

NATIONAL POSTGRADUATE MEDICAL COLLEGE OF NIGERIA



POST-FELLOWSHIP IN NEUROANAESTHESIA 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 SUBSPECIALIZATION IN NEUROANAESTHESIA
CURRICULUM FOR POST-FELLOWSHIP SUBSPECIALISATION IN NEUROANAESTHESIA

Post-Fellowship. Post-Fellowship Diploma in Neuroanaesthesia.

A. INTRODUCTION

The programme is designed for candidates who wish to deepen their academic and clinical knowledge in anaesthesia and neuroanaesthesia, and, increase their capacity for higher responsibilities and leadership positions in the field.

B. PROGRAMME PHYLOSOPHY

The course shall be designed to train Post Part 1 in Anaesthesia Residents Post Fellowship in Anaesthesia who desire to specialize and function as Neuroanaesthetists in the Principles and Practice of Neuroanaesthesia. The training program shall enable the candidates to function as Consultants Neuroanaesthetists. The training will include anaesthetic management of patients with neurological disorders presenting for Neurosurgical procedures /Neuroradiological intervention and /or admitted into the Neurosurgical / General ICU.

C. AIM AND OBJECTVES OF THE PROGRAMME

At the end of the course, the candidate shall be able to:

- i. Understand physiological and pathological basis of central nervous system disorders.
- ii. Understand the theoretical basis of Neurological and other organ dysfunction
- iii. Develop Knowledge and skills in the Anaesthetic management of Neurosurgical patients
- iv. Develop the knowledge and skills in the Anaesthetic management of patients for Neuro radiological intervention
- v. Managing patients in the Neurosurgical ICU
- vi. Critically evaluate published Literature
- vii. Learn to practice evidence-based anaesthetic management of neurosurgical patients
- viii. Develop skills of communication with other team members as well as patient relatives
- ix. Apply the highest ethical standards in the practice of medicine

D. ENTRY REQUIREMENTS/ELIGIBILITY

Fellowship of the Faculties of Anaesthesia of the National Postgraduate Medical College of Nigeria or its equivalent.

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

F. DOMAIN OF THE PROGRAMME

The Neuroanaesthesia Programme will be domiciled in institutions that are accredited by the National Postgraduate Medical College of Nigeria on recommendation by the Faculty of Anaesthesia

G. OVERVIEW OF TRAINING PROGRAM INCLUDING EXTERNAL POSTING IF REQUIRED

Rotation schedule

i) Clinical neuroanaesthesia 9 months

ii) Neuroscience/Neurology posting 1 month

iii) Neurocritical care 2 months

iv) Mandatory Update courses /workshops – Update Course in related fields of neurology, neurosurgery and critical care

NB; It will be desirable for each trainee to spend at least 3 months out of the 9 months of clinical neuroanaesthesia posting in a developed/developing country where advanced neurosurgical procedures such as deep brain stimulation, epilepsy surgery, neurophysiological monitoring, neuro radiological intervention are available.

H. DETAILED CURRICULUM OF TRAINING

i) Knowledge of both medical and surgical diseases specific to the specialty, their management and anaesthetic implications

ii) Specific Core clinical skills /competences with the minimum number of cases required to be recorded in the logbook and assessed

iii) Teaching and Training /Academic and Research

I. CLINICAL NEUROANAESTHESIA

The rotation in clinical neuroanesthesiology consists of direct care of both adult and paediatric patients presenting for neurosurgical procedures in the operating rooms and radiology suites. This includes Cranial and Spine procedures, as well as procedures that require the use of various neurophysiologic monitoring modalities.

J. NEUROCRITICAL CARE

Candidates shall spend at least two months of their training in the Neurology/Neurosurgery intensive care Unit working as part of a multidisciplinary team to care for critically ill patients with neurological diseases or neurosurgical patients. The Trainee shall be responsible for: placement, interpretation, and management of invasive lines and haemodynamic management, airway and ventilator management, monitoring and management of intracranial pressure and other monitors of neurological well-being. In addition, they are expected to be involved in the management of issues arising from neurological pathophysiology such as intracranial hypertension, cerebral vasospasm, and systemic complications of brain injury, as well as other common problems encountered in critically ill patients such as sepsis, shock, and multi-organ system failure.

