Guidelines

for

Competency Based Training Programme

in

FNB- CRITICAL CARE MEDICINE

NATIONAL BOARD OF EXAMINATIONS
IN MEDICAL SCINCES

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CONTENTS

GOAL OF THE PROGRAMME

Critical care medicine (CCM) or Intensive care medicine is a multidisciplinary and multi-professional medical/nursing field concerned with patients who have sustained or are at risk of sustaining acutely life-threatening single or multiple organ failure due to disease or injury. CCM involves the assessment, resuscitation, and ongoing management of critically ill patients with life-threatening single and multiple organ system failure. An intensivist or an ICU specialist makes decisions regarding the care of the patients, including admissions and discharges, appropriate referrals, which physicians to consult, and daily care.

The goal of programme is to produce a competent intensivist who:

a. Recognizes the health needs of patients and carries out professional obligations in keeping with established standards, professional ethics and National Health policy
b. Has acquired the competencies pertaining to critical care medicine that are required to be practiced in the community and at all levels of health care system
c. Has acquired skills in effectively communicating with the patients, family and the community
d. Is aware of the contemporary advances and developments in medical sciences
e. Acquires a spirit of scientific enquiry and is oriented to principles of research methodology
f. Has acquired skills in educating medical and paramedical professionals

TEACHING AND TRAINING ACTIVITIES

Fellowship of National Board in Critical Care Medicine is a 2 year (24 months) comprehensive competency based training programme designed to train post graduate doctors in critical care medicine.

During the programme the teaching and learning methodology will include Clinical Case Discussion, Morbidity-Mortality Discussion, Audit presentation, Lectures, Seminars and Journal Clubs, Research projects, Simulation based learning, Joint inter-departmental academic meets etc.

The trainee students will participate in daily ICU rounds to gain competency in clinical diagnosis, diagnostic workup, resuscitation, therapeutic procedures, and advanced decision making in the management of critically sick medical and surgical patients.

For this purpose, the trainees will be rotated through other clinical disciplines, laboratories and speciality ICUs.

SYLLABUS AND COMPETENCIES

This 2-year common competency-based training programme is designed for the post-graduates of internal medicine, pulmonology(Chest medicine), anaesthesiology and emergency medicine.

The Competency Based Training Programme consists of a structured syllabus divided into broad segments of Domains, Competencies and Aggregated Syllabus. The Domains are the broad areas in which skill sets need to be acquired during the two years. Competencies are general skill sets that are required to be acquired under each domain. Aggregated syllabus are specific skill sets that are classified system wise in each competency. Critical Care is a broad super speciality encompassing many subjects and all the cognitive domains and skill sets required may not be fully covered in the syllabus. Also, critical care is a rapidly evolving field, and this syllabus is to be used a guide and not as an all-encompassing document.

❖ DOMAINS AND COMPETENCIES

A. Initial Management and Resuscitation – Recognising life threatening derangement in physiology and quickly provide necessary organ support.

- Assessment and management of patients with shock
- Assessment and management of patients with organ failure
- Assessment and management of patients with trauma and burns
- Cardiopulmonary resuscitation

B. Disease management: Diagnosis, Definitive management, Critical Care Management, Monitoring and Definitive Care.

- History
- Physical examination
- Investigations
- Diagnosis
- Cross consultation with other specialities
- Monitoring
- Organ specific monitoring
- Hemodynamic support
- Ventilatory support
- Renal support
- Neurological support
- Nutritional support
- Ancillary care
- Physiotherapy

C. Perioperative Care

- Perioperative ventilatory support
- Perioperative care of high risk surgical patient
- Perioperative care of major surgeries
- Post-operative analgesia

D. Procedures

- Procedures for organ specific support

E. Transport of critically ill

- Intrahospital / Interhospital transport of critically ill patient
- Monitoring during transport

F. End of Life Care

- Prognostication
- Counselling and communication
- Withholding and withdrawing support
- Palliative care

G. Patient safety and quality management

- Structure and processes
- Root cause analysis
- Hospital Infection control
- Medication safety

H. Research and Teaching

- Critically apprising a research paper
- Participation in Departmental research programmes
- Training paramedical staff

I. Administration

- Human resource planning
- Equipment procurement and maintenance
- Conflict resolution
- Formulation and implantation of ICU protocols

J. Professionalism and Ethics

- Professional attitude
- Ethics
- Privacy and confidentiality of patient data

K. Medico legal aspects

- Knowledge of Indian laws and various government guidelines
- Medical negligence
- Consent

