CRITICAL CARE MEDICINE

(I) OBJECTIVES

1. To provide a broad training and in-depth experience at a level sufficient for trainees to acquire competence and professionalism required of a specialist in Critical Care Medicine.

2. To enhance knowledge and clinical competence in all specialties in Internal Medicine which are relevant to critical care practice, and to inculcate a multidisciplinary approach to the management of patients with acutely life-threatening conditions and multiple organ failure.

3. To ensure procedural competence in Critical Care Medicine.

4. To ensure mastery of the physiology of vital organs and interventional modalities available, including drugs and artificial support systems, in the management of vital organ failure.

5. To ensure practical and technical familiarity with monitoring and support equipment and devices in the intensive care unit.

6. To inculcate critical thinking, self-learning, enthusiasm for research, and commitment to continuing medical education in knowledge and technologic innovations in Critical Care Medicine.

7. To enhance the trainees’ sensitivity to issues of critical care delivery in the local community, and to inculcate a sense of responsibility and leadership in related policy making and implementation.

8. To acquire professional competence in training future trainees in Critical Care Medicine.

(II) STRUCTURE

1. This period consists of three years of supervised and accredited training in Critical Care Medicine. The three-year training programme comprises two years of core training in Critical Care Medicine as described below (with a minimum of 12
months of core training to be undertaken in training units that have been formally accredited by the College), plus one year of training in any of the following:

1.1 The same specialty which may be accredited for a maximum of 12 months, AND/OR

1.2 A broad-based specialty, defined as Advanced Internal Medicine (AIM) which may be accredited for a maximum of 12 months, AND/OR

1.3 Overseas training in Critical Care Medicine which may be accredited for a maximum of 12 months, with prior approval by the specialty board, AND/OR

1.4 Research in Critical Care Medicine which may be accredited for a maximum of 6 months, with prior approval by the specialty board.

2. To ensure the acquisition of a broad-based physician training for all Higher Physician Trainees undergoing Critical Care Medicine training, the College requires that all registered Higher Physician Trainees undergo dual training in a broad-based specialty, defined as Advanced Internal Medicine (AIM), together with training in Critical Care Medicine. Fellows who have been trained in Critical Care Medicine without a broad-based specialty will not be accepted as Trainer in any specialty in the future.

3. The structures of dual training programmes approved by the College include the following and Trainees must clearly indicate the programme chosen at the time of application to be registered as Higher Physician Trainee of the College:

3.1 Concurrent training: A minimum of four years of supervised training is required. The training programme comprises 24 months (cumulative) of core training in AIM and 24 months (cumulative) of core training in Critical Care Medicine.

3.2 Sequential training: A minimum of five years of supervised training is required. The training programme comprises 36 months training in either Critical Care Medicine or AIM followed by 24 months of core training in remaining specialty.

4. For a minimum period of 24 months, the trainee is required to assume direct patient care responsibility of critically ill patients for at least 44 hours per week in a general intensive care unit of an acute hospital as defined in Section IV. Clinical training in intensive care units overseas is acceptable, provided such training programmes fulfill College accreditation requirements.

5. Training Unit Rotation Requirement

During the training, the Candidate needs to work in at least 2 different training Units, with a minimum of 3 months in each training Unit.
6 The Candidate is required to attend at least 6 Board organized tutorials before undertaking the Exit Examination.

7 Procedure log

7.1 The candidate needs to have undertaken the following procedures under trainer supervision during the training period, and keep a record of these.

7.2 These procedures include:

7.2.1 Percutaneous tracheostomy: 5
7.2.2 Bronchoscopy: 10
7.2.3 Brainstem death test: 5
7.2.4 Ultrasound guided central venous catheter insertion, including catheters for Renal Replacement Therapy: 20
7.2.5 Echocardiography: 20

9 An elective period totaling no more than three months is allowed in one or more of the following.
Internal Medicine
Anaesthesia
Bone Marrow Transplantation Unit
Cardiothoracic Intensive Care Unit
Neurologic/Neurosurgical Intensive Care Unit
Traumatology

All elective programmes must be formally accredited by the respective Colleges and/or Specialties.

10 Concurrent Training with Advanced Internal Medicine

10.1 For the minimum period of 24 months of Critical Care Medicine training, the trainee is required to go through training as specified in (II) Structure. (2) & (5).

10.2 During the 24 months of Advanced Internal Medicine training, the trainee is required to assume a minimum of three months of meaningful inpatient and consultative responsibilities in each of the following medical specialties based in acute hospitals: Cardiology, Nephrology and Respiratory Medicine.
Part of the training in Cardiology should preferably involve direct patient care in a coronary care unit.