K. NEUROLOGY POSTING

Candidate shall spend one month in Neurology posting under the supervision of a Consultant Neurologist to update and advance his knowledge on neurological disease and current best practice.

L. LIST OF COURSES AND DETAILED COURSE DESCRIPTION

COURSE CODE	COURSE TITLE	DURATION (weeks)	LECTURES (hours)	PRACTIALS (hours)	CREDIT UNITS
ANE 942.1	Anatomy in relation to Neuroanaesthesia	4	45	45	4
ANE 942.2	Physiology in relation to Neuroanaesthesia	4	45	45	4
ANE 942.3	Pathophysiology of the Central Nervous System	4	45	45	4
ANE 942.4	Pharmacology in Relation to Neuroanaesthesia	4	45	45	4
ANE 942.5	Measurements and Equipment in Neuroanaesthesia	10	45	180	6
ANE 942.6	Anaesthetic Management of Neurosurgical Patients	16	45	180	6
ANE 942.7	Perioperative Care of Neurosurgical Patients	16	45	180	6
ANE 942.8	Critical Care of Neurosurgical patients	14	45	1800	6
	TOTAL	72			40

ANE 942.1. Anatomy in Relation to Neuroanaesthesia.

4 Credit Units

Structures of the central nervous system- cerebrum, cerebellum, meninges, pituitary gland. Brain stem (pons and medulla oblongata). Cranial nerves. Ventricles. Cerebrospinal fluids. Spinal cord. The Vertebrae. Blood supply to the brain and spinal cord. Circle of Willis. Nerve supply.

ANE 942.2. Physiology in Relation to Neuroanaesthesia

4 Credit Units

Physiology of central nervous system. Cerebral blood flow. Cerebral perfusion pressure. Cerebrospinal fluid dynamics. Cerebral metabolic rate (CMRO₂). Intracranial pressure. Electrophysiology of the central nervous system.

ANE 942.3. Pathophysiology of The Central Nervous System:

4 Credit Unit

Pathophysiology of cerebral ischemia/traumatic brain injury. Pathophysiology of brain tumours (meningiomas, astrocytoma, pituitary gland tumours, cerebellar tumours), Cervical spine abnormalities.

ANE 942.4. Pharmacology in Relation to Neuroanaesthesia**4 Credit Units**

Pharmacology of anaesthetic/adjuvant drugs and emergency drugs- intravenous anaesthetic agents, inhalational anaesthetic agents, neuromuscular blocking agents, analgesic agents (opioids and non-opioids). Effects of drugs on intracranial pressure. Osmotic diuretics. Steroids used in reducing brain tumour size and complications of prolonged therapy. Neuro-microbiology as applicable to operating rooms and critical care units, neuro-infections.

ANE 942.5. Measurements and Equipment in Neuroanaesthesia**6 Credit Units**

Fundamental of Biomedical Engineering: EEG. Evoked potentials. Basics of instrumentation, biological signal processing. Measurement of intracranial pressure. Cervical collars.

ANE 942.6 Anaesthetic Management of Neurosurgical Patients:**6 Credit Units**

Brain tumour, neuro vascular surgery e.g. aneurysm surgery, hydrocephalus, spinal surgery, subdural and epidural haematoma drainage, surgery for epilepsy, awake craniotomy, neuroendoscopy, traumatic brain injury, pituitary surgery, myelomeningocele and other minor neurosurgical lesions, deep brain stimulation and other functional surgeries.

ANE 942.7. Perioperative Care of Neurosurgical Patients:**6 Credit Units**

Cerebral protection. Intraoperative and postoperative neuromonitoring and imaging techniques. Neuro-interventional procedures. Airway related issues in neuroanaesthesia. Cardiovascular and respiratory monitoring. Neurologic monitoring (EEG, Evoked potentials, TCD, JIRS, SjVO₂, PbtO₂, cranial nerve). Renal system monitoring. Coagulation monitoring.