❖ AGGREGATED SYLLABUS

(1). Cardiovascular and Hemodynamic System

i. **Basic and applied Anatomy and Physiology of Heart & Circulation:**

a) Electrophysiology of the heart
b) Cardiac muscle contraction
c) The cardiac cycle: pressure and volume relationships
d) Rhythmicity of the heart
e) Valves and Pericardium
f) Regulation of cardiac function; general and cellular

ii. **Hemodynamics:**

a) Cardiac output (including the Starling relationship), Oxygen delivery and consumption, Oxygen debt, Preload, Afterload, Transmural pressures, Systemic and Pulmonary vascular resistance
b) Heart Lung interaction
c) Neurohumoral control of systemic blood pressures, blood volume and blood flow
d) Peripheral circulation: capillaries, vascular endothelium and arteriolar smooth muscle, autoregulation and the effects of sepsis and the inflammatory response on the peripheral vasculature
e) Special circulations including pulmonary, coronary, cerebral, renal, portal, and fetal
f) Extracorporeal circulation and Cardiopulmonary bypass
g) Cardiovascular Critical Care Basic Principles and Monitoring

iii. **Pharmacology of Cardiovascular drugs:**

Vasoactive drugs including vasopressors and inotropes, Antiarrhythmics, Antihypertensives, Diuretics, Fluids, Antiplatelets Anticoagulants and Thrombolytics

iv. **Assessment, Investigation, Monitoring and Data interpretation**:

a) Clinical assessment of Hemodynamic status
b) Timely and appropriate biochemical investigations
c) Understanding of Electrocardiography (ECG/EKG), Indications and interpretation of the results
d) Understanding of echocardiography (trans-thoracic/trans-oesophageal), Indications and interpretation of results
e) Interpretation of blood gas reports
f) Understanding and interpretation of hemodynamic monitoring
g) Central Venous/Arterial /Pulmonary artery/Intra-Aortic Balloon Pump waveforms
h) Dynamic and Static Indices of Hemodynamic monitoring

i) Integration of clinical findings with laboratory, radiology, microbiology and other investigations to form appropriate differential diagnosis and management strategy
j) Understanding of the equipment used for monitoring and cardiac support

v. **Procedural Skills:**

a) Anatomical landmark and ultrasound guided vascular access
b) Defibrillation and cardioversion
c) Transcutaneous and transvenous pacing
d) Describes how to perform pericardiocentesis
e) Demonstrates methods for measuring cardiac output and derived hemodynamic variables
f) Lung ultrasound
g) Basic echocardiography
h) Assist in ECMO cannulation

vi. **Management of specific acute medical conditions:**

a) Acute Myocardial Infarction
b) Pulmonary Embolism
c) Shock – Hypovolemic/Cardiogenic/Obstructive/Septic/Neurogenic/anaphylactic
d) Life Threatening Arrhythmias
e) Cardiac Tamponade
f) Heart Failure – Acute/Acute on Chronic
g) Valvular emergencies
h) Hypertension and Hypotension emergencies
i) Right heart failure
j) Pregnancy related heart failure
k) Cardiomyopathy, Myocarditis and Pericarditis
l) Venous thromboembolism (VTE)
m) Air, Fat and Amniotic Fluid Embolism
n) Aortic and Peripheral Vascular Diseases
o) Mechanical Circulatory Support – Short term and Long term

(2). <u>Respiratory System</u>

i. Basic Anatomy

a) Centres of respiration
b) Upper airway with respect to mask ventilation and intubation
c) Lower airway and airway protective reflexes

d) Distal airway anatomy
e) Lobes and segments anatomy
f) Mediastinum
g) Anatomy of pleura
h) Diaphragm and other muscles of inspiration and expiration
i) Sternum and Rib cage

ii. Surface anatomy for procedures

a) Tracheal Cartilages
    (i) Cricothyrotomy and
    (ii) Percutaneous tracheostomy
b) Pleura surface anatomy
    (i) Needle Thoracocentesis and Intercostal drain

