

# **BABA FARID UNIVERSITY OF HEALTH SCIENCES**



## **Annexure – A as per agenda item no. 6** i.e. Ordinances including Guidelines & Syllabus of DM (Critical Care Medicine) course of AGENDA

for the 29<sup>th</sup> meeting of the

## **ACADEMIC COUNCIL**

to be held on **20.12.2019** at 11:00 am  
in the Senate Hall  
BFUHS, Faridkot

**FARIDKOT-151 203**

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**Ordinance**

**Postgraduate Training Programme for  
DM (Critical Care Medicine)**

**Guidelines  
&  
Syllabus**

**Baba Farid University of Health Sciences,  
Faridkot, Punjab**

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## **Ordinance**

### **Postgraduate Training Programme for DM in Critical Care Medicine**

#### **1. Preamble**

Competency based postgraduate training programme for DM in Critical Care Medicine (CCM) aims to produce a postgraduate student who after undergoing the required training should be able to deal effectively with the needs of the community and should be competent to handle all basic problems of critically ill patients. He / She should also acquire skill in supervision of paramedical staff and be able to work as a team member of the health care providers.

Postgraduate students must gain ample of knowledge and experience in the diagnosis and treatment of patients with acute, serious, and life-threatening medical and surgical diseases. He / She should be aware of his/her limitations and should be able to decide the point of referral and cross consultation.



## 2. Goals and objectives for DM (CCM)

The goal of the DM (Critical Care Medicine) course will be to produce within the three-year tenure, a competent critical care physician who can resuscitate, evaluate and manage critically ill patients of all medical and surgical categories. The candidate will acquire the following competencies

1. Knowledge- The candidate will be trained for resuscitation of the acutely ill patients. He /she should be able to assess, diagnose and formulate a plan for initial management of critically ill patients with single and multiple organ failure.
2. Skills- The candidate will be acquiring skills of monitoring and data interpretation along with the capacity to perform common therapeutic interventions for organ system support in single or multiple organ failure.
3. Attitude- The candidate will also be trained for patient safety, pain relief, comfort recovery and end of life care. Apart from this he/she will be imparted knowledge of ethical practice, and professionalism including skills of communications and teamwork.
4. Research – Every candidate shall carry out work on an assigned research project, written and submitted to the university within the set time frame.

### 3. Need Based Assessment of Course

DM in Critical Care Medicine is a recently instituted postgraduate training programme in India and requires strategic planning for successful inception and growth. In the inception phase, problems like resource constraints in public-funded medical institutions may potentially dampen the evolution of leadership to launch the programme. A few strategic relaxations, therefore, would be extremely beneficial for the initial period of inception.

The proposed programme is to be judged in the light of following historical and contemporary facts:

Most of the developed countries started intensive care in 1950s and by 1980s they had postgraduate training programme in Critical Care Medicine (CCM). CCM is also known as Intensive Care Medicine (ICM) in many countries. The specialty of CCM, by its very nature, is a specialty of convergence of knowledge and skills with the involvement of various primary specialties. It is for this reason that there has been flexibility in the models of training, access, duration of training, regulation and certification systems across the globe.

There is a growing need for trained CCM specialists in India. This is because there is an increasing burden of sicker patients in hospitals and an aging population with more comorbid conditions coupled with aggressive surgical and medical treatments resulting in immunosuppression and invasive procedures. Trauma is an increasingly important problem affecting young individuals. Critical Care will be required to intensively monitor such patients, treat acute illness and severe trauma, and to manage serious infections with multiorgan dysfunction.

There is huge absolute deficit of ICU beds in nearly all government hospitals in India. And in many government hospitals (both Central Government and State Government funded) it has been a common experience that expensive intensive care equipments lie unused or underutilized.

Currently most of the critical care units are in the metropolitan areas, some state capitals and a few affluent cities within the ambit private sector. Majority of public hospitals (including medical colleges) have very poor intensive care infrastructure including trained manpower. In the next 20-25 years the achievable target of ICU beds should be as below:

1. District Hospitals – From almost zero to about 3-4 % of total hospital beds
2. Medical Colleges – From about 0-1% to about 6-8 % of total hospital beds
3. Tertiary care hospitals – From about 1-2% to about 10-12% of total hospital beds

At the level of education and research specialty of Critical Care Medicine is in its infancy in this country and a huge effort is required to elevate the basic framework of this from the point of view of quality education and research. DM course is only a starting point in that direction. To fill this overall huge gap, we urgently need a training programme to create knowledge, capacity and human resource to handle the futuristic requirements.

There is considerable data to suggest that the presence of a critical care specialist improves outcomes. Thus, there will be a growing need for CCM specialists in all secondary and tertiary levels of health care, in Academic / Government Institutions, large corporate private hospitals, smaller hospitals as well as nursing homes. There are excellent placement opportunities and financial rewards to trained CCM specialists in private and public sector.

The proposed three-year degree program shall offer a very promising and fast-growing career choice in Critical Care Medicine (CCM) to the postgraduate doctors from Anaesthesiology, Internal Medicine, Respiratory/Pulmonary Medicine and Emergency Medicine. DM course in Critical Care Medicine should also lead to holistic growth and development of Critical Care Medicine as a specialty in India from the academics and research point of view. At the end of training in CCM, the qualified resident doctor should have broadly acquired well rounded competence in the specialty of CCM as given below:

1. General and specialist aspects of critical care, including management of the service
2. Supervision of long-term collaborative management plans for larger numbers of patients.
3. Leadership for whole ICU team.
4. Teaching and supervision of junior colleagues.
5. Integration of complex web of information.
6. Effective functioning of critical care service within wider environments of case-mix.
7. Capable of planning personal professional development as a contribution to the holistic growth of specialty including patient care, teaching/training and research.

This training programme would be of immense help in creating a large pool of trained manpower to fulfil the need of faculty requirement in teaching institutions or consultant level jobs in non-teaching public or private sector hospitals.

As and when the need arises, curriculum contents, teaching and learning methodology and assessment method shall be re-assessed and reviewed.



#### 4. Avenues Available for the Course

Historically, like in many parts of the world, in India too various primary/base specialties have taken a lead to cater intensive care services to the adult population. In the evolutionary phase of the specialty, this kind of diversity should be preserved and promoted. A prudent approach to nurture Critical Care Medicine in India would be to allow Anaesthesiology, Internal Medicine, Emergency Medicine and Pulmonary Medicine to offer DM courses in Critical Care Medicine.

In the long run it would not matter much which department had taken the lead in a particular medical college or institute, what would matter would be the availability of hundreds of doctors trained in Critical Care Medicine who subsequently will have choice to further their career in their parent specialty or Critical Care Medicine or both.