ANE 942.8 Critical Care of the Neurosurgical patients:**6 Credit Units**

Neurosurgery and post-operative care. Principles of ventilatory management. Respiratory infections; community and hospital acquired infections. Principles of management of cardiac and haemodynamic disturbances. Cardiopulmonary resuscitation. Brain death- diagnosis and management. Cerebral protection. Coma, causes and management. Management of Status epilepticus. Management of severe traumatic brain injury. Management of subarachnoid haemorrhage. Management of intracranial hypertension. Cerebrospinal Fluid Aspiration/EVD. Neuro-interventional procedures Cerebrovascular accidents and cerebral vasospasm. Management of meningo-encephalitis. Acute neuromuscular disease (including myasthenia & Guillain-Barre Syndrome). Post anoxic brain damage. Acute confusional states. Spinal cord injury.

M. SKILLS AND COMPETENCIES**At the end of the programme, the trainee will be able to:**

- i. Demonstrate proficiency in pre- anaesthetic evaluation for elective and emergency neurosurgery.

- ii. Understand the conceptual and practical aspects of administering anaesthesia for a basic craniotomy
- iii. Demonstrate proficiency in perioperative management of various neurosurgical and neuro-radiology intervention conditions
- iv. Demonstrate ability to manage patients undergoing transsphenoidal pituitary surgery for pituitary tumours and also understand the intraoperative concerns.
 - v. Understand common postoperative complications after craniotomy and management
 - vi. Understand the principles of intraoperative neuromonitoring for spine surgery.
- vii. Demonstrate proficiency in the intraoperative management of patients undergoing spine surgery including airway management, analgesia, blood conservation strategies and positioning concerns
- viii. Demonstrate proficiency in acute and intensive care management of patients with traumatic brain injury including intracranial pressure monitoring
- ix. Understand the presentation and pathophysiology of acute and chronic spinal cord injury concerns for anaesthetic management
- x. Demonstrate ability for management of patients scheduled for awake craniotomy, DBS and epilepsy surgeries.

NON-TECHNICAL SKILLS

The trainee should also be able to:

- i. Order and prioritize appropriate investigations
- ii. Understand the principles of informed consent
- iii. Demonstrate the principles of crisis management, conflict resolution, negotiation and debriefing
- iv. Understand nonverbal communication with critically ill neurological patients
- v. Understand the principles of delivering bad news to patients and families

N. PROCEDURES, TECHNIQUES, AND MINIMALLY INVASIVE MONITORING

- i. Advanced Airway Management techniques
- ii. Central Venous Catheterization
- iii. Arterial Line Placement and Care
- iv. Cardio version and Defibrillation
- v. Chest Tube Insertion and Care
- vi. Minimally Invasive Hemodynamic Monitoring
- vii. Neurologic Multimodal Monitoring
- viii. Mechanical ventilation in neurological patients
- ix. Haemodynamic management in a neuro-ICU patient including ACLS,
- x. Fluid & electrolyte management in neuro – ICU patient

- xi. ICP monitoring
- xii. Basic interpretation of EEG, Evoked potential
- xiii. Management of blood gases and acid - base status
- xiv. Infection control in a neuro – ICU
- xv. Bedside echocardiography
- xvi. Ultrasonic diagnostic: Intravascular volume status assessment, assessment of contractility. Vascular: deep vein thrombosis, placement of IV cannula, CVP lines and arterial cannulations

O. DETAILED CURRICULUM OF TRAINING

- i) Knowledge of both medical and surgical diseases specific to the specialty, their management and anaesthetic implications
- ii) Specific Core clinical skills /competences with the minimum number of cases required to be recorded in the logbook and assessed. Log book containing 250 cases as follows:
 - 120 Cranial surgeries
 - 100 spinal surgeries
 - 15 Neurology cases
 - 15 non-surgical neurocritical care cases.

P. ASSESSMENT

a) Formative assessment

- Knowledge and skills
- Non-Technical Skills -Cognitive, Social and personal (Effective communication, Team working, Leadership, Decision making, Situation awareness and stress management)

b) Summative Assessment

Post-Fellowship Programme 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. Neuroanaesthesia- Applied Basic Sciences (20), Medicine (15), Surgery (15) and Paediatrics (15) as applicable to the specialty, Principles and Practice of Neuroanaesthesia (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%

Q. 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.

R. 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 neuroanaesthesia 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.

