

**THE TAMILNADU Dr.M.G.R. MEDICAL UNIVERSITY,
No.69, Anna Salai, Guindy, Chennai – 600 032.**

**D.M/ M.Ch
SUPER SPECIALTY DEGREE COURSE**



SYLLABUS AND CURRICULUM

2021-2022

D.M-CRITICAL CARE MEDICINE

THE TAMIL NADU Dr. MGR MEDICAL UNIVERSITY, CHENNAI

Syllabus – D.M Critical Care

1. AIMS:

The syllabus focuses on training specialists and equipping them with knowledge and skills to deal with acutely ill patients to provide a wholesome care for the patient and provide necessary support for the family. It also aims to equip the specialist to develop skills in other areas like, research, communication, and to work as a team.

2. OBJECTIVES:

Critical Care physicians working in closed ICU's improve the outcome of critically ill in comparison to an open ICU model. A critically ill patient would have multiple organ failure and it is essential that the treating physician have in depth knowledge in various medical and surgical specialties. The Intensivist has to be equipped knowledge in all the specialties of medicine to holistically manage patients in the critical care unit. He / she should also be competent with soft skills like communication, working as a team. He / She should also be able to be technically sound with procedures and use of equipments and interpretation of the findings to provide quick and timely treatment, which could be life saving in an acutely ill patient. Being a relatively new specialty in India, he / she should also be able to train medical and paramedical personnel to meet the ever increasing demand of manpower requirements in critical care. Critical illness has a wide scope for research and the specialist should also be equipped with research skills. Treating critically ill is a teamwork coordinating specialists and paramedical personnel and also involving the family in decision-making. Increased awareness of the public and litigation in health care necessitates to work within legal framework of our country. The scope of this course is to cover all the above areas.

The curriculum of three-year training in Critical Care Medicine deals with the cognitive, psychomotor and affective domains covering following learning objectives:

3. THEORY SYLLABUS

(A) . General curriculum

- Applied Anatomy
- Applied Physiology & Biochemistry
- Applied Pharmacology
- Pathophysiology of acute illness
- o Diagnosis
 - Assessment of critically ill
 - Investigation
 - Monitoring
 - Interpretation of data
- o Practical Procedures
- o Comfort, Pain-Relief and Recovery
- o Basics of Pediatric Critical Care
- o Physics & Clinical Measurement
- o Research Methods

(B) Advanced curriculum

- o Resuscitation and Initial Management of the Acutely ill Patients
- o Disease Management
 - Therapeutic Interventions/Organ System Support in Single or multiple organ failure
 - Inter and Intra hospital Transport of critically ill
 - Peri-operative Care
 - Organ transplant management

(C) Professional qualities curriculum

- Patient Safety and Health Systems Management
- Professionalism and Ethics
- End of Life Care
- (D) Certification in BLS ,ACLS, ATLS & PALS during the 1st year from a recognised centres.

Course contents divided into Cognitive, psychomotor and affective domains:

Cognitive Domain

The course contents under the cognitive domain include following:

1. Resuscitation and Initial Management of the Acutely Ill Patients
2. Diagnosis: Assessment, Investigation, Monitoring and Data Interpretation of the acutely ill patients
3. Disease Management
4. Therapeutic Interventions/Organ System Support in Single or Multiple Organ Failure
5. Peri-operative Care
6. Paediatric Care
7. Transportation
8. Physics & Clinical Measurement
9. Research Methods
10. Applied Anatomy
11. Physiology & Biochemistry
12. Pharmacology
13. Pathophysiology.

1. Resuscitation and Initial Management of the Acutely Ill Patients

- 1.1 Timely approach to the recognition, assessment and stabilization of the acutely ill patients with disordered physiology
- 1.2 Cardiopulmonary resuscitation
- 1.3 Post-resuscitation management
- 1.4 Triage and prioritization of patients for ICU admission
- 1.5 Assessment and initial management of the trauma patient
- 1.6 Assessment and initial management of the patient with burns
- 1.7 Fundamentals of the management of mass casualties.
- 1.8 Fundamentals of disaster management.

2. Diagnosis : Assessment, Investigation, Monitoring and Data Interpretation of the acutely ill patients

- 2.1 History taking and clinical examination
- 2.2 Timely and appropriate investigations
- 2.3 Understanding of echocardiography (transthoracic/transoesophageal), Indications and interpretation of results
- 2.4 Understanding of Electrocardiography (ECG/EKG), Indications and interpretation of the results
- 2.5 Appropriate microbiological sampling and interpretation of results
- 2.6 Interpretation of results from blood gas samples
- 2.7 Organization and interpretation of wide range of clinical imaging including bed-side chest x- rays, ultrasound, CT scan, MRI and nuclear imaging relevant for the diagnosis and management of critically ill and injured patients.
- 2.8 Understanding and interpretation of physiological variables

- 2.9 Integration of clinical findings with laboratory, radiology, microbiology and other investigations to form appropriate differential diagnosis and management strategy

3. Disease Management

Acute disease

- 3.1 Management of the care of the critically ill patient with following specific acute medical conditions

