

NATIONAL POSTGRADUATE MEDICAL COLLEGE OF NIGERIA



POST-FELLOWSHIP IN INTENSIVE CARE MEDICINE CURRICULUM

FACULTY OF ANAESTHESIA

APPROVED BY THE SENATE ON 5TH DECEMBER, 2024

A handwritten signature in blue ink, appearing to read 'F. A. Arogundade', is positioned above the name of the Registrar.

**DR F. A. AROGUNDADE, MD FMCP
COLLEGE REGISTRAR**

FACULTY OF ANAESTHESIA
NATIONAL POSTGRADUATE MEDICAL COLLEGE OF NIGERIA
CURRICULUM FOR POST-FELLOWSHIP SUBSPECIALISATION IN INTENSIVE CARE MEDICINE

i) Post-Fellowship. Post-Fellowship Diploma in Intensive Care Medicine.

A. INTRODUCTION

This curriculum aims to equip physicians with advanced knowledge, skills and expertise in critical care, fostering their ability to deliver targeted and specialized care for patients with complex medical conditions. It recognizes the diverse and rapidly evolving nature of critical care medicine and emphasizes a commitment to continuous learning, multidisciplinary collaboration and the pursuit of excellence in patient care.

B. PHILOSOPHY

The philosophy behind the sub-specialisation in intensive care medicine is to enhance the quality of care provided to critically ill patients. Fellowship subspecialisation allows physicians to acquire advanced knowledge, skills and expertise in specific area of critical care, enabling them to provide more targeted and specialized care for patients with complex medical and surgical conditions.

Another aspect is the recognition that critical care medicine is diverse and rapidly evolving and the commitment to continuous learning and improvement. The fellowship training provides opportunities to engage in focused research, participate in academic discussions and collaborate with other experts in their field. With specialized training, intensivists can effectively collaborate with healthcare professionals from other disciplines, such as surgeons, Anaesthesiologists, pulmonologists, and nurses to provide holistic care that addresses the diverse needs of the critically ill patients.

Overall, the philosophy behind this subspecialisation in intensive care medicine is centred on improving patient outcomes and advancing the field of critical care.

C. AIM AND OBJECTIVES

The aim of the sub-specialisation in Intensive Care Medicine is to promote standards in education and training in intensive care medicine in Nigeria to improve the needed critical workforce in this area of Medicine.

Objectives:

1. To provide immediate and timely care to critically ill patients
2. To manage complex medical conditions and emergencies
3. To provide comprehensive multidisciplinary care
4. To optimize patient outcomes
5. To promote research and advancements in intensive care
6. To train future intensivists

D. ENTRY REQUIREMENTS.

Fellowship of the Faculties of Anaesthesia of the National Postgraduate Medical College of Nigeria, the West African College of Surgeons and related specialties of both Colleges.

E. DURATION OF PROGRAMME

The duration of the programme is eighteen (18) calendar months.

The candidate is advised to do 3 months rotation in a fully accredited institution within the country or in a recognized institution outside the country

LIST OF COURSES AND DETAILED COURSE DESCRIPTION

The following curriculum will be provided through lectures, seminars, conferences and workshops as necessary to supplement clinical experience in the following areas:

COURSE CODE	COURSE TITLE	DURATION (weeks)	LECTURES (hours)	PRACTICALS (hours)	CREDIT UNITS
ANE 946.1	Anatomy relevant to intensive care medicine	4	45	45	4
ANE 946.2	Physiology and pathophysiology relevant to intensive care medicine.	4	45	45	4
ANE 946.3	Biochemistry relevant to intensive care medicine.	4	45	45	4
ANE 946.4	Pharmacology relevant to intensive care medicine.	4	45	45	4
ANE 946.5	Physics & clinical measurement in intensive care.	14	30	180	6
ANE 946.6	Intensive care procedures and skills	16	30	180	6
ANE 946.7	Intensive care divisions.	16	30	180	6
ANE 946.8	Critical care equipment- types and functions	10	30	180	6
	TOTAL	72			40

ANE 946.1: Anatomy relevant to intensive care medicine

4 Units

RESPIRATORY SYSTEM- 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.