Additional Specific Requirements for Neuroanaesthesia:

The number of beds in the hospital as well as the total volume of work and the number of consultants will determine the maximum number of postgraduate trainees which can be handled by the department at any one time. *The institution must have full accreditation in anaesthesia.* At least two consultants in the field of neuroanaesthesia, one of whom must be a Fellow of the College are required for accreditation. The object of the training is to ensure that each resident does a minimum of 250 neurosurgical cases as specified in this curriculum. Details of additional specific requirements for accreditation in neuroanaesthesia are indicated below.

a) Information on Neurosciences:

1. Neurology Unit
2. Number of qualified neurologists
3. Number of qualified neurosurgeons
4. Number of dedicated neurosurgical operation theatres
5. Number of tables for neurosurgical cases /week
6. Number of Neurosurgical operations / year (average over the last two years). Provide list of operations carried out in the last 12 calendar months
7. Number of Elective surgeries (last 12 months)
8. Number of Emergency surgeries (last 12 months)
9. Dedicated Neuro-ICU if available (NICU)
10. Number of admissions to Neuro-ICU in the last 12 calendar months
11. Separate Neuroradiology Department if available
12. Number of neuroradiological investigations carried out under anaesthesia in the last 12 calendar months

b) Facilities in the Neuro-operation theatres

1. Anaesthesia machines (No. & make /OT)
2. Monitors- ECG. NIBP. IBP. Pulse oximetry. Capnography. BIS. Neuromuscular transmission monitor.
3. Adjustable OT tables
4. Infusion pumps
5. Infusion syringes
6. Fibreoptic broncho-/laryngoscope
7. LMA's
8. Any other airway devices
9. Intraoperative EEG for seizure surgery
10. Evoked potentials

c) Facilities in Neuro ICU (NICU)

1. ICU ventilators per bed and make
2. Monitoring facilities: ECG. NIBP. IBP. Pulse oximetry. Capnography. ICP. EEG. Blood gas analyzer
3. Infusion pumps (Total no)
4. Infusion syringes (Total no.)
5. Bed-side x-ray
6. Bronchoscope
7. Transport ventilator
8. Round-the clock Biochemistry
9. Round the clock x Ray service
10. Microbiology back-up

d) Facilities in Neuroradiology

1. Angiography
2. CT Scan
3. MRI
4. Dedicated anaesthesia machine
5. Monitoring facilities: ECG. SPO2. NIBP/IBP. Capnography.
6. Infusion pump/Syringe
7. MRI-Compatible anaesthesiamachine/monitor

e) Staff of Neuroanaesthesia

1. Number of dedicated Neuroanaesthetists
2. Number of other Consultant Anaesthetists doing Neuroanaesthesia
3. Number of Senior Residents
4. Number of Junior Residents
5. Number of Anaesthesia Technicians
6. Number of Residents per ICU (day)
7. Number of Residents per ICU (night)
8. Consultant coverage for ICU available
9. Number of Residents on Call
10. Number of Consultants for emergency

f) Proposed 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 anaesthesia (< 10-year-old editions)
2. Journals of anaesthesia- local and international
3. Journals pertaining to Neuroanaesthesia
4. Internet access for the programme
5. On-line material (books, journals subscribed for by the institution).

h) Seminar Room

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

DETAILS OF SURGICAL OPERATIONS IN EIGHTEEN MONTHS

Type of operation	Total no. of cases (in 18 months)
Elective	
Supratentorial tumours	20
Infratentorial tumours	10
Cerebral aneurysms	5
Other vascular lesions	5
Pituitary	10
Cervical Spinal lesions	20
Other Spinal lesions	10
Shunts	20
Neuro-endoscopy	20
Surgery on bony lesions / skull base lesions	10
Peripheral nerve surgery	10
Any other surgery	
Emergency	
Head injury	30
Other emergency (List below)	
Anaesthesia for awake craniotomy	10
Anaesthesia for neuroradiology	30
Neurology Cases	15
Non-neurosurgical neuro-critical cases	15

DETAILS OF NEURO-ICU PATIENTS IN EIGHTEEN MONTHS

Diagnosis	Total no. of cases (in 18 months)
Postoperative observation only (no invasive interventions)	35
Neuro-medical patients for observation only)	20
Patients requiring ICU interventions	35
Patients requiring invasive monitoring (IBP, ICP)	30
No. of patients requiring mechanical Ventilation	30
TOTAL	150