- Acute Myocardial Infarction
- Pulmonary Embolism
- Cardiogenic Shock
- Life Threatening Arrhythmias
- Pericardial Tamponade
- Acute Ischemic Stroke
- Intracranial Hemorrhage
- Status Epilepticus
- Head & Spine Trauma
- Acute neuromuscular failure (OPP/GBS/MG/Snakebite, etc)
- Acute severe Asthma
- Acute Exacerbation of COPD
- Severe Community acquired pneumonia
- Chest Trauma
- Acute hypoxemia Respiratory Failure including ARDS
- Acute GI Bleed
- Acute Liver Failure
- Acute Pancreatitis
- Acute Abdomen
- Neutropenia
- Acute coagulation disorders
- Thrombocytopenia
- Sepsis and Septicemic Shock
- Meningitis
- Acute Hemorrhagic Fevers
- Severe forms of tropical infections like Malaria, Typhoid etc.
- Acute Renal Failure
- Eclampsia
- Acute poisoning
- Tropical emergencies namely tropical infections and environmental emergencies like heat stroke
- Toxicology

Chronic Disease

- 3.2 Identifications of the implications of chronic and co morbid disease in the acutely ill patients

Organ System Failure

- 3.3 Management of patients with, or at risk of, circulatory failure
- 3.4 Management of patients with, or at risk of, acute renal failure
- 3.5 Management of patients with, or at risk of, acute liver failure
- 3.6 Management of patients with, or at risk of, neurological impairment
- 3.7 Management of patients with, or at risk of, acute gastrointestinal failure

- 3.8 Management of patients with, or at risk of, acute lung injury syndromes (ALI/ARDS)
Management of patients with, or at risk of, severe sepsis/septic shock with multi-organ dysfunction /failure
- 3.9 Management of patients following intoxication with drugs or environmental toxins
- 3.10 Recognition of life-threatening maternal peri-partum complications like acute fatty liver of pregnancy, HELLP and eclampsia/preeclampsia etc. and their management

4. Pathophysiology of acute diseases

- Acute Myocardial Infarction
- Pulmonary Embolism
- Cardiogenic Shock
- Life Threatening Arrhythmias
- Pericardial Tamponade
- Acute Ischemic Stroke
- Intracranial Hemorrhage
- Status Epilepticus
- Head & Spine Trauma
- Acute neuromuscular failure (OPP/GBS/MG/Snakebite, etc)
- Acute severe Asthma
- Acute Exacerbation of COPD
- Severe Community acquired pneumonia
- Chest Trauma
- ARDS
- Liver Failure
- Acute Pancreatitis
- Acute Renal Failure
- Eclampsia

5. Therapeutic Interventions/Organ System Support in Single or Multiple Organ Failure

- 5.1. Principles of safe prescription
- 5.2. Principles of safe delivery of life-support therapies
- 5.3. Antimicrobial drug therapy – Fundamental principles and ICU specific issues.
- 5.4 Antimicrobial Stewardship
- 5.4 Transfusion therapy - Fundamental principles and ICU specific issues
- 5.5 Circulatory therapies - Fundamental principles and ICU specific issues pertaining to fluid therapy including dynamic variables of fluid responsiveness and vasoactive/inotropic drugs
- 5.6 Mechanical circulatory assist devices
- 5.7 Initiation, management and weaning of the patients from invasive and non-invasive ventilatory support
- 5.8 Initiation, management and weaning of the patients from renal replacement therapy
- 5.9 Management of electrolyte, glucose and acid-base disturbances
- 5.10 Nutritional assessment and support

6. Peri-operative Care

- 6.1 Management of the pre & post-operative care of the high-risk surgical patients
- 6.2 Fundamentals of the management of the care of patients following cardiac surgery
- 6.3 Fundamentals of the management of the patients following craniotomy

- 6.4 Fundamentals of the management of the patients following solid organ transplantation and bone marrow transplantation
- 6.5 Fundamentals of the management of the pre and post-operative trauma care.

7. Paediatric Care

- 7.1 Understanding of the recognition of the acutely ill child and initial management of paediatric emergencies.

Protocols & scoring systems

Discuss and explain critical appraisal and application of guidelines, protocols and care bundles.

Demonstrate understanding of scoring systems for assessment of severity of illness and case mix.

8. Transportation

- 8.1 Transportation of the mechanically ventilated critically ill patient outside the ICU, within and out of hospital
- 8.2 Understanding of the special considerations required during patient transport by air

9. Physics & Clinical Measurement

Mathematical Concepts:

- 9.1 Relationships and graphs
- 9.2 Concepts of exponential functions and logarithms: wash-in and washout
- 9.3 Basic measurement concepts: linearity, drift, hysteresis, signal:noise ratio, static and dynamic response
- 9.4 SI units: fundamental and derived units
- 9.5 Other systems of units where relevant to ICM (e.g. mmHg, bar, atmospheres)
- 9.6 Simple mechanics: Mass, Force, Work and Power

Gases & Vapours:

- 9.7 Absolute and relative pressure.
- 9.8 The gas laws; triple point; critical temperature and pressure
- 9.9 Density and viscosity of gases.
- 9.10 Laminar and turbulent flow; Poiseuille's equation, the Bernoulli principle
- 9.11 Vapour pressure: saturated vapour pressure
- 9.12 Measurement of volume and flow in gases and liquids.
- 9.13 The pneumotachograph and other respirometers.
- 9.14 Principles of surface tension

Electricity & Magnetism:

- 9.15 Basic concepts of electricity, magnetism and Bridge circuits

- 9.16 Capacitance, inductance and impedance
- 9.17 Amplifiers: bandwidth, filters
- 9.18 Amplification of biological potentials: ECG, EMG, EEG.
- 9.19 Sources of electrical interference
- 9.20 Processing, storage and display of physiological measurements

Electrical Safety:

- 9.21 Principles of cardiac pacemakers and defibrillators
- 9.22 Electrical hazards: causes and prevention.
- 9.23 Electrocutation, fires and explosions.
- 9.24 Diathermy and its safe use
- 9.25 Basic principles and safety of lasers
- 9.26 Basic principles of ultrasound and the Doppler effect

Pressure & Flow Monitoring:

- 9.27 Principles of pressure transducers
- 9.28 Resonance and damping, frequency response
- 9.29 Measurement and units of pressure.
- 9.30 Direct and indirect methods of blood pressure measurement; arterial curve analysis
- 9.31 Principles of pulmonary artery and wedge pressure measurement
- 9.32 Cardiac output: Fick principle, thermodilution

Clinical Measurement:

- 9.33 Measurement of gas and vapour concentrations, (oxygen, carbon dioxide, nitrous oxide, and volatile anaesthetic agents) using infrared, paramagnetic, fuel cell, oxygen electrode and mass spectrometry methods
- 9.34 Measurement of H⁺, pH, pCO₂, pO₂
- 9.35 Measurement CO₂ production/ oxygen consumption/ respiratory quotient
- 9.36 Colligative properties: osmometry
- 9.37 Simple tests of pulmonary function e.g. peak flow measurement, spirometry.
- 9.38 Capnography including volumetric capnography
- 9.39 Pulse oximetry
- 9.40 Monitoring of neuromuscular blockade
- 9.41 Quantification of pain
- 9.51 Bispectral Index

10. Research Methods

Data Collection:

- 10.1 Simple aspects of study design (research question, selection of the method of investigation, population, intervention, outcome measures)
- 10.2 Power analysis
- 10.3 Defining the outcome measures and the uncertainty of measuring them
- 10.4 The basic concept of meta-analysis and evidence based medicine

Descriptive Statistics:

- 10.5 Types of data and their representation
- 10.6 The normal distribution as an example of parametric distribution
- 10.7 Indices of central tendency and variability

Deductive & Inferential Statistics, Literature reading & writing

- 10.8. Simple probability theory and the relation to confidence intervals
- 10.9 The null hypothesis.
- 10.10 Choice of simple statistical tests for different data types
- 10.11 Type I and type II errors
- 10.12 Inappropriate use of statistics
- 10.12 Reading and interpreting scientific papers
- 10.13 Writing scientific (research) papers

11. Applied Anatomy

Respiratory System:

- 11.1 Mouth, nose, pharynx, larynx, trachea, main bronchi, segmental bronchi, structure of bronchial tree and differences in the paediatric airway
- 11.2 Airway and respiratory tract, blood supply, innervation and lymphatic drainage
- 11.3 Pleura, mediastinum and its contents
- 11.4 Lungs, lobes, microstructure of lungs
- 11.5 Diaphragm, other muscles of respiration, innervation
- 11.6 The thoracic inlet and 1st rib
- 11.7 Interpretation of a chest x-ray

Cardiovascular System:

- 11.8 Heart, chambers, conducting system, blood and nerve supply
- 11.9 Congenital deviations from normal anatomy
- 11.10 Pericardium
- 11.11 Great vessels, main peripheral arteries and veins
- 11.12 Foetal and materno-foetal circulation

Nervous System:

- 11.13 Brain and its subdivisions
- 11.14 Spinal cord, structure of spinal cord, major ascending & descending pathways
- 11.15 Spinal meninges, subarachnoid & extradural space, extradural space-contents
- 11.16 Cerebral blood supply
- 11.17 CSF and its circulation
- 11.18 Spinal nerves, dermatomes
- 11.19 Brachial plexus, nerves of arm
- 11.20 Intercostal nerves
- 11.21 Nerves of abdominal wall
- 11.22 Nerves of leg and foot
- 11.23 Autonomic nervous system
- 11.24 Sympathetic innervation, sympathetic chain, ganglia and plexuses
- 11.25 Parasympathetic innervation.
- 11.26 Stellate ganglion

- 11.27 Cranial nerves: base of skull: trigeminal ganglion
- 11.28 Innervation of the larynx
- 11.29 Eye and orbit

Vertebral Column:

- 11.30 Cervical, thoracic, and lumbar vertebrae
- 11.31 Interpretation of cervical spinal imaging in trauma
- 11.32 Sacrum, sacral hiatus
- 11.33 Ligaments of vertebral column
- 11.34 Surface anatomy of vertebral spaces, length of cord in child and adult

Surface Anatomy:

- 11.35 Structures in ante-cubital fossa
- 11.36 Structures in axilla: identifying the brachial plexus
- 11.37 Large veins and anterior triangle of neck
- 11.38 Large veins of leg and femoral triangle
- 11.39 Arteries of arm and leg
- 11.40 Landmarks for tracheostomy, cricothyrotomy
- 11.41 Abdominal wall (including the inguinal region): landmarks for suprapubic urinary and peritoneal lavage catheters
- 11.42 Landmarks for intrapleural drains and emergency pleurocentesis
- 1.143 Landmarks for pericardiocentesis

Abdomen:

- 11.44 Gross anatomy of intra-abdominal organs
- 11.45 Blood supply to abdominal organs and lower body

11. Physiology & Biochemistry

General:

- 11.1 Organisation of the human body and homeostasis
- 11.2 Variations with age
- 11.3 Function of cells; genes and their expression
- 11.4 Mechanisms of cellular and humoral defense
- 11.5 Cell membrane characteristics; receptors
- 11.6 Protective mechanisms of the body
- 11.7 Genetics & disease processes