iii. Physiology

a) Neural control of respiration
b) Normal and abnormal breathing patterns
c) Signaling pathways
d) Airway reflexes
e) Lung Mechanics
f) West Zones and their application in mechanical ventilation
g) Compliance and Resistance
h) Time constant
i) Work of breathing
j) Oxygenation and Ventilation
k) Classification of Hypoxia
l) Aetio-pathogenesis of hypoxia and hypercapnia
m) V/Q mismatch
n) Shunt/Dead space/Diffusion defect
o) Alveolar gas equation and its implications
p) Oxygen Transport and factors affecting it
q) Hb-O2 dissociation curve
r) Carbon dioxide transport
s) Heart lung interactions
t) Effect of respiratory diseases on right heart function

iv.Pharmacology of Drugs used in Respiratory system

a) Bronchodilators and their delivery systems
b) Anti-inflammatory
c) Mucolytics
d) Oxygen and oxygen delivery devices
e) Pulmonary vasodilators
f) Steroids
g) Inhaled antibiotics

h) Neuromuscular blocking agent
i) Thrombolytics and anticoagulants

v. Examination of Respiratory systems

a) Clinical assessment of Respiratory failure
b) Upper airway obstruction
c) Obstructive airway disease
d) Assessment of acute hypoxemic respiratory failure
e) Assessment of consolidation/collapse
f) Clinical assessment of trauma to thorax/lungs
g) Assessment of flail chest

vi.Practical and procedural Skills

a) Mask ventilation and Airway Management
b) Assessment and management of anticipated difficult airway

Mechanical ventilation:

c) Physics related to mechanical ventilation
d) Non-invasive ventilation initiation, monitoring and weaning
e) Invasive ventilation
f) Basic modes
g) Advanced modes
h) Disease specific ventilation
i) Ventilator waveforms
j) Measuring auto PEEP, plateau pressure, driving pressure
k) Esophageal pressure monitoring
l) Troubleshooting in mechanical ventilation
m) Weaning
n) Difficult weaning
o) Prone ventilation

vii.Procedures

a) Thoracocentesis
b) Intercostal drain placement
c) Cricothyroidotomy
d) Percutaneous Tracheostomy
e) Diagnostic Bronchoscopy ,
f) Chest Physiotherapy
g) Management of thoracic epidural analgesia
h) VV ECMO basic principles

viii.Respiratory system monitoring

a) Arterial Blood Gas sampling and analysis
b) Pulse Oximetry
c) Capnography
d) Ventilator graphics
e) Imaging
f) Chest X-ray
g) High resolution CT (HRCT) lung
h) CT pulmonary angiogram (CTPA)
i) Pulmonary Function tests

ix.Equipment Knowledge

a) Oxygen delivery systems
b) Nebulizers and Humidification systems
c) Oxygen cylinder
d) Pulse oximeter
e) Capnograph
f) Laryngoscopes and airway adjuncts
g) Non-Invasive Ventilation interface and circuits
h) High flow oxygen systems
i) Invasive ventilators and circuits
j) Transport ventilators and circuits
k) Chest drain systems
l) Bronchoscope
m) ECMO
n) High Frequency Oscillator

x.Respiratory diseases management

a) Upper airway obstruction
b) Acute and Acute on Chronic Respiratory failure
c) COPD exacerbation
d) Acute severe asthma
e) Ventilatory and non-ventilatory management of ARDS
f) Cardiogenic pulmonary edema
g) Transfusion related acute lung injury
h) Massive hemoptysis
i) Pulmonary embolism classification and management
j) Hepatopulmonary syndrome
k) Pneumonia
    - Severe Community acquired
    - Hospital acquired / VAP
    - Aspiration
l) Bronchopleural fistula
m) Pleural diseases
n) Chest Trauma

(3). Hepatobiliary & Gastrointestinal System

i. Applied Anatomy & Physiology

a) Acid secretion
b) Digestion and absorption, Bowel motility and peristalsis
c) Ammonia production and metabolism
d) Synthesis and excretion of bile
e) Anatomy of liver, biliary tree and Pancreas
f) Mesenteric and portal circulation
g) Abdominal paracentesis

ii. Pharmacology

a) Prokinetics/anti-motility agents, laxatives
b) Antacids, H2 blockers, proton pump inhibitors, sucralfate
c) Vasopressin, terlipressin, somatostatin, midodrine, octreotide
d) Drugs used in hepatic encephalopathy
e) Drug dosing in liver disease/liver failure

iii. Clinical Skill

a) Abdominal examination and organ palpation
b) Rectal examination

iv. Practical Skills & Related Equipment Knowledge

a) Paracentesis
b) Measurement of intra-abdominal pressure
c) Insertion of nasogastric tube and Sengstaken-Blackmore tube
d) Care of bowel stoma
e) Screening abdominal ultrasound