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 maternal-foetal circulation.

NERVOUS SYSTEM: Brain and its subdivisions. Spinal cord, structure of spinal cord, major ascending and descending pathways. Spinal meninges, subarachnoid and extradural space, contents of extradural space. Cerebral blood supply CSF and its circulation. Spinal nerves, dermatomes. Brachial plexus. 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

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.

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

ANE 946.2: Physiology and pathophysiology relevant to intensive care medicine.

4 units

Organisation of the human body and homeostasis. Variations with age. Function of cells; genes and their expression. Mechanisms of cellular and humoral defence. Cell membrane characteristics; receptors: Protective mechanisms of the body. Genetics & disease processes. Capillary dynamics and interstitial fluid. Oncotic pressure. Osmolarity: osmolality, partition of fluids across membranes. Lymphatic system. Special fluids: cerebrospinal, pleural, pericardial and peritoneal fluids.

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.

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

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. 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 manoeuvres). 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.

RENAL TRACT: Blood flow, glomerular filtration and plasma clearance. Tubular function and urine formation. Endocrine functions of kidney. Regulation of fluid and electrolyte balance. Regulation of acid-base balance. Micturition. Pathophysiology of acute renal failure.

RESPIRATION: Gaseous exchange: O₂ and CO₂ transport, hypoxia and hyper- and hypocapnia, hyper- and hypobaric 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.

NERVOUS SYSTEM: Functions of nerve cells: action potentials, conduction, synaptic mechanisms and transmitter. The brain: functional divisions. Intracranial pressure: cerebrospinal fluid, blood flow. Maintenance of posture. Autonomic nervous system: functions. Neurological reflexes Motor function: spinal and peripheral receptor: receptors, nociception, special receptor. Pain: afferent nociceptive pathways, dorsal horn, peripheral and central mechanisms, neuro-modulatory systems, supraspinal mechanisms, visceral pain, neuropathic pain, influence of therapy on nociceptive mechanisms. Spinal cord: anatomy and blood supply, effects of spinal cord section.

GASTROINTESTINAL: Gastric function. 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. **LIVER:** Functional anatomy and blood supply, Metabolic functions.

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.

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, glucagon and exocrine function. Thyroid and parathyroid hormones and calcium homeostasis.

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.

ANE 946.3: Biochemistry relevant to intensive care medicine.

4 Units

Acid base balance and buffers ions e.g. Na^+ , K^+ , Ca^{++} , Cl^- , HCO_3^- , Mg^{++} , PO_4^- . Cellular and intermediary metabolism; variations between organs. Enzymes.

ANE 946.4: Pharmacology relevant to Intensive Care Medicine.

4 Units

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 interaction-Inhibition and promotion of drug uptake. Competitive protein binding. Receptor inter-actions. Effects of metabolites and other degradation products.

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.

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 anticholinesterase. 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 A-E, folate, B12.

ANE 946.5: Physics & clinical measurements in intensive care.

6 Units

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.

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.

ELECTRICITY & MAGNETISM: Basic concepts of electricity and magnetism. 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. Bridge circuits.

ELECTRICAL SAFETY: Principles of cardiac pacemakers and defibrillators: Electrical hazards: causes and prevention. Electrocutation, fires and explosions. Diathermy and its safe use. Basic principles and safety of lasers. Basic principles of ultrasound and the Doppler effect.

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 analysis. Principles of pulmonary artery and wedge pressure measurement. Cardiac output: Fick principle, thermodilution.

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, pCO₂, pO₂. Measurement CO₂ 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.

ANE 946.6: Intensive care procedures and skills.

6 Units

Venous Accesses. Arterial Accesses. Airway Management. ABG-Arterial Blood Gas. Mechanical Ventilation (basics, types), Non-invasive ventilation (NIV). Weaning. Ultrasound in the ICU. Echocardiography. Oxygen Therapy. Tracheostomy. Analgo-sedation. Principles of Antibiotic Therapy. Haemodynamic monitoring. Volume therapy. Catecholamine therapy, ICP and IAP monitoring. Shock- assessment and management. Nutrition of critically ill patients. Glycaemic control. Resuscitation of children. Resuscitation of adults.