For above stated reasons, in the absence of Department of Critical Care Medicine as a standalone clinical department of Critical Care Medicine having the prescribed minimum strength of faculty and staff in either of the below mentioned MCI recognised clinical departments shall be considered eligible to initiate and institute the training programme –

- 1) Anaesthesiology,
- 2) Internal Medicine,
- 3) Pulmonary Medicine and
- 4) Emergency Medicine

till such time as permitted by MCI

## 5. Eligibility and Admission Criteria

The trainee applying for the DM course in Critical Care Medicine must be a postgraduate possessing MD in Anaesthesiology or Internal Medicine or Respiratory/Pulmonary Medicine or Emergency Medicine from the institution recognized by the Medical Council of India. Postgraduate degree equivalent to MD as recognized by MCI would be acceptable in either of the above-mentioned specialties.

The eligibility conditions would be as per MCI rules/conditions. Admission should be made through the competitive entrance examination (NEET Super-speciality entrance test) as applicable in a particular state or medical institution approved by BFUHS and the MCI as done for other MCI approved courses. Any change by competent authority would be applicable as and when notified.

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## 6. Departmental facilities needed

### Departmental Training Facilities:

Department of Critical Care Medicine should have preferably dedicated faculty and ancillary infrastructure. In the absence of Department of Critical Care Medicine as a stand-alone clinical department, the Unit of Critical Care Medicine having the prescribed minimum strength of faculty and staff in either of the below mentioned MCI recognised clinical departments shall be considered eligible to initiate and institute the training programme – 1) Anaesthesiology, 2) Internal Medicine, 3) Pulmonary Medicine and 5) Emergency Medicine.

### Beds:

The department/division recognised for training DM students in Critical Care Medicine should cater to a minimum of 10 ICU beds. The department/division must have following minimum clinical work load for the past 03 years:

- A. Number of ICU admissions/year  $\geq 250$
- B. Number of Ventilator days/year  $\geq 1500$
- C. Case mix - The case-mix must include both surgical and medical patients

ICU should be adequately supported by a minimum nurse/bed ratio of 1:2 and the department/division should have adequate number of other staff like Physiotherapist, Dietician, Technician and Medical Social Worker etc. by appropriate mechanism.

### Equipment

Following functional infrastructure is mandatory to fulfill special training requirements of the specialty of Critical Care Medicine:

#### I. Intensive Care Unit:

A minimum of 100 square feet space per bed over and above the corridors and ample of utility spaces and rooms

#### II. Equipment within the ICU

- Multi-channel monitoring on all beds
- Piped Medical Gas supply including oxygen & suction on all beds
- Invasive vascular pressures (two) on at least 50% ICU beds



- ICU Ventilators on at least 50% of ICU beds
- PA catheter/cardiac output available in ICU
- Non-invasive ventilation available in ICU
- Crash intubation equipment available in ICU
- Crash resuscitation equipment available in ICU
- Defibrillator available in ICU
- 12-lead ECG available in ICU
- Bed-side availability of various modalities of renal replacement therapy like haemodialysis and peritoneal dialysis
- Bed-side availability of fibreoptic bronchoscopy
- Temporary pacemakers available in ICU
- Volumetric/syringe pumps in adequate quantities available in ICU

**III. Support Equipment/services within the hospital**

- Portable X-ray
- Ultrasound/ECHO
- Fluoroscopy
- CT/MRI/Cardiac Cath Lab
- 24-hour Diagnostic Laboratory Services
- 24-hour Stat/Emergency Lab services including arterial blood gas
- 24-hour pharmacy support

**Staff – Faculty:**

In place of DM in Critical Care Medicine, minimum educational qualification for the faculty to be recognised as postgraduate teacher for DM in Critical Care Medicine would be MD in Anaesthesiology or Internal Medicine or Pulmonary Medicine or Emergency Medicine.

**The unit will consist of:**

<b>Professor:</b>	<b>01</b>
<b>Associate Professor:</b>	<b>01</b>
<b>Assistant Professor:</b>	<b>01</b>
<b>Senior Resident:</b>	<b>01</b>
<b>Junior Resident:</b>	<b>02</b>

### Eligibility of teaching staff

- Eligibility of teachers will be as per MCI notification regarding DM courses as per the MCI gazette. "Minimum Qualifications for Teachers in Medical Institutions Regulations, 1998 with amendments till date."
- M.D. (Anesthesiology, Internal Medicine, Pulmonary Medicine or Emergency Medicine) with 2 years special training in Critical Care Medicine. The academic qualification as shown above will be the academic qualification required for teaching faculty post for a period of 10 years w.e.f. in terms of Notification published in the Gazette of India on 08.12.2010.
- It is reiterated that only the academic qualification of D.M. (Critical Care Medicine) will be the required academic qualification for appointment to the post of teaching faculty after the expiry of the period of 10 years from the date of notification.
- For the candidates possessing DNB qualification from Centers other than of MCI recognized medical colleges/central institutes. Three years teaching experience in the subject either during the DNB course or after possessing DNB qualification. The concerned candidate would require two years additional teaching experience as Sr. Resident/Research Associate (CSIR) in MCI recognized medical college/central institute.

### Professor

- Associate Professor in the subject for 3 years in a permitted/ approved/recognized medical college/institutions with 4 Research Publications in Indexed Journal on cumulative basis with minimum of 2 Research publication during the tenure of Associate Professor as 1st Author or as corresponding author.

### Associate Professor

- As Assistant Professor in the subject for 2 years in a permitted/ approved/recognized medical college/ institution with 2 Research Publication in Indexed Journals as 1<sup>st</sup> Author or as corresponding author.

### Assistant professor

- Only academic qualification or 2 years special training after MD is required for the post.

## **7. Syllabus:**

The candidate must gain experience in the diagnosis and treatment of patients with acute, serious, and life-threatening medical and surgical diseases. The curriculum of three-year training in Critical Care Medicine deals with the cognitive, psychomotor and affective domains. Following is the detailed list of course contents divided into (2.1) cognitive, (2.2) psychomotor and (2.3) affective domains:

### **7.1. Cognitive Domain**

**The course contents under the cognitive domain include following:**

- 7.1.1 Resuscitation and Initial Management of the Acutely Ill Patients
- 7.1.2 Diagnosis: Assessment, Investigation, Monitoring and Data Interpretation of the actively ill patients
- 7.1.3 Disease Management
- 7.1.4 Therapeutic Interventions/Organ System Support in Single or Multiple Organ Failure
- 7.1.5 Peri-operative Care
- 7.1.6 Paediatric Care
- 7.1.7 Transportation
- 7.1.8 Physics in Medicine
- 7.1.9 Clinical Measurement
- 7.1.10 Research Methods
- 7.1.11 Applied Anatomy
- 7.1.12 Physiology & Biochemistry
- 7.1.13 Pharmacology