v. Interpretation of Data

a) Blood labs
    i. liver function tests
    ii. Pancreatitis related investigations
b) Abdominal paracentesis fluid analysis
c) Imaging (CT/USG/X-ray) of abdomen
d) Intra-abdominal pressure

vi. Clinical Management Competency

a) Diarrhea in critically ill patients
b) Hepatitis, acute and chronic liver failure
c) Acute on chronic liver failure (ACLF)
d) Liver failure in pregnancy
e) Surgical abdomen, peritonitis, intra-abdominal infections
f) Acute pancreatitis

g) Cholecystitis—calculous and acalculous
h) Ileus, bowel obstruction
i) High output fistula
j) Colonic dilatation and Ogilive syndrome, toxic megacolon
k) Mesenteric ischemia
l) Portal hypertension and hepatic encephalopathy
m) Upper and lower gastrointestinal bleed
n) Hepatorenal, hepatopulmonary syndrome, refractory ascites
o) Stress ulcer prophylaxis, nutrition in critically ill
p) Postoperative management of abdominal surgery
q) Plasmapheresis

(4). <u>Renal System</u>

i. Anatomy and Physiology

a) Surface marking & palpation of kidneys, examination of AV fistula
b) Renal physiology—renal circulation, urine formation
c) Basics of hemodialysis and hemofiltration

ii. Pharmacology

a) Diuretics and nephrotoxic agents
b) Dosing in renal failure and with renal replacement therapy
c) Dosing in chronic kidney disease
d) Drug pharmacokinetics and pharmacodynamics in kidney failure
e) Renal protective agents

iii. Procedure competencies and Equipment Knowledge

a) Measurement of urinary bladder pressure
b) Insertion of hemodialysis catheter
c) Knowledge of renal replacement therapy machines and circuitry
d) Data interpretation
e) Urinalysis—routine microscopy, urinary electrolytes
f) Biomarkers of kidney function—new biomarkers, creatinine clearance
g) Imaging (CT/USG) of kidney

iv. Clinical skills

a) Assessment and staging of acute kidney injury
b) Prevention and management of acute kidney injury
c) Management of oliguria and polyuria
d) Management of electrolyte imbalances and emergencies
e) Complications of renal replacement therapy

(5). Nervous System

i. Anatomy and Physiology

a) Anatomy of spine
b) Cerebral circulation
c) Physiology of autonomic, central and peripheral nervous system
d) Physiology of nerve conduction, neuromuscular junction
e) Cerebral autoregulation and intracranial pressure
f) CSF physiology—production, circulation
g) Principles of targeted temperature management in post-cardiac arrest scenario

ii. Pharmacology

a) Sedatives/hypnotics, analgesics, anesthetic agents, antipsychotics
b) Anticonvulsants
c) Osmotic agents
d) Thrombolytics
e) Anticholinesterases, anticholinergics

iii. Clinical skills

a) Neurological examination
b) Delirium, sedation assessments, scales used
c) Targeted temperature management
d) Brain death assessment

iv. Practical skills

e) Lumbar puncture
f) Monitoring of intracranial pressure
g) Cerebral protection methods
h) Neuromuscular monitoring

v. Data Interpretation

a) Neuroimaging (CT/MRI)
b) ICP waveform analysis
c) CSF analysis
d) Knowledge of transcranial Doppler, EEG, Bispectral Index
e) Optic nerve sheath diameter interpretation

vi. Equipment use

a) Lumbar puncture needle
b) External ventricular drains
c) ICP monitors
d) NMJ monitor
e) Continuous EEG monitoring (if available)
f) Ophthalmoscope

vii. Clinical management skills

a) Management of stroke—ischemic, hemorrhagic
b) Status epilepticus—convulsive and non-convulsive
c) Meningitis, encephalitis, brain abscess
d) Traumatic brain injury
e) Neuromuscular weakness in critical care (Guillain-Barre syndrome, Myasthenic crisis), weakness related to toxicity
f) Critical illness related neuropathy/Myopathy
g) Subarachnoid hemorrhage
h) Hypertensive encephalopathy, PRES (posterior reversible encephalopathy syndrome)
i) Metabolic encephalopathy
j) Hydrocephalus
k) Spinal cord injury
l) Cerebral venous sinus thrombosis
m) Assessment of coma, delirium and sedation