ANE 946.7: Intensive care divisions.

6 Units

CARDIOLOGY: Acute coronary syndrome (ACS). Cardiogenic shock. Cardiac arrhythmias. Inflammatory heart diseases (endocarditis, myocarditis, pericarditis [i.e., pericardial effusion, pericardial puncture]). Hypertensive crisis.

PULMONOLOGY: ARDS. Respiratory failure. Pulmonary oedema. Aspiration pneumonitis. Acute pulmonary embolism. Pulmonary hypertension. Acute right heart failure. Obstructive lung diseases. Status asthmaticus. Acute exacerbation of COPD. Interstitial lung diseases. Bronchial hemorrhage.

GASTROENTEROLOGY: Upper gastrointestinal bleeding. Lower gastrointestinal bleeding. Acute pancreatitis. Gastrointestinal atony. Liver Failure. Nutrition.

ENDOCRINOLOGY: Endocrinological emergencies. Diabetic coma (diabetic ketoacidosis, hyperglycemic hyperosmolar syndrome). Thyrotoxic crisis. Myxedema coma. Addison crisis (acute adrenocortical insufficiency). Pheochromocytoma. Conn syndrome. Cushing syndrome. Hypopituitarism (i.e., pituitary coma).

DISORDERS OF ELECTROLYTES: Disorders of sodium, Disorders of potassium, Disorders of calcium, Disorders of magnesium, Disorders of phosphate, Disorders of acid-base balance, Acidosis. Alkalosis.

NEPHROLOGY: Acute kidney injury. Renal replacement therapy.

INFECTIONS: Sepsis (SARS-CoV-2, Haemorrhagic fevers, Community-acquired pneumonia, Hospital-acquired pneumonia, Malaria). Multi-drug resistant organisms (MDRO). Skin and soft tissue infections. Fungal infections (Mycosis). Infection Control.

HAEMATOLOGY: Thromboprophylaxis. Blood products (i.e. red cell concentrates, platelet concentrates, FFP, PCC, antithrombin, fibrinogen, factor VII, factor XIII). DIC (disseminated intravascular coagulation). Hyperfibrinolysis. AHA (acquired hemophilia). von Willebrand disease. ITP (idiopathic thrombocytopenic purpura). HIT (heparin-induced thrombocytopenia). TTP (thrombotic thrombocytopenic purpura). HELLP syndrome.

ONCOLOGY: Upper venous congestion (Superior vena cava syndrome). Spinal compression syndrome. Brain metastases. Tumor lysis syndrome. Neutropenic fever.

NEUROLOGY: Intracranial hemorrhage. Stroke. Epidural hemorrhage. Subdural hemorrhage. Subarachnoidal haemorrhage. Intracerebral haemorrhage. Status epilepticus. Bacterial meningitis. Brain death (irreversible loss of brain function), organ donation. Critical illness polyneuropathy (CIP). Critical illness myopathy (CIM). Guillain-Barré syndrome (GBS). Malignant hyperthermia (MH). Tetanus. Myasthenic crisis.

TRAUMATOLOGY/EMERGENCIES: Polytrauma. Head and Spine trauma. Electrical accident. Drowning accident. Hypothermia. Hyperthermia (heat stroke). Burns. Obstetric Emergencies. Paediatric Emergencies. Toxicology: General toxicology. Special toxicology-drugs, alcohols, chemicals, metals, gases, plants, fish, snakes.

Ethics of end-of-life Care: Withholding treatment, withdrawing treatment, palliative care, do not attempt resuscitation (DNAR), power of attorney, euthanasia, organ donation and harvesting.

ANE 946.8. Critical care equipment- types and functions

6 Units

Ventilators. Infusion pmp. Defibrillator (manual and AED), Patient monitors. Electrocardiograph. Syringe pump. Dialysis machines. The ICU bed. Anaesthesia machine. The crash cart. Warmers, blood warmers. Ultrasound machine. ABG machine. Side laboratory equipment. CPAP machine.