#### **7.1.1 Resuscitation and initial management of the acutely ill patients**

- 7.1.1.1 Timely approach to the recognition, assessment and stabilization of the acutely ill patients with disordered physiology
- 7.1.1.2 Cardiopulmonary resuscitation
- 7.1.1.3 Post-resuscitation management
- 7.1.1.4 Triage and prioritization of patients for ICU admission
- 7.1.1.5 Assessment and initial management of the trauma patient



- 7.1.1.6 Assessment and initial management of the patient with burns
- 7.1.1.7 Fundamentals of the management of mass casualties

**7.1.2 Diagnosis: assessment, investigation, monitoring and data interpretation of the acutely ill patients**

- 7.1.2.1 History taking and clinical examination
- 7.1.2.2 Timely and appropriate investigations
- 7.1.2.3 Understanding of echocardiography (transthoracic/ TEE), indications and interpretation of results
- 7.1.2.4 Understanding of Electrocardiography (ECG/EKG), Indications & interpretation of the results
- 7.1.2.5 Appropriate microbiological sampling and interpretation of results
- 7.1.2.6 Interpretation of results from blood gas samples
- 7.1.2.7 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.
- 7.1.2.8 Understanding and interpretation of physiological variables
- 7.1.2.9 Integration of clinical findings with laboratory, radiology, microbiology & other investigations to form appropriate differential diagnosis and management strategy

**7.1.3 Disease management**

**7.1.3.1 Acute disease: 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 Haemorrhage

- 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 Haemorrhagic Fevers
- Severe forms of tropical infections like Malaria, Typhoid etc.
- Acute Renal Failure
- Eclampsia
- Acute poisoning

**7.1.3.2 Chronic Disease:** Identifications of the implications of chronic and co morbid disease in the acutely ill patients.

**7.1.3.3 Organ System Failure**

- Management of patients with, or at risk of, circulatory failure
- Management of patients with, or at risk of, acute renal failure

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

**7.1.4 Therapeutic interventions/organ system support in single or multiple organ failure**

- Principles of safe prescription
- Principles of safe delivery of life-support therapies
- Antimicrobial drug therapy – Fundamental principles and ICU specific issues
- Transfusion therapy - Fundamental principles and ICU specific issues
- Circulatory therapies - Fundamental principles and ICU specific issues pertaining to Fluid therapy including dynamic variables of fluid responsiveness and vasoactive/inotropic drugs
- Mechanical circulatory assist devices
- Initiation, management and weaning of the patients from invasive and non-invasive ventilatory support
- Initiation, management and weaning of the patients from renal replacement therapy

- Management of electrolyte, glucose and acid-base disturbances
- Nutritional assessment and support

#### **7.1.5 Peri-operative care**

- Management of the pre & post-operative care of the high risk surgical patients
- Fundamentals of the management of the care of patients following cardiac surgery
- Fundamentals of the management of the patients following craniotomy
- Fundamentals of the management of the patients following solid organ transplantation
- Fundamentals of the management of the pre and post-operative trauma care of the trauma patients

#### **7.1.6 Paediatric care**

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

#### **7.1.7 Transportation**

- Transportation of the mechanically ventilated critically ill patient outside the ICU
- Understanding of the special considerations required during patient transport by air

#### **7.1.8 Physics in Medicine**

##### **7.1.8.1 Mathematical concepts:**

- Relationships and graphs
- Concepts of exponential functions and logarithms: wash-in and washout
- Basic measurement concepts: linearity, drift, hysteresis, signal:noise ratio, static and dynamic response



- SI units: fundamental and derived units
- Other systems of units where relevant to ICM (e.g. mmHg, bar, atmospheres)
- Simple mechanics: Mass, Force, Work and Power

#### 7.1.8.2 **Gases & vapours:**

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

#### 7.1.8.3 **Electricity & magnetism:**

- Basic concepts of electricity, magnetism and Bridge circuits
- Capacitance, inductance and impedance
- Amplifiers: bandwidth, filters
- Amplification of biological potentials: ECG, EMG, EEG.
- Sources of electrical interference
- Processing, storage and display of physiological measurements

#### 7.1.8.4 **Electrical safety:**

- Principles of cardiac pacemakers and defibrillators
- Electrical hazards: causes and prevention.
- Electrocution, fires and explosions.
- Diathermy and its safe use

- Basic principles and safety of lasers
- Basic principles of ultrasound and the Doppler effect

#### 7.1.8.5 Pressure & flow monitoring:

- Principles of pressure transducers
- Resonance and damping, frequency response
- Measurement and units of pressure.
- Direct and indirect methods of blood pressure measurement; arterial curve lysis
- Principles of pulmonary artery and wedge pressure measurement
- Cardiac output: Fick principle, thermodilution
- Transportation of the mechanically ventilated critically ill patient outside the ICU
- Understanding of the special considerations required during patient transport by air

#### 7.1.9 Clinical measurement

- 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
- Measurement of  $H^+$ , pH,  $pCO_2$ ,  $pO_2$
- Measurement  $CO_2$  production/ oxygen consumption/ respiratory quotient
- Colligative properties: osmometry
- Simple tests of pulmonary function e.g. peak flow measurement, spirometry.
- Capnography
- Pulse oximetry
- Measurement of neuromuscular blockade
- Measurement of pain

### 7.1.10 Research methods

#### 7.1.10.1 Data collection:

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

#### 7.1.10.2 Descriptive statistics:

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

#### 7.1.10.3 Deductive & inferential statistics:

- Simple probability theory and the relation to confidence intervals
- The null hypothesis.
- Choice of simple statistical tests for different data types
- Type I and type II errors
- Inappropriate use of statistics

### 7.1.11 Applied anatomy

#### 7.1.11.1 Respiratory System:

- Mouth, nose, pharynx, larynx, trachea, main bronchi, segmental bronchi, structure of bronchial tree and differences in the children's airway
- Airway and respiratory tract, blood supply, innervation and lymphatic drainage
- Pleura, mediastinum and its contents
- Lungs, lobes, microstructure of lungs
- Diaphragm, other muscles of respiration, innervation

- The thoracic inlet and 1st rib
- Interpretation of a chest x-ray

#### **7.1.11.2 Cardiovascular system:**

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

#### **7.1.11.3 Nervous system:**

- Brain and its subdivisions
- Spinal cord, structure of spinal cord, major ascending & descending pathways
- Spinal meninges, subarachnoid & extradural space, extradural space-contents
- Cerebral blood supply
- CSF and its circulation
- Spinal nerves, dermatomes
- Brachial plexus, nerves of arm
- Intercostal nerves
- Nerves of abdominal wall
- Nerves of leg and foot
- Autonomic nervous system
- Sympathetic innervation, sympathetic chain, ganglia and plexuses
- Parasympathetic innervation.
- Stellate ganglion
- Cranial nerves: base of skull: trigeminal ganglion
- Innervation of the larynx
- Eye and orbit