(6). Obstetric Critical Care

Competencies

a) Knowledge of physiological changes in pregnancy
b) Diagnosis and ICU Management of patients with hypertensive disorders of pregnancy including Preeclampsia and Eclampsia
c) Diagnosis and ICU Management of peripartum life threatening complications - Postpartum haemorrhage, Amniotic fluid embolism, Peripartum Cardiomyopathy, Pulmonary Embolism
d) Diagnosis and ICU Management of Pregnancy associated Liver Diseases –Viral Hepatitis/Acute Fatty Liver of Pregnancy/ HELLP Syndrome/ Cholestatic disorders
e) Diagnosis and management of puerperal sepsis
f) Management of Cardiac arrest in Pregnancy
g) Knowledge of Pharmacotherapy in Pregnancy

(7). Infectious Diseases

i. Microbiology

a) Obtains appropriate microbiological samples
b) Can perform sample collection, storage and transport of blood and body fluids for cultures
c) Interpretation of culture and sensitivity reports
d) Familiar with interpretation of molecular diagnostics / PCR assays

ii. Antimicrobial Use in ICU

a) Manage antimicrobial therapy for empirical and definitive management of infectious diseases
b) Knowledge of pharmacokinetics and pharmacodynamics of various antimicrobials
c) Knowledge of mechanisms of bacterial resistance in ICU
d) Knowledge on methods available to treat drug resistant organisms

iii. Organism specific infectious diseases

a) Diagnosis and Management of Gram negative, Gram positive, atypical bacterial infections
b) Diagnosis& Management of invasive fungal infections
c) Diagnosis and management of mycobacterial and viral infections
d) Diagnosis and management of Rickettsial fever/ other tropical illnesses

iv. Specific Infectious syndromes

a) Management of septic shock
b) Management of complicated Abdominal infections – cholecystitis, peritonitis, enterocolitis, intra – abdominal abscess, infected pancreatic necrosis
c) Management of pleural and pulmonary infections – pneumonia, empyema, lung absces
d) Management of Complicated genitourinary infections – pyelonephritis, complicated UTI, renal abscess
e) Management of skin and soft tissue infections – Cellulitis, Necrotising fasciitis with/without myonecrosis
f) Management of complicated neurological infections – Meningoencephalitis, Brain abscess, Ventriculitis
g) Management of postoperative sepsis
h) Management of nosocomial infections - VAP/ VAT / CRBSI / CAUTI / Surgical site infections

v. Infection Prevention & Control

a) Knowledge on Infection prevention and Control Practices in the ICU
b) Knowledge of Transmission Based Precautions / Isolation Precautions
c) Environmental cleaning, disinfection and sterilization practices in the ICU
d) Diagnosis of Nosocomial Infections
e) Knowledge of antimicrobial stewardship
f) Knowledge of reading an antibiogram

(8). Hematology

i. Applied Physiology

a) Basics of blood components: RBCs, WBCs, Platelets and coagulation factors-
   (i) Production pathways, up and down-regulators.
   (ii) Functional role.
   (iii) Normal values.
b) Coagulation pathways.

ii. Diagnostics and Data Interpretation

a) Iron studies.
b) Interpretation of peripheral blood smear results.
c) Workup for hemolytic anemia (Immune and Non-immune).
d) Blood grouping and cross matching.
e) Tests for coagulation.
f) POC: Interpretation of thromboelastograph

iii. Pharmacology

a) Iron Preparations.
b) Blood components.
c) Antiplatelet agents.
d) Drugs acting on coagulation pathway- Anti-coagulants, anti-fibrinolytics and their antidotes.
e) Immunosuppressants and Immunomodulators.
f) Hematopoietic growth factors.

iv. Equipment in hematology

a) Blood collection instruments- Sample tubes, culture bottles, blood component bags etc.
b) Thromboelastogram.
c) Blood warming devices.

v. Diagnosis and Treatment:

a) Diagnosis and treatment of anemia and hemolytic disorders.
b) Diagnosis and treatment of bleeding disorders.
c) Managing acute hemorrhagic shock- Massive transfusion protocol.
d) Acute thrombotic emergencies.
e) Blood Transfusion Reactions:
   (i) Reporting protocol of transfusion reactions.
   (ii) Prevention and treatment of complications.

vi. Procedure and Skills:

a) Universal precautions.
b) Safe transfusion practices of blood components
c) Massive transfusion protocols