Biochemistry:

- 11.8 Acid base balance and buffers, ions e.g. Na, K, Ca, Cl, HCO₃, Mg, PO₄,
- 11.9 Enzymes and Cellular and intermediary metabolism

Body Fluids:

- 11.10 Capillary dynamics and interstitial fluid
- 11.11 Oncotic pressure
- 11.12 Osmolarity: osmolality, partition of fluids across membranes

- 11.13 Lymphatic system
- 11.14 Special fluids: cerebrospinal, pleural, pericardial and peritoneal fluids

Haematology & Immunology:

- 11.15 Red blood cells: haemoglobin and its variants
- 11.16 Blood groups
- 11.17 Haemostasis and coagulation; pathological variations
- 11.18 White blood cells
- 11.19 Inflammation and its disorders
- 11.20 Immunity and allergy

Muscle:

- 11.21 Action potential generation and its transmission
- 11.22 Neuromuscular junction and transmission
- 11.23 Muscle types
- 11.24 Skeletal muscle contraction
- 11.25 Motor unit
- 11.26 Muscle wasting
- 11.27 Smooth muscle contraction: sphincters

Heart & Circulation:

- 11.28 Cardiac muscle contraction
- 11.29 The cardiac cycle: pressure and volume relationships
- 11.30 Rhythmicity of the heart
- 11.31 Regulation of cardiac function; general and cellular
- 11.32 Control of cardiac output (including the Starling relationship)
- 11.33 Fluid challenge and heart failure
- 11.34 Electrocardiogram and arrhythmias
- 11.35 Neurological and humoral control of systemic blood pressures, blood volume and blood flow (at rest and during physiological disturbances e.g. exercise, haemorrhage and Valsalva manoeuvre)
- 11.36 Peripheral circulation: capillaries, vascular endothelium and arteriolar smooth muscle, autoregulation and the effects of sepsis and the inflammatory response on the peripheral vasculature
- 11.37 Characteristics of special circulations including: pulmonary, coronary, cerebral, renal, portal and foetal

Renal Tract:

- 11.38 Blood flow, glomerular filtration and plasma clearance
- 11.39 Tubular function and urine formation
- 11.40 Endocrine functions of kidney
- 11.41 Assessment of renal function
- 11.42 Regulation of fluid and electrolyte balance
- 11.43 Regulation of acid-base balance
- 11.44 Micturition
- 11.45 Pathophysiology of acute renal failure

Respiration:

- 11.46 Gaseous exchange: O₂ and CO₂ transport, hypoxia and hyper- and hypocapnia, hyper and hypobaric pressures
- 11.47 Functions of haemoglobin in oxygen carriage and acid-base equilibrium
- 11.48 Pulmonary ventilation: volumes, flows, dead space.
- 11.49 Effect of IPPV and PEEP on lungs and circulation
- 11.50 Mechanics of ventilation: ventilation/perfusion abnormalities
- 11.51 Control of breathing, acute and chronic ventilatory failure, effect of oxygen therapy
- 11.52 Non-respiratory functions of the lungs
- 11.53 Cardio-respiratory interactions in health & disease

Nervous System:

- 11.54 Functions of nerve cells: action potentials, conduction, synaptic mechanisms and transmitters
- 11.55 The brain: functional divisions
- 11.56 Intracranial pressure: cerebrospinal fluid, blood flow
- 11.57 Maintenance of posture
- 11.58 Autonomic nervous system: functions
- 11.59 Neurological reflexes Motor function: spinal and peripheral
- 11.60 Senses: receptors, nociception, special senses
- 11.61 Pain: afferent nociceptive pathways, dorsal horn, peripheral and central mechanisms, neuromodulatory systems, supraspinal mechanisms, visceral pain, neuropathic pain, influence of therapy on nociceptive mechanisms
- 11.62 Spinal cord: anatomy and blood supply, effects of spinal cord section

Liver:

- 11.63 Functional anatomy and blood supply
- 11.64 Metabolic functions
- 11.65 Tests of function

Gastrointestinal:

- 11.66 Gastric function; secretions, nausea and vomiting
- 11.67 Gut motility, sphincters and reflex control
- 11.68 Digestive functions and enzymes
- 11.69 Nutrition: calories, nutritional fuels and sources, trace elements, growth factors

Metabolism and Nutrition:

- 11.70 Nutrients: carbohydrates, fats, proteins, vitamins, minerals and trace elements
- 11.71 Metabolic pathways, energy production and enzymes; metabolic rate
- 11.72 Hormonal control of metabolism: regulation of plasma glucose, response to trauma
- 11.73 Physiological alterations in starvation, obesity, exercise and the stress response
- 11.74 Body temperature and its regulation

Endocrinology:

- 11.75 Mechanisms of hormonal control: feedback mechanisms, effect on membrane and intracellular receptors
- 11.76 Central neuro-endocrine interactions
- 11.77 Adrenocortical hormones
- 11.78 Adrenal medulla: adrenaline (epinephrine) and noradrenaline (norepinephrine)

- 11.79 Pancreas: insulin, glucagon and exocrine function
- 11.80 Thyroid and parathyroid hormones and calcium homeostasis

Pregnancy:

- 11.81 Anatomical and Physiological changes associated with a normal pregnancy and delivery
- 11.82 Materno-foetal, foetal and neonatal circulation
- 11.83 Functions of the placenta: placental transfer
- 11.84 Foetus: changes at birth