#### **7.1.11.4 Vertebral column:**

- Cervical, thoracic, and lumbar vertebrae



- Interpretation of cervical spinal imaging in trauma
- Sacrum, sacral hiatus
- Ligaments of vertebral column
- Surface anatomy of vertebral spaces, length of cord in child and adult

#### **7.1.11.5 Surface anatomy:**

- Structures in antecubital fossa
- Structures in axilla: identifying the brachial plexus
- Large veins and anterior triangle of neck
- Large veins of leg and femoral triangle
- Arteries of arm and leg
- Landmarks for tracheostomy, cricothyrotomy
- Abdominal wall (including the inguinal region): landmarks for suprapubic urinary and peritoneal lavage catheters
- Landmarks for intrapleural drains and emergency pleurocentesis
- Landmarks for pericardiocentesis

#### **7.1.11.6 Abdomen:**

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

### **7.1.12 Physiology & Biochemistry**

#### **7.1.12.1 General:**

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

**7.1.12.2**

**Biochemistry:**

- Acid base balance and buffers, ions e.g. Na, K, Ca, Cl,  $\text{HCO}_3$ , Mg,  $\text{PO}_4$
- Enzymes and Cellular and intermediary metabolism

**7.1.12.3**

**Body fluids:**

- Capillary dynamics and interstitial fluid
- Oncotic pressure
- Osmolarity: osmolality, partition of fluids across membranes
- Lymphatic system
- Special fluids: cerebrospinal, pleural, pericardial and peritoneal fluids

**7.1.12.4**

**Haematology & immunology:**

- Red blood cells: haemoglobin and its variants
- Blood groups
- Haemostasis and coagulation; pathological variations
- White blood cells
- Inflammation and its disorders
- Immunity and allergy

**7.1.12.5**

**Muscle:**

- Action potential generation and its transmission
- Neuromuscular junction and transmission
- Muscle types
- Skeletal muscle contraction
- Motor unit
- Muscle wasting
- Smooth muscle contraction: sphincters

7.1.12.6

Heart & Circulation:

- Cardiac muscle contraction
- The cardiac cycle: pressure and volume relationships
- Rhythmicity of the heart
- Regulation of cardiac function; general and cellular
- Control of cardiac output (including the Starling relationship)
- Fluid challenge and heart failure
- Electrocardiogram and arrhythmias
- 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)
- Peripheral circulation: capillaries, vascular endothelium and arteriolar smooth muscle, autoregulation and the effects of sepsis and the inflammatory response on the peripheral vasculature
- Characteristics of special circulations including: pulmonary, coronary, cerebral, renal, portal and foetal

7.1.12.7

Renal tract:

- Blood flow, glomerular filtration and plasma clearance
- Tubular function and urine formation
- Endocrine functions of kidney
- Assessment of renal function
- Regulation of fluid and electrolyte balance
- Regulation of acid-base balance



- Micturition
- Pathophysiology of acute renal failure

#### 7.1.12.8

##### Respiration:

- Gaseous exchange: O<sub>2</sub> and CO<sub>2</sub> transport, hypoxia and hyper- and hypocapnia, hyperandhypobaric pressures
- Functions of haemoglobin in oxygen carriage and acid-base equilibrium
- Pulmonary ventilation: volumes, flows, dead space.
- Effect of IPPV and PEEP on lungs and circulation
- Mechanics of ventilation: ventilation/perfusion abnormalities
- Control of breathing, acute and chronic ventilatory failure, effect of oxygen therapy
- Non-respiratory functions of the lungs
- Cardio-respiratory interactions in health & disease

#### 7.1.12.9

##### Nervous system:

- Functions of nerve cells: action potentials, conduction, synaptic mechanisms and transmitters
- The brain: functional divisions
- Intracranial pressure: cerebrospinal fluid, blood flow
- Maintenance of posture
- Autonomic nervous system: functions
- Neurological reflexes Motor function: spinal and peripheral
- Senses: receptors, nociception, special senses

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- Pain: afferent nociceptive pathways, dorsal horn, peripheral and central mechanisms, neuromodulatory systems, supraspinal mechanisms, visceral pain, neuropathic pain, influence of therapy on nociceptive mechanisms
  - Spinal cord: anatomy and blood supply, effects of spinal cord section

#### **7.1.12.10 Liver:**

- Functional anatomy and blood supply
- Metabolic functions
- Tests of function

#### **7.1.12.11 Gastrointestinal:**

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

#### **7.1.12.12 Metabolism and nutrition:**

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

7.1.12.13

Endocrinology:

- Mechanisms of hormonal control: feedback mechanisms, effect on membrane and intracellular receptors
- Central neuro-endocrine interactions
- Adrenocortical hormones
- Adrenal medulla: adrenaline (epinephrine) and noradrenaline (norepinephrine)
- Pancreas: insulin, glucagons and exocrine function
- Thyroid and parathyroid hormones and calcium homeostasis

7.1.12.14

Pregnancy:

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

**7.1.13 Pharmacology**

7.1.13.1 Principles of Pharmacology:

- Dynamics of drug-receptor interaction
- Agonists, antagonists, partial agonists, inverse agonists
- Efficacy and potency
- Tolerance
- Receptor function and regulation
- Metabolic pathways; enzymes; drug: enzyme interactions; Michaelis-Menten equation
- Enzyme inducers and inhibitors.

- Mechanisms of drug action Ion channels: types: relation to receptors.
- Gating mechanisms.
- Signal transduction: cell membrane/receptors/ion channels to intracellular molecular targets, second messengers
- Action of gases and vapours
- Osmotic effects
- pH effects
- Adsorption and chelation
- Mechanisms of drug interactions:
- Inhibition and promotion of drug uptake.
- Competitive protein binding.
- Receptor inter-actions.
- Effects of metabolites and other degradation products.

### 7.1.13.2

#### Pharmacokinetics & Pharmacodynamics

- Drug uptake from: gastrointestinal tract, lungs, nasal, transdermal, subcutaneous, IM, IV, epidural and intrathecal routes
- Bioavailability
- Factors determining the distribution of drugs: perfusion, molecular size, solubility, protein binding.
- The influence of drug formulation on disposition
- Distribution of drugs to organs and tissues:
- Body compartments Influence of specialised membranes: tissue binding and solubility
- Materno-foetal distribution
- Distribution in CSF and extradural space
- Modes of drug elimination:
- Direct excretion

- Metabolism in organs of excretion: phase I & II mechanisms
- Renal excretion and urinary Ph
- Non organ breakdown of drugs
- Pharmacokinetic analysis:
- Concept of a pharmacokinetic compartment
- Apparent volume of distribution
- Orders of kinetics
- Clearance concepts applied to whole body and individual organs
- Simple 1 and 2 compartmental models:
- Concepts of wash-in and washout curves
- Physiological models based on perfusion and partition coefficients
- Effect of organ blood flow: Fick principle
- Pharmacokinetic variation: influence of body size, sex, age, disease, pregnancy, anaesthesia, trauma, surgery, smoking, alcohol and other drugs
- Effects of acute organ failure (liver, kidney) on drug elimination Influence of renal replacement therapies on clearance of commonly used drugs
- Pharmacodynamics: concentration-effect relationships: hysteresis
- Pharmacogenetics: familial variation in drug response
- Adverse reactions to drugs: hypersensitivity, allergy, anaphylaxis, anaphylactoid reactions