(10). <u>Oncology</u>

i. Data Interpretation

- Peripheral blood smears in common hematological malignancies

ii. Pharmacology

- Commonly used chemotherapeutic agents

iii. Clinical skills

a) Diagnosis and management of common emergencies in oncology:
    - Tumor Lysis syndrome
    - Hyper viscosity syndrome
    - Bleeding in acute leukemias
    - SVC syndrome
b) Managing common complications of chemotherapeutic drugs:
    - Bone marrow suppression
    - Mucositis
    - Sepsis
    - Cardiotoxicity

(11). <u>Nutrition, Fluid and Electrolyte Abnormalities, and Metabolic Disorders</u>

<u>Nutrition:</u>

i. Physiology

- Glucose metabolism.
    a) Lipid metabolism.
    b) Protein metabolism.
    c) Water metabolism
    d) Fasting and starvation

ii. Data Interpretation

a) Nutrition assessment scores.
b) Nitrogen balance.
c) Anthropometry
d) Laboratory data

iii. Pharmacology

a) Preparations of enteral nutrition.
b) Preparations of parenteral nutrition.
c) Micronutrients.
d) Immunonutrition
e) Probiotics

iv. Clinical skills:

a) Assessment of nutritional status of critically ill patients.
b) Prevention and management of malnutrition in critically ill patients.
c) Formulation of nutritional plan in general and in disease specific states- In terms of calorie and protein requirements, route of administration (Enteral/Parenteral).
d) Management of refeeding syndrome and other complications related to nutrition.

Metabolic disorders, Fluid and electrolyte abnormalities:

i. Physiology

a) Fluid and electrolyte balance.
b) Insulin and sugar control.
c) Thyroid hormone.
d) Glucocorticoids and mineralocorticoids.

ii. Data Interpretation

a) Electrolyte abnormalities.
b) Thyroid function tests.
c) Acid-base, electrolyte abnormalities in DKA, Hyperglycemic Hyperosmolar non-ketotic Syndrome.
d) Cosyntropin challenge test.
e) Arterial blood gas analysis.

iii. Pharmacology

a) Electrolyte preparations.
b) Crystalloids and plasma expanders.
c) Dextrose preparations used in the treatment of hypoglycemia.
d) Insulin and its analogues.
e) Thyroid hormone.
f) Corticosteroids.

iv. Clinical skills

a) Identification and management of electrolyte abnormalities (sodium, potassium, calcium, phosphorus, magnesium).

b) Diagnosis and management of metabolic and respiratory acid-base disorders.
c) Diagnosis and management of SIADH and diabetes insipidus.
d) Assessment of fluid status and managing hypovolemia.
e) Glucose control in ICU.
f) Managing DKA, HHNS.
g) Evaluation and management hypoglycemia.
h) Diagnosis and management of other endocrinal emergencies-thyrotoxicosis, myxedema coma, adrenal crisis.
i) Perioperative management of pheochromocytoma.

(12). <u>Trauma</u>

i. Polytrauma
ii. Initial assessment and ide
iii. Application of ATLS
iv. Airway management in Trauma patient
v. Management of Traumatic brain injury
vi. Identification and management of patients in ICU with
    a) Head and airway injury
    b) Spinal injury
    c) Chest, abdominal injury
    d) Long bone injury
    e) Inhalational injury
    f) Vascular injury
    g) Crush Injury
vii. Assessment and application of principles of ultrasound in trauma and shock
viii. Interpretation of Xray chest, CT and MRI images of common injuries
ix. Damage control resuscitation
x. Pre and post-operative management of trauma patient
xi. Rehabilitation
    a) Physical rehabilitation
    b) Psychological rehabilitation
    c) Family support

(13). Burn Injury

i. Severity estimation, assessment of Burn patient
i. Management and resuscitation
ii. Triaging and transfer to specialist burn center
iii. Wound care
iv. Identification of patients requiring surgical intervention - escharotomy, fasciotomy, wound care and other primary and secondary surgical techniques

v. Management of nutrition and infection
vi. Principles and ethical management of mass casualties
vii. Specific burn injuries
    a) Electrical burns
    b) Chemical burns
    c) Inhalational injury

(14). <u>Organ Donation</u>

i. Identification and management of brain-dead potential organ donor
ii. Preoperative and postoperative of solid organ transplant patient
iii. Management of critically ill hematopoietic transplant patients
iv. Immunosuppression
v. Infections in immunocompromised/post-transplant patient
vi. Legal and social issues related to organ donation