F. COMPETENCIES

The CoBaTrICE competencies define the minimum standard of knowledge, skills and attitudes required for a doctor to be identified as a specialist in intensive care medicine (ICM). They have been developed with the intention of being internationally applicable but able to accommodate national practices and local constraints. They comprise 102 competence statements grouped into 12 domains. (Adapted from European Society of Intensive Care Medicine). This will apply to both routes.

CoBaTrICE Domains

Resuscitation. Diagnosis. Disease management. Interventions. Procedures. Peri-operative care. Comfort and recovery. End of life care. Paediatric care. Transport. Safety and management. Professionalism

1. RESUSCITATION

The point of first contact with an acutely ill, deteriorating, or collapsed patient requires clinicians to take action to prevent or correct physiological deterioration despite uncertainty about causation and the underlying diagnosis. Meeting this challenge - action in uncertainty - demands a structured approach to patient management, exemplified by the resuscitation algorithms, but less well developed for the non-arrested acutely ill patient.

- i. Adopts a structured and timely approach to the recognition, assessment and stabilization of the acutely ill patient with disordered physiology.
- ii. Manages cardiopulmonary resuscitation.
- iii. Manages the patient post-resuscitation.
- iv. Triages and prioritises patients appropriately, including timely admission to ICU.

- v. Assesses and provides initial management of the trauma patient.
- vi. Assesses and provides initial management of the patient with burns.
- vii. Describes the management of mass casualties.

2. DIAGNOSIS

It is very easy to acquire large amounts of data in modern medical practice. The challenge is to acquire appropriate data and convert it into information, essential steps on the pathway to diagnosis and treatment. Monitoring devices combine the functions of clinical investigation with surveillance. Clinical investigations are forms of hypothesis testing; they bring burdens and occasional risks for patients, as well as additional costs and work for the investigating clinician and laboratory staff. Their utility, safety and accuracy must be balanced against these factors.

- i. Integrates clinical findings with laboratory investigations to form a differential diagnosis.
- ii. Undertakes timely and appropriate investigations.
- iii. Performs and interprets ultrasonography assessment.
- iv. a) Performs and interprets transthoracic cardiac ultrasound for the recognition and assessment of left ventricular and right systolic failure, contraction pattern and dilation and pericardial tamponade. b) Performs and interprets ultrasonographic assessment of the lungs and pleura for the recognition and assessment of consolidation, pleural effusion and pneumothorax. c) Performs and interprets ultrasonographic assessment of the abdomen to assess intraperitoneal free fluid, hydronephrosis and bladder volume. d) Performs and interprets venous ultrasound examination to assess for deep venous thrombosis and to aid vascular access (arterial and venous).
- v. Performs electrocardiography (ECG / EKG) and interprets the results.
- vi. Obtains appropriate microbiological samples and interprets results.
- vii. Obtains and interprets the results from blood gas samples.
- viii. Interprets chest x-rays.
- ix. Liaises with radiologists to organise and interpret clinical imaging.
- x. Monitors and responds to trends in physiological variables.
- xi. Integrates clinical findings with laboratory investigations to form a differential diagnosis.

3. DISEASE MANAGEMENT

Diagnostic accuracy determines therapeutic specificity. Although in the early phases of managing an acutely ill patient, physiological safety and support are the main issues, making the correct diagnosis and providing the right treatment will determine the patient's outcome. Disease management therefore requires skills in integrating clinical information with laboratory data and applying 'best practice' guidelines promptly and effectively. It also involves regular clinical review with revision of diagnostic possibilities and modification of treatment according to patient response.

- i. Acute disease
- ii. Manages the care of the critically ill patient with specific acute medical conditions and co-morbid disease.
- iii. Identifies the implications of chronic and co-morbid disease in the acutely ill patient.
- iv. Organ system failure
- v. Recognises and manages the patient with circulatory failure.
- vi. Recognises and manages the patient with, or at risk of, acute kidney injury.
- vii. Recognises and manages the patient with, or at risk of, acute liver failure.
- viii. Recognises and manages the patient with neurological impairment.
- ix. Recognises and manages the patient with acute gastrointestinal failure.
- x. Recognises and manages the patient with ARDS.
- xi. Recognises and manages the septic patient.
- xii. Recognises and manages the patient following intoxication with drugs or environmental toxin.
- xiii. Recognises life-threatening maternal peripartum complications and manages care under supervision.