11 Sequential training subsequent to accreditation in other medical specialties

11.1 Fellows accredited in any one or more specialties other than AIM

11.1.1 Fellows accredited in any one or more specialty other than AIM may opt for sequential training in Critical Care Medicine, provided that they undertake a concurrent or sequential core training programme of Critical Care Medicine together with AIM. The training programme will thus comprise 48 months, being the sum of 24 months of core training in each specialty.

11.1.2 Such Fellows are required to have completed the core training requirements and passed the Exit Assessment in AIM as their first specialty before they can undergo the Exit Assessment of Critical Care Medicine.

11.1.3 It should be noted that such Fellows are not required to submit a dissertation for the Exit Assessment in AIM.

11.1.4 For the minimum period of 24 months of Critical Care Medicine training, the trainee is required to go through training as specified in Structure II, (2) & (5).

11.1.5 For a minimum of three months, the trainee is required to assume inpatient and consultative responsibilities in each of the following medical specialties based in acute hospitals during his/her higher physician training period:

Cardiology, Nephrology and Respiratory Medicine. Part of the training in Cardiology should preferably involve direct patient care in a coronary care unit. If the trainee is already accredited as fellows in related specialties include Cardiology, Nephrology and Respiratory Medicine, he/she would be exempted from the three month training in his/her accredited specialty(ies).

11.2 Fellows accredited in AIM with or without another specialty

Fellows accredited in AIM with or without another specialty may undertake sequential training in Critical Care Medicine by completing

11.2.1 For the minimum period of 24 months of Critical Care Medicine training, the trainee is required to go through training as specified in Structure II, (2) & (5).

11.2.2 For a minimum of three months, the trainee is required to assume inpatient and consultative responsibilities in each of the following medical specialties based in acute hospitals during his/her higher physician training period:
Cardiology, Nephrology and Respiratory Medicine. Part of the training in Cardiology should preferably involve direct patient care in a coronary care unit. If the trainee is already accredited as fellows in related specialties include Cardiology, Nephrology and Respiratory Medicine, he/she would be exempted from the three month training in his/her accredited specialty(ies).

(III) CONTENTS

(1) Knowledge

Knowledge to be acquired includes the following broad categories:

1.1 Management of the critically ill status of all major systems
1.2 Monitoring and medical instrumentation
1.3 Psychosocial and emotional effects of critical illness
1.4 Ethical, economic, and legal aspects of critical illness
1.5 Administrative and technical organisation of critical care units.

The following list is not exclusive and represents commonly encountered or important conditions or scenarios in the intensive care units.

1.5.1 Management of the critically ill status of all major systems

1.5.1.1 Cardiovascular Medicine
Various types of shock; myocardial infarction; cardiac arrhythmias and conduction disturbances; pulmonary embolism; cardiogenic and noncardiogenic pulmonary edema; cardiac tamponade and other pericardial diseases; acute valvular disorders; acute complications of cardiomyopathies and myocarditis; hypertensive emergencies; complications of angioplasty and other coronary interventional procedures; use of thrombolytic therapy; use of vasoactive and inotropic therapies

1.5.1.2 Respiratory Medicine
Acute hypoxaemic and hypercapnoeic respiratory failure; status asthmaticus; smoke inhalation, airway burn; aspiration and chemical pneumonitis; bronchopulmonary infections; upper airway obstruction; drowning; oxygen therapy; interpretation of arterial and venous blood gases; physiologic
principles of non-invasive positive and negative pressure ventilation.

1.5.1.3 Renal
Renal failure (acute and chronic): prerenal, renal and postrenal; acid-base and fluid and electrolyte physiology, pathophysiology and therapy; principles of haemodialysis, peritoneal dialysis and continuous renal replacement therapy. anticoagulation for extracorporeal circuit; interpretation of urine electrolytes.

1.5.1.4 Neurology and Neurosurgery
Differential diagnosis and acute management of coma; diagnosis and acute management of stroke; drug overdose including barbiturates, narcotics, tranquilizers, organophosphates; brain death certification; management of status epilepticus, Guillain-Barré syndrome and myasthenia gravis.

1.5.1.5 Endocrine and Metabolic
Disorders of thyroid function: thyroid storm, myxoedema and the sick euthyroid syndrome; adrenal crisis; disorders of antidiuretic hormone; diabetic ketoacidosis, hyperosmolar coma, and hypoglycaemia; phaeochromocytoma; insulinoma.

1.5.1.6 Infectious Diseases
Basic knowledge of microbiology; systemic sepsis; tetanus; hospital acquired infections in the critically ill; opportunistic infection in the immunocompromised patient; emerging infectious diseases; infection control in critical care units; use of antimicrobial agents: indications, dosing, adverse effects, and interpretation of antibiotic levels and sensitivities.