(15). <u>Toxicology</u>

i. Identification, assessment and initial management of acute poisoning, drug overdose
ii. Resuscitation, acute management
iii. Approach to toxic syndromes
iv. Specific poisoning management – immediate action, antidote administration, prevention of absorption, enhancing elimination
    a) Neurotoxins
        - Alcohol,
        - Opioids
        - Sedative/Hypnotics – Benzodiazepines, Barbiturates etc
        - Neuroleptics -
        - Antidepressants -
    b) Cardiotoxins and others
        - Beta blockers
        - Calcium Channel blocker
        - Cardiac Glycosides
        - Hypoglycemics
    c) Analgesics and Simple drugs
        - Paracetamol
        - Salicylates
        - Methemoglobin inducers/Sulphhemoglobinemia
        - Cyanide toxicity
    d) Stimulants
        - Amphetamines
        - Cocaine

e) Hallucinogens/sedatives
   - GHB
   - Ketamine
   - LSD
   - Phencyclidine

f) Organophosphorus, Aluminium Phosphide,
g) Corrosive
h) Metal poisoning
i) Carbon monoxide
j) Snake/Insect/scorpion Bite
k) Plant poisons
l) Volatile substance poisoning

(16). <u>Clinical Pharmacokinetics and Pharmacodynamics</u>

i. Principles in ICU
ii. Pharmacokinetics – parameters for drug dosing
iii. Pharmacokinetics of in sepsis and organ failures
iv. Pharmacodynamics
v. Interactions
vi. PK/PD of common drugs – antimicrobials
vii. PK/PD limitations – concentration at site of infection, resistance, synergism
viii. Drug dosing in organ failure
ix. Therapeutic drug monitoring in ICU

(17). <u>Sedation, Muscle relaxants and Analgesia</u>

i. Commonly used agents for endotracheal intubation and sedation
   - Benzodiazepines
   - Opioid agents
   - Ketamine
   - Alpha 2 agonists
   - Propofol
   - Etomidate

ii. Commonly used analgesics
   - Paracetamol
   - Non-steroidal analgesics
   - Opioids
   - Non-classical analgesics
     - Ketamine

- Gabapentin and Pregabalin
- Amitriptyline
- Steroids

iii. Muscle relaxants
- Depolarising muscle relaxants
- Non-depolarising muscle relaxants
- Reversal of neuromuscular block
- Monitoring of neuromuscular block

iv. Sedation scoring
v. Pain scoring
vi. WHO pain ladder
vii. Regional analgesia
- Epidural analgesia
- Regional blocks
- Nerve blocks including intercostal blocks

viii. Patient controlled analgesia
ix. Routes od administration
- Parenteral
- Transdermal

(18). <u>Research</u>

i. Core concepts in in clinical Research – Data and Basic statistic, population and outcome
ii. Designing a study, writing a protocol, ethics committee approval, conducting a study
iii. Publication

(19). <u>Administration and Quality</u>

i. Planning and designing of ICU
ii. Allocation of resources
iii. Preparation of SOPs
iv. Deployment of various care bundles (VAP, Central line, CAUTI etc)
v. Development of key performance indicators
vi. Conducting audit, Mock drills
vii. Importance of Electronic Medical Record
viii. Sentinel event or critical incident reporting
ix. Protocolised care versus optimum care
x. Managing social issues in ICU

(20). <u>Education</u>

i. Academic activities/Journal club/paper presentation
ii. Review of literature
iii. Non- technical skills - communication
iv. Teaching skills
v. Training and supervision of junior medical staff
vi. Onsite
vii. Remote
viii. Simulation

(20). <u>Bioengineering</u>

i. Medical gases, pipeline and equipments
ii. Electrical safety
iii. Calibration of common instruments, ventilators, transducers
iv. Electronic recording of data medical record

(21). <u>Transport</u>

i. Intrahospital, interhospital transport of critically ill patients
    - On road transfer
    - Air transfer (if available)
ii. Importance of Handover, documentations

LOGBOOK

Fellows are required to maintain a logbook as a record of the training and academic activities during the tenure of their training. The logbook should be reviewed by the student and the involved teachers periodically to regularly keep a track of their progress during the course.

