of electrocardiographic monitoring, measurement of skin temperature and resistance, transcutaneous measurements
- c. Invasive hemodynamic monitoring
 - i. Principles of strain gauge transducers
 - ii. Signal conditioners, calibration, gain, adjustment
 - iii. Display techniques
 - iv. Principles of arterial, central venous, and pulmonary artery pressure catheterization and monitoring
 - v. Assessment of cardiac function and derived hemodynamic parameters
- d. Noninvasive hemodynamic monitoring
- e. Thermoregulation
- f. CNS brain monitoring (intracranial pressure, cerebral blood flow, cerebral metabolic rate, electroencephalogram, jugular venous bulb oxygenation, transcranial Doppler)
- g. Respiratory monitoring (airway pressure, intrathoracic pressure, tidal volume, pulse oximetry, dead-space-tidal volume ratio, compliance, resistance, capnography, pneumotachography)
- h. Metabolic monitoring (oxygen consumption, carbon dioxide production, respiratory quotient)
- i. Use of computers in critical care units
- j. Research Methodology
- K. Electrical safety

(B) General Interventions and Procedures

The intensivist must be able to perform a number of specific procedures; for all candidates experience is desirable but not mandatory in the following areas:

- Maintenance of open airway
- Endotracheal intubation (oral and nasal)
- Intermittent positive pressure ventilation on resuscitation bag
- Setting and turning on the respirator with various modes of ventilation
- Chest physiotherapy and suctioning of airway
- Titration of oxygen therapy and assessment and measurement of arterial and mixed venous blood gas analysis
- Assessment of gas exchange and respiratory mechanics
- Various modes of weaning from mechanical ventilation
- Placement of intercostal drainage tube
- Fiberoptic bronchoscopy and bronchoalveolar lavage
- Cricothyrotomy, minitracheotomy and percutaneous dilational tracheostomy
- Placement of central venous catheter through various approaches.
- Arterial catheterisation
- Placement of pulmonary artery (Swan Ganz) catheter and measurement & interpretation of hemodynamic variables
- Implementation of cardiovascular support and antiarrhythmic therapy and thrombolysis.
- Bedside Ultrasound screening of lungs & abdomen
- Bedside Echo screening (TTE/TEE)

(C) Speciality Specific Interventions and Procedures

The intensivist must be able to perform a number of specific procedures; for all candidates experience is desirable but not mandatory in the following areas:

- **Neurological**
 - Basic interpretation of brain CT/MRI Scan
 - Monitoring of intracranial pressure
 - Lumbar puncture and sampling of CSF
- **Metabolic and Nutritional**
 - Implementation of intravenous fluid therapy
 - Enteral and parenteral nutritional therapy
- **Haematological**
 - Correction of haemostatic and coagulation disorders
 - Interpretation of coagulation profile including thromboelstograph
 - Implementation of thrombolysis
- **Renal**
 - Urinary bladder catheterization
 - Renal support techniques including peritoneal dialysis, SLED, CRRT
- **General**
 - Measurement of severity of illness and outcome assessment
 - Exposure to clinical research, ethical and legal aspects of critical care

(D) Assessment Procedures:

The candidates would maintain 1 logbook of procedures performed /assisted which would be countersigned by the departmental faculty members.

(E) Professional Duties and Ethics

Obligation and responsibilities in medical practice; knowledge of relevant laws of the country governing the practice of medicine; knowledge of medical ethics and principles of good practice; doctor-patient relationship, doctor-doctor relations, relationship with medical organisation and hospitals, para-medical services, including pharmacists and druggists.

(F) Medico-legal aspects of critical care

Knowledge of health legislation and duties of doctor attending to cases, certification court evidence, expert advice; medical negligence and Consumer Protection Act.

(G) Palliation and communication in critical care - The various methods of communication like breaking bad news, handling workplace conflict, handling an aggressive relative will be taught to the trainee.

Research:

1. See 20 cases of quality analysing and discussing which will be certified by the faculty of the department.
2. Present at one regional and one national conference.

Textbooks/Reference books/Journals:

TEXT BOOKS:

1. Intensive Care Medicine: Rippe, Irwin Alpert & Funk, Little Brown.
2. Textbook of Critical Care: Shoemaker Ayres Grekvik, Holbrook & Thompson Saunders.
3. Critical Care: Civetta. Taylor & Kirby, J.B. Lippincott
4. Principles of Critical Care: Hall, Schmidt & Wood, McGraw Hill.
5. Cardiopulmonary Critical Care: Dantzker, Saunders.
6. Pharmacologic Approach to the Critically Ill patient: Chernow, Williams & Wilkins
7. Respiratory Physiology - The Essentials: West, Williams Wilkins.
8. Textbook of advanced cardiac life support. American Heart Association.

POCKET MANUALS:

1. Critical Care Secrets: Parsons, Wiener-Kronish, Jaypee Brothers
2. Washington Manual of Critical Care

JOURNALS:

1. Critical Care Medicine
2. Journal of Trauma
3. Intensive Care Medicine
4. Anaesthesia & Intensive Care
5. Critical Care & Resuscitation
6. Current Opinion in Critical Care Medicine
7. American Journal of Respiratory & Critical Care Medicine
8. Critical Care Clinics
9. Critical Care
10. Chest
11. Journal of Enteral & Parenteral Nutrition

EXIT EXAM –

As per Institute policy