1.5.1.7 Haematology
Management of haemostatic defects including disseminated intravascular coagulation; management of massive transfusion and principles of blood component therapy; acute haemolytic disorders; acute haematologic disorders of immunosuppressed patients; oncologic emergencies; indications and principles of therapeutic aphaeresis.
1.5.1.8 Gastrointestinal, liver and pancreas

Acute pancreatitis with shock; gastrointestinal bleeding including variceal bleeding; acute and fulminant hepatic failure; acute perforations of gastrointestinal tract; ruptured oesophagus; acute inflammatory diseases of the intestine; stress ulcer prophylaxis.

1.5.1.9 Immunology and Transplantation

Principles of organ transplantation, including organ donation, procurement, preservation, transportation, implantation; immunosuppression.

1.5.1.10 Others

Pharmacokinetics and dynamics in critical illness; management of condition related to environmental emergencies e.g. heat stroke, hypothermia; critical care nutrition; management of anaphylaxis and acute allergic reactions; principles and management of trauma; critical obstetric and gynaecologic disorders.

1.5.2 Understanding of various ICU monitoring systems including invasive arterial pressure monitoring, pulse oximetry, capnography, intracranial pressure monitoring and electroencephalogram. Various common scoring systems in ICU including the APACHE systems.

1.5.3 Psychosocial and emotional effects of critical illness.

1.5.4 Ethical, economic, and legal aspects of critical illness, including withholding and withdrawal of treatment.

1.5.5 Administrative and technical organisation of critical care units.

(2) Skills

To be conversant with the indications, contraindications, complications, and limitations of the following procedures and to acquire the technical skills necessary to perform the following.
2.1 Airway

2.1.1 Maintenance of open airways in nonintubated, unconscious, paralyzed patients.

2.1.2 Endotracheal intubation via oral and nasal routes.

2.1.3 Percutaneous tracheostomy

2.2 Breathing & ventilation

2.2.1 Ventilation by bag and mask.

2.2.2 Mechanical ventilation, including pressure-cycled, volume-cycled and time-cycled mechanical ventilators. Ventilation modes including inverse-ratio ventilation and pressure-support ventilation.

2.2.3 Use of nasal continuous positive airway pressure mask to deliver positive pressure ventilation.

2.2.4 Use of reservoir masks and positive end-expiratory masks for delivery of supplemental oxygen, humidifiers, nebulizers, incentive spirometry.

2.2.5 Management of pneumothorax using transthoracic needle drainage, chest tube insertion and thoracostomy drainage systems.

2.2.6 Basic and advanced cardiopulmonary resuscitation.

2.2.7 Fibreoptic laryngotracheobronchoscopy.

2.2.8 Use of high-frequency mechanical ventilation and non-invasive negative pressure ventilation (Preferable).

2.3 Circulation

2.3.1 Arterial puncture and blood sampling.
2.3.2 Insertion of central venous, arterial, and pulmonary artery catheters; management of venous air embolism.

2.3.3 Cardiac output determinations using thermodilution technique.

2.3.4 Cardioversion.

2.3.5 Transvenous pacemaker insertion.

2.3.6 Transcutaneous pacing.

2.3.7 Application of intra-aortic assist devices (Preferable).

2.4 Parenteral nutrition.

2.5 Monitoring/bioengineering

2.5.1 Utilization, zeroing, calibration of transducers.

2.5.2 Use of amplifiers and recorders.

2.6 Pericardiocentesis (Preferable).

2.7 Peritoneal dialysis, continuous arterio-venous and veno-venous haemofiltration.

2.8 Peritoneal lavage (Preferable).

2.9 Insertion of haemodialysis catheters.

2.10 Therapeutic aphaeresis (Preferable).

2.11 Basic echocardiography
2.12 Basic ultrasonography

(3) Attitudes

3.1 Critical Care Medicine aims to deliver total patient care. Trainees and physicians should be in charge of their patients continuously throughout their stay in the unit. The training process should emphasize on the holistic care of the patients and ICU operator should ensure continuity of care and enhance exposure of trainees to their trainers. Shift duty is thus not a preferable mode of operation in the practice of this specialty.

3.2 To provide the best possible care to the critically ill. Critical care physicians should learn to adopt a special attitude to cope with the high levels of stress and high patient mortality.

3.3 Empathy, communication and good rapport with patients and relatives are crucial to helping them adjust to the stressful, unfamiliar, and 'hi-tech' intensive care environment.

3.4 Critical Care Physicians should

3.4.1 Be team leaders of nursing and allied medical professionals in the total care of the critically ill.

3.4.2 Respect and observe the privacy and confidentiality of patients and the sanctity of life.

3.4.3 Respect the legal definition of brain death.

3.4.4 Be ready to admit the limitations of medical interventions in clinical conditions which are deemed to be irreversible by consensus of their peers.