### 7.1.13.3

#### Systemic Pharmacology

- Hypnotics, sedatives and intravenous anaesthetic agents
- Simple analgesics



- Opioids and other analgesics; Opioid antagonists
- Non-steroidal anti-inflammatory drugs
- Neuromuscular blocking agents (depolarising and non-depolarising) and anti cholinesterases
- Drugs acting on the autonomic nervous system (including inotropes, vasodilators vasoconstrictors, antiarrhythmics, diuretics)
- Drugs acting on the respiratory system (including respiratory stimulants and bronchodilators)
- Antihypertensives
- Anticonvulsants
- Anti-diabetic agents
- Diuretics
- Antibiotics
- Corticosteroids and other hormone preparations
- Antacids. Drugs influencing gastric secretion and motility
- Antiemetic agents
- Local anaesthetic agents
- Immunosuppressants
- Principles of therapy based on modulation of inflammatory mediators' indications, actions and limitations
- Plasma volume expanders
- Antihistamines
- Antidepressants
- Anticoagulants
- Vitamins and trace elements

## **7.2 Psychomotor Domain**

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

- 7.2.1 Physiology & Biochemistry
- 7.2.2 Respiratory
- 7.2.3 Oxygen therapy - Fundamental principles and ICU specific issues
- 7.2.4 Fibreoptic laryngoscopy
- 7.2.5 Difficult and failed airway management
- 7.2.6 Cardiovascular system
- 7.2.7 Peripheral venous catheterization
- 7.2.8 Arterial catheterization
- 7.2.9 Surgical isolation of vein/artery
- 7.2.10 Ultrasound techniques for vascular localization
- 7.2.11 Central venous catheterization
- 7.2.12 Defibrillation and cardioversion
- 7.2.13 Cardiac pacing (transvenous or transthoracic)
- 7.2.14 Fundamentals of pericardiocentesis
- 7.2.15 Measurement of cardiac output and derived haemodynamic variable
- 7.2.16 Emergency airway management
- 7.2.17 Lumbar puncture (intradural/spinal)
- 7.2.18 Nasogastric tube placement
- 7.2.19 Sengstaken tube (or equivalent) placement
- 7.2.20 Fundamentals of upper GI endoscopy
- 7.2.21 Measurement and interpretation of intra-abdominal pressure
- 7.2.22 Urinary catheterization



### **7.3 Affective Domain**

The course contents under the affective domain include following:

- 7.3.1 Comfort, Pain-Relief and Recovery
- 7.3.2 End of Life Care
- 7.3.3 Patient Safety and Health Systems Management
- 7.3.4 Professionalism

#### **7.3.1 Comfort, pain-relief and recovery**

- 7.3.1.1 Understanding of the physical and psychosocial consequences of critical illness for patients and families and methods of prevention and management
- 7.3.1.2 Assessment, prevention and treatment of pain and delirium
- 7.3.1.3 Sedation, analgesia and neuromuscular blockade
- 7.3.1.4 Communication of the continuing care requirements of patients at ICU discharge to health care professionals, patients and relatives
- 7.3.1.5 Management of the safe and timely discharge of patients from the ICU

#### **7.3.2 Affective Domain**

- 7.3.2.1 Comfort, pain-relief and recovery

#### **7.3.3 End of life care**

- 7.3.3.1 Management of the process of withholding or withdrawing treatment with the multidisciplinary team
- 7.3.3.2 Management of the process of withholding or withdrawing  
Discussion of the end of life care with patients and their families/surrogates
- 7.3.3.3 Management of palliative care of the critically ill patient
- 7.3.3.4 Brain-stem death testing
- 7.3.3.5 Management of the physiological support of the organ donor

support of the organ donor

### **7.3.4 Patient Safety and Health Systems Management**

- 7.3.4.1 Leadership in daily multidisciplinary ward round
- 7.3.4.2 Infection control in ICU
- 7.3.4.3 Environmental hazards
- 7.3.4.4 Safety for patients & staff in ICU
- 7.3.4.5 Understanding of critical incidents, adverse events, complications related to ICU care
- 7.3.4.6 Organisation of multi-disciplinary case conference and counselling sessions with family
- 7.3.4.7 Critical appraisal and application of guidelines, protocols and care bundles
- 7.3.4.8 Understanding of scoring systems for assessment of severity of illness and case mix
- 7.3.4.9 Understanding of the managerial & administrative responsibilities of the critical care specialist

### **7.3.5 Ethics, Attitudes and Professionalism**

#### **7.3.5.1 Communication skills**

- Communication with patients and relatives
- Communication with members of the health care team
- Management of records/documentation
- Teaching and training of the multidisciplinary members of critical care team

#### **7.3.5.2 Professional relationships with patients and relatives**

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

**7.3.5.3 Professional relationships with members of the health care team**

Collaboration, consultation, team work

Continuity of care through effective hand-over of clinical information

Supportive care outside the ICU

Supervision and delegation of duties and responsibilities to others

**7.3.5.4 Self-governance**

Understanding of the responsibilities for safe patient care

Formulation of clinical decisions with respect for ethical and legal principles

(Understanding of learning opportunities and integration of new knowledge into clinical practice)

Participation in multidisciplinary teaching

Participation in research or audit under supervision

Participation in the team approach with respect for team members

## **8. Teaching and Learning Methodology**

### **8.1 General Principles**

Acquisition of practical competencies being the keystone of postgraduate medical education, postgraduate training is skills oriented.

Learning in postgraduate program is essentially self-directed and primarily emanating from clinical and academic work. The formal sessions are merely meant to supplement this core effort.

### **8.2 Teaching Sessions**

The teaching methodology consists of bedside discussions, ward rounds, case presentations, clinical grand rounds, statistical meetings, journal clubs, lectures, seminars. Along with these activities, trainees should take part in interdepartmental meetings organized regularly.

The residents are expected to be fully conversant with the use of computers and be able to use databases like the Medline, pubmed etc.

They should be familiar with the concept of evidence-based medicine and use of guidelines available for managing various diseases.