12. Pharmacology

Principles of Pharmacology:

- 12.1 Dynamics of drug-receptor interaction
- 12.2 Agonists, antagonists, partial agonists, inverse agonists
- 12.3 Efficacy and potency
- 12.4 Tolerance
- 12.5 Receptor function and regulation
- 12.6 Metabolic pathways; enzymes; drug: enzyme interactions; Michaelis-Menten equation 12.7
Enzyme inducers and inhibitors.
- 12.8 Mechanisms of drug action Ion channels: types: relation to receptors.
- 12.9 Gating mechanisms.
- 12.10 Signal transduction: cell membrane/receptors/ion channels to intracellular molecular
targets, second messengers
- 12.11 Action of gases and vapours
- 12.12 Osmotic effects
- 12.13 pH effects
- 12.14 Adsorption and chelation
- 12.15 Mechanisms of drug interactions:
- 12.16 Inhibition and promotion of drug uptake.
- 12.17 Competitive protein binding.
- 12.18 Receptor inter-actions.
- 12.19 Effects of metabolites and other degradation products.

Pharmacokinetics & Pharmacodynamics

- 12.20 Drug uptake from: gastrointestinal tract, lungs, nasal, transdermal, subcutaneous, IM, IV, epidural
and intrathecal routes
- Mechanism of drug resistance
- 12.21 Bioavailability
- 12.22 Factors determining the distribution of drugs: perfusion, molecular size, solubility, protein binding.
- 12.23 The influence of drug formulation on disposition
- 12.24 Distribution of drugs to organs and tissues:
- 12.25 Body compartments Influence of specialised membranes: tissue binding and solubility
- 12.26 Materno-foetal distribution
- 12.27 Distribution in CSF and extradural space
- 12.28 Modes of drug elimination:
- 12.29 Direct excretion
- 12.30 Metabolism in organs of excretion: phase I & II mechanisms

- 12.31 Renal excretion and urinary pH 12.32
- Non-organ breakdown of drugs
- 12.33 Pharmacokinetic analysis:
- 12.34 Mechanism of drug resistance
- 12.34 Concept of a pharmacokinetic compartment
- 12.35 Apparent volume of distribution
- 12.36 Orders of kinetics
- 12.37 Clearance concepts applied to whole body and individual organs
- 12.38 Simple 1 and 2 compartmental models:
- 12.39 Concepts of wash-in and washout curves
- 12.40 Physiological models based on perfusion and partition coefficients
- 12.41 Effect of organ blood flow: Fick principle
- 12.42 Pharmacokinetic variation: influence of body size, sex, age, disease, pregnancy, anaesthesia, trauma, surgery, smoking, alcohol and other drugs
- 12.43 Effects of acute organ failure (liver, kidney) on drug elimination Influence of renal replacement therapies on clearance of commonly used drugs
- 12.44 Pharmacodynamics: concentration-effect relationships: hysteresis
- 12.45 Pharmacogenetics: familial variation in drug response
- 12.46 Adverse reactions to drugs: hypersensitivity, allergy, anaphylaxis, anaphylactoid reactions
- 12.47 Therapeutic Drug monitoring

Systemic Pharmacology

- 12.47 Hypnotics, sedatives and intravenous anaesthetic agents
- 12.48 Simple analgesics
- 12.49 Opioids and other analgesics; Opioid antagonists
- 12.50 Non-steroidal anti-inflammatory drugs
- 12.51 Neuromuscular blocking agents (depolarising and non-depolarising) and anti cholinesterases
- 12.52 Drugs acting on the autonomic nervous system (including inotropes, vasodilators vasoconstrictors, antiarrhythmics, diuretics)
- 12.53 Drugs acting on the respiratory system (including respiratory stimulants and bronchodilators)
- 12.54 Antihypertensives
- 12.55 Anticonvulsants
- 12.56 Anti-diabetic agents
- 12.57 Diuretics
- 12.58 Antibiotics
- 12.59 Corticosteroids and other hormone preparations
- 12.60 Antacids. Drugs influencing gastric secretion and motility
- 12.61 Antiemetic agents
- 12.62 Local anaesthetic agents
- 12.63 Immunosuppressants
- 12.64 Principles of therapy based on modulation of inflammatory mediators indications, actions and limitations
- 12.65 Plasma volume expanders
- 12.66 Antihistamines
- 12.67 Antidepressants
- 12.68 Anticoagulants
- 12.69 Vitamins and trace elements

Psychomotor Domain

The course contents under the psychomotor domain include various intensive-care practical-procedures related to various organ systems.

1. Respiratory system

- 1.1. Oxygen therapy - Fundamental principles and ICU specific issues
- 1.2. Oxygen therapy devices
- 1.2. Fiberoptic laryngoscopy
- 1.3. Emergency airway management
- 1.4. Difficult and failed airway management & volumetric capnography
- 1.5. Endotracheal suction
- 1.6. Fiberoptic bronchoscopy and BAL in the intubated patient
- 1.7. Percutaneous tracheostomy and minitracheostomy
- 1.8. Thoracocentesis via a chest drain
- 1.9. Lung Ultrasound

2. Cardiovascular system

- 2.1. Peripheral venous catheterization
- 2.2. Arterial catheterization
- 2.3. Surgical isolation of vein/artery
- 2.4. Ultrasound techniques for vascular localization, assessment of shock states and doppler.
- 2.5. Point of care Trans thoracic echo
- 2.5. Central venous catheterization
- 2.6. Defibrillation and cardioversion
- 2.7. Cardiac pacing (transvenous or transthoracic)
- 2.8. Fundamentals of pericardiocentesis
- 2.9. Measurement of cardiac output and derived haemodynamic variable