(IV) INSTITUTIONAL REQUIREMENTS

For recognition as a training unit in Critical Care Medicine, the training hospital should fulfill the following criteria.

1 The hospital should be an acute care hospital with the following facilities:
1.1 A general intensive care unit defined in (2) below.

1.2 An Accident and Emergency Department with active patient service 24 hours a day.

1.3 Beds of both sexes, admitting patients with a comprehensive range of medical and surgical diseases.

1.4 24-hour access to emergency consultative services including the various specialties in Medicine, Surgery and Anaesthesia.

2 The intensive care unit should admit patients with a variety of critical illnesses. It should be attended daily by trained critical care physicians with regular clinical input from related physician-based specialties. In hospitals where there are administratively independent medical and surgical intensive care units, the training programme should be based in the medical intensive care unit, but provision for the trainee to obtain regular exposure to surgical intensive care patients is also encouraged.

3 The general intensive care unit should have the following organisation and be equipped with, or have access to, the following facilities.

3.1 Fellows accredited in Critical Care Medicine as trainers, to provide a minimum trainer to trainee ratio of 1:2 at any one time. To ensure efficient, timely and consistent delivery of critical care services, the trainers should be directly supervising all aspects of critical care practice, including a minimum of twice daily rounds; acute management of newly admitted patients; performance of technical procedures; initiation, maintenance, and discontinuation of life support devices and systems; critical evaluation and analysis of data obtained from monitoring devices; regular conferences with families; regular conferences with other members of the care team; emergency calls; in-service teaching; triage and bed allocation; as well as other administrative activities.

3.2 Trainer and trainee should have adequate contact time to allow teaching, supervision and assessment of trainee performance. Trainer-trainee contact time is defined as the total duration within a week during which both the trainer and trainee are physically present within the hospital performing clinical critical care duties. The maximum accredited durations of core CCM training in CCM training centres recommended by the College are as follows:
<table>
<thead>
<tr>
<th>Number of CCM trainer</th>
<th>Contact time per week in hours</th>
<th>Maximum duration of core CCM training accredited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two or more</td>
<td>More than 30</td>
<td>21 months</td>
</tr>
<tr>
<td>Two or more</td>
<td>Between 22 to 30</td>
<td>18 months</td>
</tr>
<tr>
<td>Two or more</td>
<td>Less than 22</td>
<td>0 month</td>
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<tr>
<td>One</td>
<td>More than 30</td>
<td>18 months</td>
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<tr>
<td>One</td>
<td>Between 22 to 30</td>
<td>12 months</td>
</tr>
<tr>
<td>One</td>
<td>Less than 22</td>
<td>0 month</td>
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The contact time of supervisors having CCM Fellowship but had not become CCM trainer would be counted as half the contact time of accredited trainers.

3.3 Well-trained nursing staff at patient-to-nurse ratio of no more than 2:1.

3.4 Life support devices and systems including mechanical ventilators, intra-aortic balloon pump, haemodialysis, peritoneal dialysis and temporary transvenous pacemaking facilities.

3.5 Haemodynamic monitoring devices, including monitoring of blood pressure, pulse, cardiac output, pulmonary artery occlusion pressure, mixed venous oxygen saturation.

3.6 Respiratory monitoring devices including arterial oxygen saturation, respiratory mechanics while on mechanical ventilation, end-tidal or transcutaneous PCO₂.

3.7 Neurologic monitoring including intracranial pressure monitoring.

3.8 Facilities for the following diagnostic and therapeutic procedures.

3.8.1 Haemofiltration

3.8.2 Charcoal haemoperfusion/Molecular adsorbent recirculation system (MARS)
3.8.3 Plasmapheresis
3.8.4 Bedside fibreoptic bronchoscopy.

3.9 24-hour access to laboratory for arterial blood gas analysis, and cell count and biochemistry of body fluids.

3.10 24-hour blood banking facilities and imaging services (X-rays, CT Scan).

3.11 Ready access to total parenteral nutrition service.

3.12 On-call facilities close to the unit for trainees.

4 Laboratory and diagnostic facilities

4.1 Radiology/imaging (X-rays, CT Scan, radionuclide scans, pulmonary angiogram, ultrasound).

4.2 Pathology, including exfoliative cytology.

4.3 Microbiology.

4.4 Clinical Chemistry.

4.5 Haematology.

5 Regular medical audit procedures and performance of autopsies to resolve diagnostic problems.

6 Maintenance of adequate and high quality medical records with easy and prompt accessibility at all times.

7 Structured educational programme including teach-ins, journal clubs and grand rounds in Critical Care Medicine.
8 Adequate educational facilities, which include

8.1 Access to medical library facilities and computerized search system.

8.2 Space and equipments for educational activities.