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

### **8.3 Teaching schedule**

**These should be the teaching classes/week**

**8.3.1** Clinical Case Discussion : 1 / Week

**8.3.2** Morbidity-Mortality Discussion 1/ Month

**8.3.3** Audit presentation: 1/ Month

**8.3.4** Lectures, Seminars and Journal Clubs : Each 1 / Weeks

**8.3.5** Presentation of progress report on the research projects: 1/ 3 monthly

**8.3.6** Simulation Laboratory: 1/ Week

**8.3.7** Joint inter-departmental academic meets with radiology, microbiology etc.: 1/Month



**8.3.8** Departmental Clinical Meetings, Grand Rounds and Clinico pathological Meetings: 1/Month

**8.3.9** Multi-departmental Combined Grand Rounds / Joint Academic Activities of the Institution: 1/ Month

#### **8.4 Schedule of Posting**

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.

Department should have regular teaching rounds for residents posted in that unit. The rounds should include bedside case discussions, file rounds (documentation of case history and examination, progress notes, round discussions, investigations and management plan), interesting and difficult case unit discussions.

Central hospital teaching sessions will be conducted regularly, and DM residents would present interesting cases, seminars and take part in clinico-pathological case discussions.

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

- Twenty-four months in core discipline i.e. Intensive Care Units of the Department/Division of Critical Care Medicine
- Maximum of 12 months of need-based rotation in other disciplines like Internal Medicine, Cardiology, Nephrology, Neurology, Medical Gastroenterology, Endocrinology, Medical Oncology, Immunology, Anaesthesiology, Trauma and Emergency Care and Intensive Care Units of other disciplines/hospitals to cover up any deficiency in the required case-mix for DM in CCM
- Wherever the case-mix is deficient either in surgical and medical patients, the deficiency must be fulfilled by intra-hospital or inter-hospital ICU rotation of the trainees in such units/departments which are running MCI recognized MD/MS or DM/MCh courses.

- It is essential that in the first 06 months trainees coming from the background of Anaesthesiology are mandatorily rotated through medical specialties for quick training in thorough and holistic patient evaluation, and those coming from other backgrounds (Internal Medicine, Respiratory/Pulmonary Medicine and Emergency Medicine) are mandatorily rotated through Anaesthesiology (Routine and Emergency Anaesthetic management in OTs) for quick training in ABC (airway, breathing and circulation) including practical training and complete understanding of airway armamentarium, breathing circuits, rapid sequence intubation, initiation-maintenance-termination of mechanical ventilation, invasive or non-invasive hemodynamic monitoring and safe insertion of central venous and intra-arterial catheters etc.

### **8.5 Leave and Conferences**

- Candidate has to have minimum of 80% attendance during three calendar year tenure.
- Candidate is permitted 20 leaves per year.
- One paper must be presented (each as poster and presentation separately) during the period of training before appearing in the final examination.
- One original research paper must be published/ accepted/sent for publication in an indexed journal (as MCI norms)

### **8.6 Log Book**

All the work done during the course will be recorded by the candidate in the log book duly signed by the consultant.

Maintenance of log books:

- Every Post-Graduate degree candidate shall maintain a record of skills he has acquired during the three years training period certified by the various Head of Departments in which he/she has undergone training.

- The candidates should also be required to participate in the teaching and training programme of undergraduate and post graduate (MD) students.
- In addition, the Head of the Department shall involve their Post-Graduate CCM candidates in Seminars, Journal Clubs, Group Discussions and participation in clinical, clinicopathological conferences.
- Candidates are required to attend at least 2 Regional/National/International Conferences and make at least one presentation at any of these conferences during the course on relevant subjects. These should be entered in the Log Book.
- The Head of the Department shall scrutinize the Log Book once in every three months.
- At the end of the course, the candidate should summarize the contents and get the Log Book Certified by the Head of the Department.
- The Log book should be submitted at the time of practical Examination for the scrutiny of the Board of Examiners.

## 9. Thesis:

- Every candidate shall carry out work on an assigned research project under the guidance of a recognized postgraduate teacher, the project shall be written and submitted in the form of a Project.
- Every candidate shall submit project plan to university within time frame set by university
- Thesis plan shall be submitted to the University within 9 months of joining the course.
- The student will
  - (i) identify a relevant research problem,
  - (ii) conduct a critical review of literature,
  - (iii) formulate a hypothesis,
  - (iv) determine the most suitable study design,
  - (v) state the objectives of the study,
  - (vi) prepare a study protocol,
  - (vii) undertake a study according to the protocol,
  - (viii) analyze and interpret research data, and draw conclusion,
  - (ix) write a research paper.



## 10. Assessment

All the candidates will be accessed daily for their academic activities and periodically also. At the end of three calendar years training the student shall appear in examination as per the university notification. 80% attendance is required to appear for examination. Maximum 20 leaves are allowed per year. In case examination is scheduled before end of 3 calendar year tenure the result shall be declared only on completion of tenure.

### 10.1 General principles

- The assessment is valid, objective and reliable.
- It covers cognitive, psychomotor and affective domains.
- Formative, continuing and summative (final) assessment is also conducted in theory as well as practicals. In addition, thesis is also assessed separately.

### 10.2 Formative assessment

Integrated and coherent formative assessment of competence of the students during the residency programme shall be comprised of various suitable methods complemented by the provision of frequent and constructive feedback.

#### 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.

Assessment shall be carried by supervising teachers with focus on:

- Acquisition and application of knowledge and skills
- Clinical reasoning and judgment in uncertain situations
- Problem solving skills - Situation/Problem Based Learning
- Skill development for diagnostic and therapeutic procedures
- All above through departmental and extra department rotation

Formative assessment by suitable assessment method(s) should cover all competencies mentioned in the curriculum and include the following:

### 10.2.1 Cognitive domain

Competence	Assessment Method(s)
1. Resuscitation and Initial Management of the Acutely Ill Patients	1 Case Presentation 2 Structured directed observation with check list 3 Objective Structured Clinical Examination (OSCE) including Problem solving skills – Problem situations and case scenario 4 Objective Structured Practical Examination (OSPE) Portfolio 6 a) Log Book (clinical cases) b) Log Book (procedures) c) Log Book (extra-departmental rotation) Structured essay
2. Diagnosis: Assessment, Investigation, Monitoring and Data Interpretation	
3. Disease Management	
4. Therapeutic interventions/organ system support in single or multiple organ failure	
5. Peri-operative care	
6. Pediatric Care	
7. Transportation	
8. Research Methods	1. Short answer 2. Structured essay 3. Oral examination (viva-voce)
9. Physics & Clinical Measurement Mathematical Concepts	1.2. Short answer 3. Structured essay Oral examination (viva-voce)
10. Applied Anatomy	
11. Physiology & Biochemistry	
12. Pharmacology	

### 10.2.2 Psychomotor Domain

Competence	Assessment Method(s)
1 Practical procedures	1. Structured directed observation with check list 2. Log Book (departmental procedures) 3. Log Book (extra-departmental procedures)

### 10.2.3 Affective Domain

Competence	Assessment Method(s)
1. Pain Relief, Comfort and Recovery	1. Case Presentation 2. Structured directed observation with check list 3. Objective Structured Clinical Examination (OSCE) including Problem solving skills – Problem situations and case scenario 4. Objective Structured Practical Examination (OSPE) 5. Structured essay 6. Incognito standardized method(s) 7. Oral examination (viva-voce)
2. End of life care	
3. Patient safety and health systems management	
4. Ethics, Attitudes and Professionalism	
a. Integrity, Empathy & Patient Advocacy b. Self-Motivation & Time Management c. Appearance and Personal Hygiene d. Self-Confidence & Respect e. Communications f. Teamwork and Diplomacy g. Careful Delivery of Service	

### 5.3 Internal Assessment

Items	Marks
5.3.1 Personal attributes	20
5.3.2 Clinical skills and performance (from all rotator postings)	20
5.3.3 Academic activities (journal club, seminars, case discussions)	20
5.3.4 End of term theory examination (1 <sup>st</sup> year, 2 <sup>nd</sup> year and 2 years & 9 months)	20
5.3.5 End of term practical examination/oral	20

The record of internal assessment will be presented to the board of examiners for consideration at the time of final assessment.