The format for the logbook should be as follows:

- Title page
- Personal and educational details of the candidate
- Certificate signed by the head of the department mentioning the NBE registration number and training period.
- Details of classroom teaching by faculty
- Details of classroom presentations or seminars
- Details of case presentations
- Details of journal club
- Clinical procedures performed under supervision and independently
- Cases managed in various clinical rotations such as emergency room
- Code blue or MET calls attended
- Special training courses attended within or outside the hospital (Eg. ACLS, mechanical ventilation workshops etc.)
- Various rotational postings
- Research projects undertaken if any
- Publications
- Presentations in conferences if any

Rotations in various departments:

Sr. No.	Department	From (Date)	To (Date)	Supervisor (Name & Sign)

Classroom teaching by faculty

Sr. No	Date	Topic	Lecturer (Name & Sign)

Classroom presentations / seminars

Sr. No.	Date	Topic	Presenter	Moderator (Name & Sign)

Case Presentations

Sr. No.	Date	Topic	Presenter	Moderator (Name & Sign)

Journal Club

Sr. No.	Date	Article with Journal Name	Presenter	Moderator (Name & Sign)

Guideline on minimum number of procedures to achieve competence

Area of expertise	**Name of Procedure**	**Minimum number**
Airway	Bag mask ventilation	10
	Endotracheal intubation	20
	Observe and assist difficult intubation	10
	Percutaneous tracheostomy	5
	Cricothyrotomy	2
	Tracheostomy tube exchange	5
	Insertion of oral or nasal airway	5
Cardiovascular	Central venous catheterisation (blind/USG guided)	
	-Internal jugular	15
	-Subclavian	10
	-Femoral	10
	-Peripherally inserted central catheter (PICC)	5
	Arterial line insertion	
	-Femoral	10
	-Radial	15
	Trouble-shooting the arterial pressure wave tracing	10
	Advanced cardiovascular monitoring techniques	10
	Basic bedside Echocardiography	25
	Pericardiocentesis (Observe / assist)	2
	1. Cardiopulmonary resuscitation	30
	2. Transcutaneous and transvenous pacing	4
Respiratory system	Setting up and weaning from mechanical ventilator in various scenarios eg Asthma, ARDS, COPD, ILD, NM weakness	30
	Initiation and weaning from NIV and HFNO	30
	Needle thoracostomy	2
	Intercostal drain insertion	10
	Lung ultrasound – normal lung, Pleural Effusion, Pneumothorax, Consolidation, Pulmonary edema	20
	Bronchoscopy (Observed / assisted)	5
Renal	Dialysis catheter placement	10
	Understanding and performing IHD, SLEDD, CRRT	20
Nervous system	Lumbar puncture	15
	Brain death certification	5
GI system	Paracentesis	5
	Measurement of intra-abdominal pressure	5

	eFAST	10
Communication	Breaking bad news	25
	Brain death and organ donation	5
	End of life care	5

Format for recording procedures in the logbook
(Use separate tables for each procedure category)

Name of the procedure-				
Sr. No	**Date**	**Medical Records No.**	**Supervised/assisted/independent**	**Supervisor (Name & Sign)**

RECOMMENDED TEXTBOOKS AND JOURNALS

Textbooks

1. Oh's Intensive Care Manual
2. The ICU Book - Paul L Marino
3. Textbook Of Critical Care Including Trauma & Emergency Care -Mehta Y, et al
4. The Washington Manual of Critical Care Medicine
5. The Ventilator book - William Owens
6. The Advanced ventilator book - William Owens
7. Essential of Mechanical Ventilation - Dean Hess

Journals

1. Critical Care Medicine
2. Intensive Care Medicine (ESICM)
3. American journal of Respiratory and Critical care medicine
4. Critical Care
5. Indian Journal of Critical Care Medicine
6. New England Journal of Medicine (NEJM)
7. Journal of the American Medical Association (JAMA)
8. The Lancet
9. British Medical Journal

Relevant articles from major journals from allied specialties such as Internal Medicine, Infectious diseases, Anaesthesiology, Trauma, Emergency Medicine Cardiology, Neurology, Gastroenterology, Surgery, etc.

Online Resources

1. Comprehensive Critical Care Course - 4C (https://isccmcourses.org/local/staticpage/view.php?page=4c-course-contents)
2. Critical Care Infectious Disease Course (https://isccmcourses.org/local/staticpage/view.php?page=course-contents)

3. Medical Research Methodology (https://isccmcourses.org/local/staticpage/view.php?page=mrm-course-contents)
4. Uptodate (www.uptodate.com)

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