4. INTERVENTIONS

Skilled organ-system support including appropriate therapeutic interventions is the 'housekeeping' of intensive care practice, a necessary - but insufficient - requirement for promoting survival from critical illness. The practical procedures associated with organ system support are considered in the next section.

- i. Prescribes drugs and therapies safely.
- ii. Manages antimicrobial drug therapy.
- iii. Administers blood and blood products safely.
- iv. Uses fluids and vasoactive / inotropic drugs to support the circulation.
- v. Describes the use of mechanical assist devices to support the circulation.
- vi. Initiates, manages, and weans patients from invasive and non-invasive ventilatory support.
- vii. Initiates, manages and weans patients from renal replacement therapy.
- viii. Recognises and manages electrolyte, glucose and acid-base disturbances.
- ix. Co-ordinates and provides nutritional assessment and support.

5. PROCEDURES

Practical procedures underpin all forms of organ system support. All these competencies will include, where relevant, attention to:

- i. Respiratory function
- ii. Performs arterial catheterization.
- iii. Performs fiberoptic laryngoscopy under supervision.
- iv. Performs emergency airway management.
- v. Performs difficult and failed airway management according to local protocols.
- vi. Performs endotracheal suction.
- vii. Performs fiberoptic bronchoscopy and BAL in the intubated patient under supervision.
- viii. Performs percutaneous tracheostomy under supervision.
- ix. Performs thoracocentesis via a chest drain.
- x. Cardiovascular
- xi. Performs peripheral venous catheterization.
- xii. Describes a method for surgical isolation of vein / artery.
- xiii. Describes ultrasound techniques for vascular localization.
- xiv. Performs central venous catheterisation and pulmonary artery catheterization.
- xv. Performs defibrillation and cardioversion.
- xvi. Performs cardiac pacing (transvenous or transthoracic).
- xvii. Describes how to perform pericardiocentesis.
- xviii. Demonstrates a method for measuring cardiac output and derived haemodynamic variables.
- xix. Central Nervous System
- xx. Performs lumbar puncture (intradural / 'spinal') under supervision.
- xxi. Manages the administration of analgesia via an epidural catheter.
- xxii. Gastrointestinal
- xxiii. Performs nasogastric tube placement.
- xxiv. Performs abdominal paracentesis.
- xxv. Describes Sengstaken tube (or equivalent) placement.
- xxvi. Describes indications for, and safe conduct of gastroscopy.
- xxvii. Renal / Genitourinary system.
- xxviii. Performs urinary catheterization.

6. PERI-OPERATIVE CARE

Acutely ill patients may present with medical, or surgical problems, or both. The complications of critical illness do not respect specialty boundaries. Perioperative care requires multidisciplinary collaboration, and often provides opportunities for preventative intensive care.

- i. Manages the pre- and post-operative care of the high-risk surgical patient.
- ii. Manages the care of the patient following cardiac surgery under supervision.
- iii. Manages the care of the patient following craniotomy under supervision.
- iv. Manages the care of the patient following solid organ transplantation under supervision.
- v. Manages the pre- and post-operative care of the trauma patient under supervision.
- vi. Manages the pre and post operative care of patients following prolonged surgery and anaesthesia.
- vii. Manages the pre and post operative care of patients following major emergency cavity surgeries.

7. COMFORT AND RECOVERY

The compassionate care of patients and families is a fundamental duty of any clinician, which is given particular emphasis by the special circumstances of critical illness. The process of rehabilitation starts in intensive care and is continued for many months - sometimes years - following discharge from hospital. This journey to recovery requires attention to both the physical and the psychological consequences of critical illness.

- i. Identifies and attempts to minimise the physical and psychosocial consequences of critical illness for patients and families.
- ii. Manages the assessment, prevention and treatment of pain and delirium.
- iii. Manages sedation and neuromuscular blockade.
- iv. Communicates the continuing care requirements of patients at ICU discharge to health care professionals, patients and relatives.
- v. Manages the safe and timely discharge of patients from the ICU.
- vi. Identifies the need for palliative care when required and consults palliative care specialists.