### 10.3 Summative Assessment

- Ration of marks in theory and practical will be equal.
- The pass percentage will be 50%. Minimum 40% marks are required in all theory papers but cumulative percentage should be 50%.
- Practical cumulative score should be 50%.
- Candidates will have to pass theory and practical examination separately.

A. Candidate will have to appear for four theory examinations

	Marks
Paper 1- Basic sciences as applied to critical care medicine	100
Paper 2- Clinical sciences as applied critical care medicine	100
Paper 3- Intensive care medicine and allied specialities	100
Paper 4- Recent advances in critical care medicine	100

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<b>Total</b>	<b>400</b>
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10 short question of 10 marks each will be asked in each paper

Station	50
One long case	100
Three Short Cases	150
Viva	100

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<b>Total</b>	<b>400</b>
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## **11. Job Responsibilities**

### **11.1 Patient responsibilities- General**

Each resident should be responsible and accountable for all the patients admitted under his care. The following are the general guidelines for the functioning of the residents in the ward:

- Detailed work up of the case and case sheet maintenance:
- He/she should record a proper history and document the various symptoms. Perform a proper patient examination using standard methodology.
- He should develop skills to ensure patient comfort/consent for examination. Based on the above evaluation he/she should be able to formulate a differential diagnosis and prepare a management plan.
- Should develop skills for recording of medical notes, investigations and be able to properly document the consultant round notes.
- To organize his/her investigations and ensure collection of reports.
- Bedside procedures for therapeutic or diagnostic purpose.
- Presentation of a precise and comprehensive overview of the patient in clinical rounds to facilitate discussion with senior residents and consultants.
- To evaluate the patient twice daily (and more frequently if necessary) and maintain a progress report in the case file.
- To establish rapport with the patient for communication regarding the nature of illness and further plan management.
- To write instructions about patient's treatment clearly in the instruction book along with time, date and the bed number with legible signature of the resident.
- All treatment alterations should be done by the residents with the advice of the concerned consultants and senior residents of the unit.

### **11.2 Patient admission to ICU**

Following guidelines should be observed by the resident during patient admission to ICU

- Resident should work up the patient in detail and be ready with the preliminary necessary investigations reports for the discussion with the consultant on duty.
- Resident is responsible for initial resuscitation also.

### **11.3 Resuscitation skills**

- At the time of joining the residency programme, the resuscitation skills should be demonstrated to the residents and practical training provided at various work stations.
- Residents should be fully competent in providing basic and advanced cardiac life support.
- They should be fully aware of all advanced cardiac support algorithms and be aware of the use of common resuscitative drugs and equipment like defibrillators and external cardiac pacemakers.
- The resident should be able to lead a cardiac arrest management team.

### **11.4 Doctor on duty**

- Duty days for each Resident should be allotted according to the duty roster.
- The resident on duty for the day should know about all sick patients in the ICU with their relevant problems, so that he could face an emergency effectively.
- In the morning, detailed over (written and verbal) should be given to the next resident on duty. This practice should be rigidly observed.
- If a patient is critically ill, discussion about management should be done with the consultant at any time.
- The doctor on duty should be available in the ICU throughout the duty hours and should not leave ICU without permission.

### **11.5 Discharge of the patient from ICU**

- Primary consultant, patient /family should be informed about his/her discharge from ICU in advance and discharge notes should be written in file.
- The discharge note should include the salient points of course of patient in ICU with complete diagnosis, important management decisions,



procedures done during stay, status of the patient at the time of discharge from ICU and the final advice to the patient and primary unit.

- All notes in file should be signed by resident along with stamp.

## **11.6 In Case of death**

- In case it is anticipated that a particular patient is in a serious condition, relatives should be informed about the critical condition of the patient beforehand.
- Residents should be expected to develop appropriate skills for breaking bad news and bereavements.
- Follow up death summary should be written in the file and face sheet notes must be filled up and the sister in charge should be requested to send the body to the mortuary with respect and dignity from where the patient's relatives can be handed over the body.
- In case of a medico legal case, death certificate has to be prepared in triplicate and the body handed over to the mortuary and the local police authorities should be informed.
- Autopsy should be attempted for all patients who have died in the hospital especially if the patient died of an undiagnosed illness.

## **11.7 Bedside procedures**

The following guidelines should be observed strictly:

- Be aware of the indications and contraindications for the procedure and record it in the case sheet. Rule out contraindications like low platelet count, prolonged prothrombin time, etc.
- Plan the procedure during routine working hours, unless it is an emergency. Explain the procedure with its complications to the patient and his/her relative and obtain written informed consent on a proper form. Perform the procedure under strict aseptic precautions using standard techniques. Emergency crash tray should be ready during the procedure.
- Make a brief note on the case sheet with the date, time, nature of the procedure and immediate complications, if any.
- Monitor the patient and watch for complications(s).

### 11.8 Medico-legal responsibilities of the residents

- All the residents are given education regarding medico-legal responsibilities at the time of admission in a short workshop.
- They must be aware of the formalities and steps involved in making the correct death certificates, mortuary slips, medico-legal entries, requisition for autopsy etc.
- They should be fully aware of the ethical angle of their responsibilities and should learn how to take legally valid consent for different hospital procedures & therapies.
- They should ensure confidentiality at every stage.



## 12. Suggested books and journals

### 12.1 Books

- Text book of Critical Care -William C Shoemaker
- Manual of Intensive Care Medicine- Richard S Irwin
- Intensive Care Medicine- OH's
- The ICU Book- Paul L Marino
- Intensive Care Medicine- Irwin and Rippe's
- The ICU Protocol Book
- Recent Advance In Critical Care -David Ashton Cleary & William English
- Critical Care Medicine- Dellinger
- The Critical Care Handbook of Massachusetts General Hospital- Wiener-Kronish
- The Washington Manual of Critical Care- Martin H Kollef

### 12.2 Journals

- Intensive Care Medicine (ESICM)
- Journal of Critical Care Medicine
- Indian Journals of Critical care Medicine
- Current opinion in Critical Care

### 13. Sample Question papers

BFUHS

DM (Critical Care Medicine)

Paper I: Basics in intensive care medicine

Time allowed: Three hours

Max. Marks: 100

Note: Attempt all Questions. Be brief and to the point. Use labelled diagram and flow charts where so ever necessary.