3. Central Nervous System

- 3.1. Lumbar puncture (Intrathecal/spinal)
- 3.2. Basic understanding of neuraxial pain medication like epidural analgesia
- 3.3 Basics of EEG and EMG and nerve conduction studies/
- 3.4 Ultrasound assessment of intracranial pressure and cerebral blood flow.
- 3.5 Assessment of Brain dead patient
- 3.6 Management of Potential Organ donor
- 3.7 Harvesting organ donor
- 3.8 Transcranial Doppler study.
- 3.9 Fundus examination

4. Gastrointestinal System

- 4.1. Nasogastric tube placement
- 4.2. Abdominal paracentesis
- 4.3. Sengstaken tube (or equivalent) placement
- 4.4. Fundamentals of upper GI endoscopy
- 4.5. Measurement and interpretation of intra-abdominal pressure
- 4.6 FAST (Focussed abdominal sonography in trauma)

5. Genitourinary System

5.1. Urinary catheterization

6. Miscellaneous

6.1 Coagulation monitoring

Affective Domain

The course contents under the affective domain include following:

1. Comfort, Pain-Relief and Recovery
2. End of Life Care
3. Patient Safety and Health Systems Management
4. Professionalism

1. Comfort, Pain-Relief and Recovery

- 1.1 Understanding of the physical and psychosocial consequences of critical illness for patients and families and methods of prevention and management
- 1.2 Assessment, prevention and treatment of pain and delirium
- 1.3 Sedation, analgesia and neuromuscular blockade
- 1.4 Communication of the continuing care requirements of patients at ICU discharge to health care professionals, patients and relatives
- 1.5 Management of the safe and timely discharge of patients from the ICU
- 1.6 Hospice Care

2. End of Life Care

- 2.1. Management of the process of withholding or withdrawing treatment with the multidisciplinary team
- 2.2. Discussion of the end of life care with patients and their families/surrogates
- 2.3. Management of palliative care of the critically ill patient
- 2.4. Brain-stem death testing /certification
- 2.5. Management of the physiological support of the organ donor
- 2.6. Organ donation by brain death and cardiac death criteria.

3. Patient Safety and Health Systems Management

- 3.1. Leadership in daily multidisciplinary ward round
- 3.2. Infection control in ICU

- 3.3. Environmental hazards
- 3.4. Safety for patients & staff in ICU
- 3.5. Understanding of critical incidents, adverse events, complications related to ICU care
- 3.6. Organisation of multi-disciplinary case conference and counselling sessions with family
- 3.7. Critical appraisal and application of guidelines, protocols and care bundles
- 3.8. Understanding of scoring systems for assessment of severity of illness and case mix
- 3.9. Understanding of the managerial & administrative responsibilities of the critical care specialist
- 3.10. Participation in quality assurance programs
 - Audit
 - Adverse drug reaction
 - Critical incident reporting
 - Morbidity and mortality meetings
 - Risk analysis
- 3.12. Handling of deceased with highly infectious condition (e.g Ebola, Nephra etc)
- 3.13. Designing a new critical Care Unit
- 3.14. IHR Guidelines for management of emergent infections.

4. Ethics, Attitudes and Professionalism

Communication skills

- 4.1. Communication with patients and relatives
- 4.2. Communication with other members of the health care team
- 4.3. Management of records/documentation
- 4.4. Teaching and training of the multidisciplinary members of critical care team

Professional relationships with patients and relatives

- 4.5. Involvement with patients (or their surrogates) in decision making
- 4.6. Understanding of cultural and religious beliefs and an awareness of their impact on decision making
- 4.7. Understanding of privacy, dignity, confidentiality and legal constraints on the use of patient data

Professional relationships with members of the health care team

- 4.8. Collaboration, consultation, team work, management of ICU burn out, conflict management / resolution
- 4.9. Continuity of care through effective hand-over of clinical information
- 4.10. Supportive care outside the ICU
- 4.11. Supervision and delegation of duties and responsibilities to others

Self-governance

- 4.12. Understanding of the responsibilities for safe patient care
- 4.13. Formulation of clinical decisions with respect for ethical and legal principles
 - 4.13.1. Understanding of learning opportunities and integration of new knowledge into clinical practice.
 - 4.13.2. Medicolegal aspects of patient care – Medical negligence, human rights, withholding and withdrawing treatment in Indian setup.
- 4.14. Participation in multidisciplinary teaching
- 4.15. Participation in research or audit under supervision Participation in the team approach with respect for team members
- 4.16. Clinical governance

5. CLINICAL TRAINING:

Teaching and training of students shall include graded all round patient care responsibility including resuscitation, clinical diagnosis, invasive diagnostic and therapeutic procedures and advanced decision making in the management of critically sick medical and surgical patients. The objective is to impart training so that the trainee will manage a “closed ICU”. As the intake of training is from diverse broad specialties, the following guidelines should be tailored for the requirement of the trainee.