8. END OF LIFE CARE

Death is inevitably a managed, not a 'natural' process in intensive care. The manner in which it is conducted may affect the survivors - family and staff - for the rest of their lives. Treatment limitation or withdrawal does not mean denial of care; patients should not suffer, and, where possible, their wishes should be determined and respected.

- i. Manages the process of withholding or withdrawing treatment with the multidisciplinary team
- ii. Discusses end of life care with patients and their families / surrogates.
- iii. Manages palliative care of the critically ill patient.
- iv. Performs brain-stem death testing.
- v. Manages the physiological support of the organ donor.

9. PAEDIATRIC CARE

These competencies are those expected of a practitioner of adult intensive care medicine, not a paediatric intensivist or neonatologist. Adult intensivists may be called upon to provide immediate care for the acutely ill child while awaiting transfer to a paediatric centre.

9.1 Describes the recognition of the acutely ill child and initial management of paediatric emergencies.

9.2 Describes national legislation and guidelines relating to child protection and their relevance to critical care.

10. TRANSPORT

Critically ill patients may require intra- or inter-hospital transfer for clinical reasons. The principles are the same for both circumstances. Competence in aero-medical transfers is not a specific requirement though they may be used for competence acquisition and assessment if local circumstances permit.

- i. Undertakes transport of the mechanically ventilated critically ill patient outside the ICU.

11. SAFETY AND MANAGEMENT

Error in healthcare often creates two victims - the patient, and the clinician who is usually the terminal component in an unsafe healthcare system. Creating safer systems may require changes in structures and resources, but always involve improvements in processes and organisation of care.

- i. Leads a daily multidisciplinary ward round.
- ii. Complies with local infection control measures.
- iii. Identifies environmental hazards and promotes safety for patients and staff.
- iv. Identifies and minimises risk of critical incidents and adverse events, including complications of critical illness.
- v. Organises a case conference.
- vi. Critically appraises and applies guidelines, protocols and care bundles.
- vii. Describes commonly used scoring systems for assessment of severity of illness, case mix and workload.
- viii. Demonstrates an understanding of the managerial & administrative responsibilities of the ICM specialist.

12. PROFESSIONALISM

A professional is someone with special expertise who gains the privilege of self-regulation through vocation and service, high ethical standards, critical self-appraisal, and personal development. Professionalism includes the capacity for clinical judgement (the translation of data into knowledge and knowledge into appropriate actions). These distinguishing attitudes and behaviours can be evaluated in terms of communication skills, professional relationships, and personal governance (personal standards, self-development, insight, and self-control).

- i. Communication skills

- ii. Appropriately supervises, and delegates to others, the delivery of patient care.
- iii. Communicates effectively with members of the health care team.
- iv. Maintains accurate and legible records / documentation.

G. ASSESSMENT/EXAMINATIONS

a. Formative evaluation

The trainee will be objectively assessed on competence in patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and compliance with institutional practice and policies. The evaluation report will document progressive performance improvement. The trainee will be provided with feedback on performance and progress. This will be performed on a 3-monthly basis.

b. Summative Evaluation.

Post-Fellowship examination: Standard setting with the **Modified Angoff method** will be used for summative assessment of the candidates. The examination consists of:

- Theory Paper: 2 hours. MCQ (SBA). 100. Intensive Care Medicine- Applied Basic Sciences (20), Surgery (15), Medicine (10), Paediatrics (10), Obstetrics (10) as applicable to the specialty, Specific Critical Care Management of Cases (35)
- **OBJECTIVE STRUCTURED CLINICAL EXAMINATION (OSCE): SIX STATIONS:** Duration of 1 hour comprising: (a) HISTORY TAKING/COMMUNICATION- 10 marks. (b) PHYSICAL EXAMINATION- 15 marks. (c) SKILLS-. 20 marks. (d) SKILLS. - 20 marks (e) INVESTIGATIONS (XRAYS, CT, HAEMATOLOGY, ECHO. ECG, ABG. CLINICAL CHEMISTRY)- 15 marks. (f) PATIENT MANAGEMENT- 20 marks (TOTAL 100 marks)
- Structured Oral examination. Subspecialty (100%). Duration is 1 hour