1. Describe in briefly general principles of resuscitation in a nonresponding young female with suspected unknown substance poisoning. Enlist the common non-homicidal clinical mimics' also. (5,5)
2. Describe briefly aetiopathogenesis of acute kidney injury in sepsis. Enumerate various risk factors leading to worsening of renal function. (5,5)
3. Write short notes on the following (5,5)
  - a. Central veno-arterial carbon dioxide gradient as guide to resuscitation in shock.
  - b. Uncalibrated cardiac output measurement using arterial pulse contour analysis
4. Write short notes on the following (5,5)
  - a. Anion gap and Delta Gap
  - b. Metabolic alkalosis in ICU
5. Write short notes on the following (5,5)
  - a. Various modalities of continuous renal replacement therapies
  - b. Patient physician trust
6. Write brief notes on the following: (5,5)
  - a. Colloid controversies in sepsis.
  - b. Hypophosphatemia
7. Write short note on the following (5,5)
  - a. Clostridium difficile infection
  - b. Criteria for determination of Brain death
8. Write short note on the following (5,5)
  - a. Hyponatremia
  - b. Goals of nutrition in acute pancreatitis
9. Enumerate causes of fever with unknown origin and describe briefly the diagnostic and syndromic treatment approach to a patient with tropical fever? (10)
10. Write short note on the following (5,5)
  - a. Burn out syndrome
  - b. MIC levels

BFUHS

DM (Critical Care Medicine)

Paper II: Intensive care medicine and allied specialities

Time allowed: Three hours

Max. Marks: 100

Note: Attempt all Questions. Be brief and to the point. Use labelled diagram and flow charts where so ever necessary.

1. Write a note on the treatment of acute ST elevation myocardial infarction. Enlist the major complications following it along with their management (5,5)
2. Describe the etiology, clinical complications and management of acute liver failure. (10)
3. Write short notes on the following (5,5)
  - a. Dynamic parameters of fluid assessment
  - b. Delirium in ICU
4. Write short notes on the following (5,5)
  - a. Critical illness neuropathy
  - b. Metabolic alkalosis in ICU
5. Write short notes on the following (5,5)
  - a. Various modalities of continuous renal replacement therapies
  - b. Doctor patient relationship and violence in the intensive care unit
6. Write brief notes on the following : (5,5)
  - a. Four phases of fluid therapy in patients of sepsis.
  - b. Role of antifungals in patients with fever in ICU
7. Write short note on the following (5,5)
  - a. Clostridium difficile infection
  - b. Criteria for determination of Brain death
8. Write short note on the following (5,5)
  - a. Hyponatremia
  - b. Goals of nutrition in acute pancreatitis
9. Write a note on the principles of mechanical ventilation in a patient with severe airway obstruction. (10)
10. A 66 year old male presents to emergency with massive haemoptysis. Write a note on the initial resuscitation, diagnostic evaluation and further management of such a case. (10)



BFUHS

DM (Critical Care Medicine)

Paper III: Clinical sciences as applied critical care medicine

Time allowed: Three hours

Max. Marks: 100

Note: Attempt all Questions. Be brief and to the point. Use labelled diagram and flow charts where so ever necessary.

1. What is Berlin's definition of ARDS. Describe the current treatment strategies in management of ventilation of these patients. Enumerate the adjuncts to mechanical ventilation.  
(5,5)
2. What are the indications of intra cranial pressure monitoring. Describe the mechanical and pharmacological therapies available to treat elevated intra cranial pressure  
(10)
3. Write short notes on the following  
a. Organ dysfunction scoring systems  
b. Mixed venous oxygen saturation  
(5,5)
4. Define CLABSI. Describe the clinical, epidemiological and microbiological features of intra vascular device related infections.  
(5,5)
5. Write short notes on the following  
a. TCA poisoning  
b. Role of ultrasound in assessment of adequacy of haemodynamic status  
(5,5)
6. Write brief notes on the following :  
a. Antibiotic stewardship.  
b. Extra corporeal membrane oxygenator  
(5,5)
7. Write short note on the following  
a. Post-transplant viral infections  
b. Abdominal compartment syndrome  
(5,5)
8. Write short note on the following  
a. Oral anti-coagulants  
b. Contrast induced acute kidney injury  
(5,5)
9. Describe the effect of critical illness on the pharmacokinetic and pharmacodynamics of drugs. Write a note on therapeutic drug monitoring.  
(5,5)
10. Role of diagnostics modalities in the diagnosis of pulmonary embolism. Write a note on the management of acute pulmonary embolism  
(5,5)



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BFUHS

DM (Critical Care Medicine)

Paper IV: Recent advances in clinical sciences

Time allowed: Three hours

Max. Marks: 100

Note: Attempt all Questions. Be brief and to the point. Use labelled diagram and flow charts where so ever necessary.

1. Write short note on patient ventilator dys-synchrony and its management. Enumerate various assisted ventilatory support modes. Compare briefly triggering and cycling of Pressure support ventilation (PSV) and Neurally adjusted ventilator assist (NAVA) modes. (5,5)
2. Describe briefly pathophysiology of coagulopathy in polytrauma patient with excessive blood loss and resuscitation. (10)
3. Write short notes on the following (5,5)
  - a. Balanced crystalloid solutions
  - b. Adverse effects of Hydroxy Ethyl Starch ( HES) solutions
4. Enumerate complications and concerns in a 35 years male patient who had aneurismal clipping on 3rd day of subarachnoid haemorrhage. Describe in brief management of vasospasm. (5,5)
5. Write short notes on the following (5,5)
  - a. qSOFA
  - b. Symptomatic hypophosphatemia
6. Write brief notes on the following : (5,5)
  - a. Managing MDR gram negative abdominal infection.
  - b. Levosimendan
7. Write short note on the following (5,5)
  - a. Current definition of Sepsis
  - b. Carbon dioxide gradient in septic shock
8. Write short note on the following (5,5)
  - a. High Flow Nasal Oxygen Catheter
  - b. Markers of acute kidney injury
9. 40 years diabetic female had laminectomy in prone position and haemodynamically stormy course with very labile pressure touching both extremes intraoperatively. She is complaining of lack of vision in immediate post operative period. Describe briefly pathogenesis of postoperative visual loss (POVL). Enumerate preventive and management steps. (5,5)
10. Enumerate and describe briefly various mechanism of VILI and current strategies to prevent it. (5,5)