To achieve these objectives, the resident doctors should be asked to spend their time in the following manner:

A. FIRST YEAR :

Rotation in all depts to get basic knowledge and hands on training for Critical care medicine

Maximum of 12 months of need-based rotation in other disciplines namely

- a. **General Medicine** – 2 Months
- b. **Anaesthesiology** - 1 month in General OT
-1 month in Cardiothoracic OT & CTS ICU
- c. **Infectious Disease** – 1 Month
- d. **Emergency Care and trauma** - 1 month
 - a. **Pulmonary Medicine** - 1 month
 - b. Bronchoscopy training
- e. **Radiology** - 2 weeks
Training in CT & MRI Interpretation/Ultra sound
- f. **Cardiology** - 3 weeks
 - a. Echocardiography
 - b. Invasive monitoring
 - c. Cath lab
- g. **Nephrology** - 3 weeks
 - a. Renal replacement & Renal Transplant Icu
- h. **Neurology** - 2 weeks
 - a. Stroke unit
- i. **Medical Gastroenterology** - 2 weeks
 - a. Liver icu including liver transplant icu

- j. **Endocrinology** - 2 weeks
 - k. **Medical Oncology** - 2 weeks
 - l. **Haematology** - 2 weeks
 - a. Bone Marrow transplant
 - m. **Immunology** - 2 weeks
- Should complete ACLS / BLS / ATLS / PALS in a certified centre before the end of first year

B. Twenty-four months in core discipline-2- 3rd year

Poster and Podium presentation to be done at the end of second year

Publication to be completed in the third year

Of the 24 months in Core ICU rotation, they **should** spend time in

	MEDICAL ICU (MICU) INCLUDING TOXICOLOGY	5
	INTENSIVE CORONARY CARE UNIT (ICCU)	3
	INTENSIVE RESPIRATORY CARE UNIT IRCU	2
	NEUROSCIENCES ICU (NEUROSURGICAL, NEURO TRAUMA AND NEUROLOGY , STROKE UNITS)	3
	POST ANAESTHESIA CARE UNIT	1
	SURGICAL ICU (SICU)	1
	TRAUMA ICU	1
	CARDIO THORACIC SURGERY ICU	1
	BURNS ICU	1
	OBSTETRIC ICU	1
	PAEDIATRIC ICU (PICU) & NEONATAL ICU (NICU)	2
	POST TRANSPLANT ICU	1
	OPTIONAL POSTINGS	2
		24

If the department does not have the above specialties, the trainee should rotate through Intensive Care Units of other hospitals to cover up any deficiency in the required case-mix for the purpose of DM in CCM.

- C. Rotation should be flexible and trainees should be given the opportunity to spend extra time within these 12 months in any specialty of their choice provided they complete the mandatory training.

6. SKILL TRAINING REQUIREMENT

1. Airway maintenance
 - i. Basic airway skills
 - ii. Advanced skills including video laryngoscopy and fibreoptic intubation
 - iii. Crici-thyroidotomy
 - iv. Percutaneous tracheostomy
 - v. Fibreoptic bronchoscopy
2. Imaging
 - a. Ultrasound:
 - i. Vascular access
 - ii. Lung
 - iii. FAST for trauma
 - iv. Intracranial pressure monitoring
 - v. Assessment of cerebral blood flow
 - b. Echocardiogram
 - i. Assessment in shock states
 - ii. Pericardial effusion
3. Vascular access
 - i. Arterial and venous including dialysis port
4. Lumbar puncture and epidural catheter placement
5. Insertion of intracranial pressure monitor
6. Insertion of tube thoracostomy
7. Bone marrow biopsy
8. Defibrillation
9. Seminars
10. Teaching Junior residents, allied health students and professionals

USE OF SIMULATION BASED SKILL TRAINING AND TEACHING.

During the training programme, patient safety is of paramount importance; therefore, skills are to be learnt initially and later to be performed under supervision followed by performing independently. Provision of skills laboratories for cardiopulmonary resuscitation in the medical colleges is mandatory.

7. TEACHING METHODOLOGY

Teaching and learning methodology given below includes but not limited to Lecture, Discussion, Student Directed Learning, Case Based Learning etc.

1. Clinical Case based Discussion / Clinical evaluation exercise/DOPS/PBL
2. Morbidity-Mortality Discussion
3. Audit presentation
4. Lectures, Seminars and Journal Clubs
5. Presentation of progress report on the research projects
6. Simulation Laboratory
7. Joint inter-departmental academic meets with radiology, microbiology etc.
8. Departmental Clinical Meetings, Grand Rounds and Clinico-Pathological Meetings
9. Multi-departmental Combined Grand Rounds / Joint Academic Activities of the Institution.
10. Certification by Medical education (MCI approved) cell. [BIOMEDICAL RESEARCH.BIO STATISTIC]
- 11. Should attend and get certified in BLS, ACLS, PALS &ATLS courses within the first year**

8. RESEARCH WORK

The candidates will be trained in the ability to

- Frame a research question
- Plan a study to answer the question
- Collect the relevant information and
- Evaluate appropriately the collected data to draw a conclusion.

The candidate should become conversant with the reporting of these results as a research paper, in journals and as a presentation in conferences.

The activities would consist of:

Planning and organizing relevant clinical studies to be submitted as a dissertation at the end of the course. Students should compulsorily attend the Research Methodology workshop conducted by the University within first six months of D.M. Course.

9. LOG BOOK

The Postgraduate student of a Postgraduate Degree Course in Super specialties shall maintain Log Book of the work carried out by them and the training program undergone during the period of training .

The Log Book shall be checked and assessed by the faculty members imparting the training.

Periodical evaluation of Log Book to be done by the Head of the Department as per 52nd SAB.