GRADING OF MARKS

GRADE	PERCENTAGE %
A (excellent)	≥ 70%
B (very good)	60-69%.
C (good)	55-59%
D (pass)	50-54%
E (borderline)	45-49%
F (fail)	< 45%

- The assessment includes the following for both groups- Logbook of 500 patients and 150 procedures (Endotracheal intubation, Fiberoptic Laryngoscopy, Arterial Cannulation, Central Venous Canulation, Lung Ultrasound, Cardiac Echocardiography, Chest tube insertion, Tracheostomy, setting up Mechanical Ventilation, Defibrillation and Cardioversion)) performed during the training period.

H. CONDITION FOR A PASS

- i. Candidate must pass all sections of the examination to be awarded a Pass
- ii Candidate who fails any section(s) of the examination will be required to repeat the failed section(s) in a subsequent examination.

I. ACCREDITATION REQUIREMENTS.

i) General Requirements for Residency Training: The anaesthesia training programme is aimed at producing specialists in anaesthesia of a high degree of competence, comparable in the extent and depth of the training of anaesthesia Fellows in other parts of the world. The anaesthesia specialist should have a firm grasp of the scientific basis of anaesthesia, be skilled in the performance of anaesthetic duties and be conversant with research methodology and the interpretation of research data. The provision of facilities for this level of training must be based on the objectives of the training and should cover the main areas of modern anaesthetic practice.

The institution must have accreditation for general fellowship training in addition to accreditation for training in anaesthesia.

Number of Trainers, related surgical specialties, minimum case load and variety cases, and, training facilities specific for the neuro-anaesthesia

- (a) Clinical Anaesthesia: Pre-Operative Care. Intra-Operative Care. Post-Operative Care
- (b) Resuscitation
- (c) Intensive Care
- (d) Pain Medicine

As much as possible, adequate facilities should be available in all these areas to give the candidate enough practice both in quantity, quality and variety.

Related disciplines and ancillary facilities for investigation must also be available. These include the core departments of Internal Medicine, Paediatrics, Surgery, Obstetrics & Gynaecology, Pathology, Radiology, and Medical Records. Details of their equipment in all areas are given below:

- (i) An Institution for Postgraduate Training in Anaesthesia must have a Department of Anaesthesia run by specialists in general and other subspecialties of anaesthesia, pain medicine and intensive care medicine, who are themselves Fellows of the National Postgraduate Medical College of Nigeria or are Fellows of other recognized Colleges or have equivalent qualifications. A minimum of two Fellows supported by residents in training would be required as a basic teaching unit.
- (ii) As many branches of surgery as possible should be available in the hospital. These include General Surgery, Obstetrics & Gynaecology, Urology, Ophthalmology, E.N.T. Surgery, Orthopaedic and Trauma Surgery, Dental Surgery, Paediatrics and Plastic

Surgery. While it is desirable to have a neurosurgical unit and a cardio-thoracic unit, it is not mandatory for basic specialist training. Residents in institutions without neurosurgical and cardio-thoracic units must do senior and junior residency rotations in fully accredited institutions as specified by the Faculty.

- (iii) There must be an out-patient complex with Emergency Rooms and facilities for resuscitation, as well as out-patient theatre(s) for minor surgery and casualty.
- (iv) Laboratories – The hospital must also have facilities for investigation in: (a) Chemical Pathology
(b) Microbiology for routine and special investigations, and emergency. (c) Haematology and Blood Bank.
- (v) There should be an Intensive Care Unit for the management of critically ill or traumatised patients.
- (vi) There should be a Departmental laboratory for research.
- (vii) There must be a suitable number of operating theatres to give the various specialties of surgery adequate operating time. Each theatre should have an anaesthetic room attached to it and should be fully equipped with anaesthetic, monitoring and resuscitation equipment. It is vital that there should be a recovery room equipped with monitors, resuscitation equipment to take a minimum, of two to four beds depending on the number of theatres.
- (viii) The Radiology Department must be capable to doing routine – X-rays and other sophisticated investigations (CT, MRI, contrast studies, Ultrasound, Doppler) which may be required by existing specialties and such facilities should extend to theatre and ICU.
- (ix) There must be a good library with current anaesthesia journals and books in anaesthesia and related subjects. Internet connectivity and subscription to data bases should be available.
- (x) Other departments viz: Medicine, Paediatrics, Surgery, Obstetrics & Gynaecology and Psychiatry must be suitably well developed to give the residents in training some experience in these disciplines.
- (xi) There must be a suitable number of Anaesthetic and Monitoring equipment in all areas of Anaesthetic service. In addition to service equipment, there should also be equipment and simulation devices for teaching and research including teaching aids, models, audio-tapes, computers, CD Rom, etc.

ii) Additional Specific Accreditation Requirements for Intensive Care Medicine.

Basic Requirement

The institution must have current Full accreditation for post-graduate training in Anaesthesia.

Qualified personnel

The institution must have at least 2 consultants in the specialty of Intensive Care Medicine, one of whom must be a Fellow of NPMCN.

Trainers/ Trainees ratio

A ratio of not more than 1:2 is ideal. The Consultant Intensive Care Physician must have the Fellowship of the NPMCN or any other sister post graduate College.

Opportunities for learning / skill acquisition

The institution must be able to provide ample opportunity for training and acquisition of skills in Intensive Care Medicine. This should be shown in records of a minimum of 500 cases managed yearly.

Details of additional specific requirements for accreditation in Intensive Care Medicine are indicated below.

a) Information on ICM Support:

1. Number of qualified Intensivists
2. Number of qualified Cardiologists (adult & paediatric)
3. Number of qualified Pulmonologists (adult & paediatric)
4. Number of qualified Neurologists (adult and Paediatric)
5. Number of qualified Neurosurgeons
6. Number of qualified Infectious disease experts
7. Number of qualified Microbiologists
8. Number of Nephrologists
9. Number of admissions to ICU in the last 12 calendar months

b) Facilities/Personnel in ICU

1. ICU ventilators per bed and make.
2. Monitoring facilities: ECG. NIBP. IBP. Pulse oximetry. Capnography. Blood gas analyzer
3. Side Laboratory
4. Infusion pumps (Total no)
5. Syringe drivers (Total no.)
6. Invasive catheters available-(arterial catheters, central venous catheters etc)
7. Mobile X-ray-available
8. Fibreoptic broncho-/laryngoscope
9. USS-available

10. 12-lead ECG-available
11. Echocardiography-available
12. Defibrillator (Total no.)
13. Transport Ventilator
14. Round-the clock Biochemistry
15. Round the clock X-Ray service
16. Microbiology back-up
17. Renal replacement backup
18. Physiotherapy-Number
19. Trained ICU Nurses-Number
20. Nurse- patient ratio
21. HDU- available

c) Facilities in Radiology

1. Angiography
2. CT Scan
3. MRI
4. Dedicated anaesthesia machine
5. Source and equipment for O₂ delivery
6. Monitoring facilities: ECG. SPO₂. NIBP/IBP. Capnography.
7. Infusion pump/Syringe
8. MRI-Compatible anaesthesia machine/monitor

d) Other supporting services

Laboratories (Microbiology, Chem Pathology, Haematology + Blood Bank)
Physiotherapy

e) Staff in Intensive Care Medicine

1. Number of dedicated Intensivist
2. Number of other Consultant Anaesthetists doing Intensive Care Medicine

3. Number of Senior Residents
4. Number of Junior Residents
5. Number of Residents per ICU (day)
6. Number of Residents per ICU (night)
7. Consultant coverage for ICU available
8. Number of Residents on Call
9. Number of Consultants on emergency call

f) Teaching programmes

1. Number of seminars per week
2. Number of journal clubs per week
3. Number of case presentations per week (A minimum of three hours of class-room teaching is mandatory per week in addition to bed-side discussions)

g) Library

1. Books on ICM (< 10-year-old editions)
2. Specific books of ICM
3. Journals pertaining to ICM- local and international
4. Internet access for the programme
5. Online material (books, journals subscribed for by the institution).

h) Seminar Room

1. Sitting capacity,
2. Computers/laptops
3. LCD projector / OHP