The Evaluation of the candidates in both theory and practical aspects will help the candidate in the improvement of his/her knowledge skills & attitude.

Presentations & publications

A Postgraduate student of a Postgraduate degree course in broad specialties / Super Specialties would be required to present one poster presentation to read one paper at a National / State conference and to present one Research paper which should be published / accepted for publication during the period of his Postgraduate studies so as to make him eligible to appear at the Examination.

Periodic Evaluation

Trainees will be evaluated continuously for their performance in all areas such as clinical and investigative work, case presentations, seminars, journal clubs, procedures etc. Additional periodic assessment will include theory and practical assessment mimicking the final examination should be conducted every 6 months. Such an evaluation will help assessing the progress of the trainees and the quality of the training program. Evaluation will be communicated to trainees and their feedback would be taken into consideration for modifications in training program.

Formative Assessment

Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills.

Quarterly assessment during the DM training should be based on:

- 1. Journal based / recent advances learning**
- 2. Patient based / Laboratory or Skill based learning / Situation/Problem Based Learning**
- 3. Self-directed learning and teaching**
- 4. Departmental and interdepartmental learning activity**
- 5. External and Outreach Activities / CMEs**

COMPETENCY ASSESSMENT

1. Communication / Commitment / Contribution / Compassion towards patients .
2. Implementation of Newly learnt techniques.
3. Documentation of case sheets / discharge Summary / Review.

4. Number of cases presented in Clinical Meetings/ Journal Clubs / Seminars / Papers presented in Conference.

5. No of Medals/ Certificates won in the conference / Quiz competitions and other academic meetings with details.

6 Assessment to be done and communicated to university

I- February - First Year

II - August - First Year

III - February - Second Year

IV - August - Second Year

V - February - Third Year

VI - May - Third Year.

Log book to be signed monthly by HOD

Feedback

- Feedback should be given to the trainees on regular basis.
- The feedback should be about the overall integrated, coherent and longitudinal assessment of the trainee.
- The feedback should be in the form of constructive suggestions for improvement in their performance.

The summative assessment examination shall include two heads:

A. Theory examination.

B. Practical, Clinical examination and Viva-voce.

Theory examination and Practical/Clinical, Viva-voce shall be separate heads of passing.

Passing shall be separate for each head and failing shall be common, meaning thereby that clearance at theory and failure at practical / clinical shall amount to failure at Summative examination and vice versa.

Theory examination shall comprise of **four papers**. Passing percentage shall be 50% .

1. **Paper one:** Basic Medical Sciences related to Critical Care Medicine
2. **Paper two:** Clinical - Etiology, diagnosis and treatment of acute life-threatening medical and surgical diseases related to Critical care medicine
3. **Paper three.** Clinical - Procedures, interventions, professionalism, ethics and research Methods related to Critical Care Medicine
4. **Paper four:** Recent Advances in the field of Critical Care Medicine

Practical /Clinical examination consisting of at least **one long case, three short cases osce and viva-voce**. Passing percentage shall be 50%.

10.CLINICAL EXAMINATION

1. Practical:

Particulars	Time for candidate to examine the cases	Time for examiners to question the candidates	Maximum marks
Long case	1 case x 60 minutes	60 Minutes	100
Short Case	2 cases x30 minutes	60 Minutes	100
Ward Rounds	2 patients x15 minutes	30 Minutes	100
OSCE*	5 stations x 3 minutes	15 Minutes	50
Viva Voce	COVERING AFFECTIVE AND COGNITIVE DOMAIN	15 Minutes	50
	Competency assessment		50
Log Book	DAILY WORK & INTERESTING CASES		50
Total			500

***OSCE Stations:**

1. Imaging – X-ray, CT scan, MRI
2. ECG and Blood Gas analysis
3. Ventilator graphics
4. Drugs and Equipments
5. Cardiopulmonary resuscitation

11. TEXT BOOKS

- a. Critical Care 5th Edition – Civetta, Taylor and Kirby
- b. Oh's Intensive Care Manual – 7th Edition – Andrew D Bersten, Neil Soni
- c. Principles of Critical Care – 3rd Edition – Farokh Erach Udwadia
- d. Nunn's Applied Respiratory Physiology
- e. Clinical Application of Mechanical Ventilation – David W Chang
- f. Critical Care Nephrology - 3rd Edition – Ronco, Bellomo, Kellum, Ricci
- g. The Washington Manual of Critical Care - Marin H Kollef, Timothy J Bedient, Warren Isakow, Chand A Witt
- h. Critical Care Handbook of the Massachusetts General Hospital – 5th Edition
- i. Evidence based Critical Care – 3rd Edition Paul Ellis Marik
- j. Avoiding Common Anaesthesia Errors – Catherine Marcucci, Norman A Cohen, David G Metro, Jeffrey R Kirsch.

12. JOURNALS

- a. Critical Care Medicine
- b. Intensive Care Medicine
- c. Indian Journal of Critical Care Medicine
- d. Current opinion in critical care
- e. Current opinion in organ transplantation
- f. Anaesthesia and intensive care
- g. American journal of Respiratory and Critical care medicine
- h. New England Journal of Medicine
- i. Journal of the American Medical Association
- j. Circulation
- k. Neurology
- l. Critical Care Clinics
- m. Critical Care and Resuscitation
- n. British Journal of Anaesthesia
- o. Lancet
- p. Chest

13. ONLINE RESOURCES

- a. Uptodate.com
- b. PACT module of the European Society of Intensive Care Medicine

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