Curriculum for Post-Doctoral Certificate Course (PDCC) in Neuroanesthesia

Department of Anesthesiology
&
Critical Care
All India Institute of Medical Sciences
Nagpur

CURRICULUM FOR POST-DOCTORAL CERTIFICATE COURSE (PDCC) IN NEUROANAESTHESIA (1 Year Course)

AT

AIIMS NAGPUR

1. Goal:

The PDCC (Post-Doctoral Certificate Course) Neuroanesthesia fellowship is a one-year course for anesthesiologists to develop skills in the field of neurosciences, including cranio-spinal surgery, neuro-vascular, and interventional neuroradiological procedures. It would facilitate the development of knowledge, attitude, and skills necessary to provide advanced peri-operative care for neurosurgical patients, ensuring comprehensive knowledge of neurological diseases, effective patient care, and professional standards.

2. Program Outcomes:

Program outcomes - By the end of the course, the student should have acquired knowledge (cognitive domain), professionalism (affective domain), and skills (psychomotor domain) as per the details given below:

1. Cognitive Domain	
Sr no.	Competencies
1.1	General principles related to neuroanaesthesia
1.2	Basic Neuroanatomy and Neurophysiology
1.3	Respiratory physiology
1.4	Cardiovascular physiology
1.5	Renal physiology
1.6	Metabolic disorders
1.7	Neurologic diseases
1.8	Neurosurgical Conditions
1.9	Neuro infections
1.10	Peripheral Motor Neuron Disease
1.11	Traumatic Brain Injury
1.12	Neuro-Pharmacology
1.13	Brain Death
1.14	Stroke
1.15	Subarachnoid Hemorrhage
1.16	Toxicity of anesthetic agents on the developing brain
1.17	Monitoring in neuro-critical care
1.18	Neuroimaging
1.19	Neuro-rehabilitation
1.20	Chronic neurological diseases
1.21	Temperature regulation

1.22	Anesthesia in pediatric neurosurgery
1.23	Anesthesia for functional neurosurgery

2. Psychomotor domain	
S.No.	Competencies
2.1	**Operation Theatre**
2.1.1	Participate in the development and execution of anesthesia plans tailored to neurosurgical patients, considering complex hemodynamic interactions and potential risks.
2.1.2	Demonstrate proficiency in identifying and evaluating neurosurgical patients with difficult airways, employing appropriate techniques and devices for successful airway management.
2.1.3	Appropriately adjust anesthesia administration techniques to accommodate differences in drug volume of distribution, MAC (Minimum Alveolar Concentration), protein binding, metabolism, and excretion in neurosurgical patients of varying ages and conditions.
2.1.4	Develop anesthesia plans that address the unique physiological considerations and potential complications associated with neurosurgical procedures.
2.1.5	Skillfully obtain informed consent from parents and assent from appropriately aged pediatric neurosurgical patients, ensuring understanding and cooperation in anesthesia procedures.
2.1.6	Safely administer premedication to neurosurgical patients, considering age-appropriate dosages and effects, to alleviate anxiety and facilitate smooth induction of anesthesia.
2.1.7	Execute various induction techniques confidently and effectively across various age groups of neurosurgical patients, ensuring safe and smooth transitions to anesthesia.
2.1.8	Skillfully monitor patient temperature and implement appropriate warming methods in neurosurgical patients undergoing anesthesia to maintain normothermia.
2.1.9	Appropriately select and administer fluids tailored to the age and physiological status of neurosurgical patients undergoing anesthesia, maintaining optimal hydration and electrolyte balance. To learn to use fluid administration through infusion pumps.
2.1.10	Demonstrate proficiency in securing both peripheral and central venous access as indicated for neurosurgical patients undergoing anesthesia, ensuring safe medication administration and fluid management.
2.1.11	Calculate allowable blood loss and estimate actual blood loss accurately for neurosurgical patients, ensuring timely intervention and appropriate management with hemodynamic monitoring.

2.1.12	Execute effective mask ventilation, laryngeal mask airway (LMA) placement, and endotracheal intubation techniques in neurosurgical patients of all ages ensuring optimal airway management during anesthesia.
2.1.13	Skillfully manage upper airway obstruction, laryngospasm, and bronchospasm in neurosurgical patients, employing prompt and effective interventions to maintain airway patency and oxygenation.
2.1.14	Demonstrate proficiency in performing commonly used regional analgesic techniques in neurosurgical patients, providing effective pain relief while minimizing systemic side effects.
2.1.15	Acquire proficiency in advanced procedures such as fiberoptic intubation, cricothyroidotomy, awake intubations and fluid resuscitation specific to neurosurgical anesthesia.
2.1.16	Assess and choose appropriate airway management techniques—endotracheal intubation, laryngeal mask airway (LMA), or facemask ventilation—for neurosurgical procedures based on patient-specific factors and surgical requirements.
2.1.17	Develop proficiency in recognizing and managing intraoperative physiological disturbances—hypoxemia, hypocarbia, hypercarbia, hypotension, hypertension, and increased intracranial pressure (ICP)—in patients undergoing neurosurgical anesthesia.
2.1.18	Demonstrate proficiency in achieving effective pain relief postoperatively in neurosurgical patients.
2.1.19	Formulate comprehensive plans for managing and treating postoperative pain in neurosurgical patients across all age groups, utilizing multimodal analgesic strategies and ensuring patient comfort and recovery.
2.1.20	Learn to use and manage patient-controlled analgesia (PCA) pumps for neurosurgical patients, optimizing pain management while minimizing opioid-related side effects.
2.1.21	Develop strategies for treating refractory postoperative pain in neurosurgical patients, employing advanced analgesic techniques and multidisciplinary approaches as needed
2.1.22	Evaluate and manage common complications associated with analgesic therapy in neurosurgical patients, including nausea, vomiting, pruritus, and ventilatory depression, ensuring timely intervention and resolution.
2.1.23	Gain foundational knowledge in the principles and applications of neuromonitoring (EEG, Evoked potentials, TCD, NIRS, SjVo2) relevant to neurosurgical anesthesia practice, aiding in perioperative assessment and management.
2.1.24	Gain proficiency in managing mechanical ventilation and intensive care unit (ICU) care of neurosurgical patients.
2.1.25	Lead resuscitation efforts using ACLS guidelines for neurosurgical patients in cardiac arrest or experiencing life-threatening hemodynamic disturbances or arrhythmias during anesthesia.
2.1.26	Management of blood gases and acid - base status

2.2	**Interventional Neuro Radiology:** Fellows will be given exposure to plan Anesthesia for:
2.2.1	Diagnostic cerebral angiogram
2.2.2	Carotid stent insertion
2.2.3	Embolization of cerebral aneurysm & Intra-arterial nimodipine infusion
2.2.4	Embolization of arterio-venous malformation
2.2.5	Embolization of Vein of Galen malformation.
2.2.6	Embolization of carotico-cavernous fistula.
2.2.7	Management of ischemic stroke for clot lysis or clot retrieval (Mechanical thrombectomy)
2.2.8	Prevention and management of anaphylactic reactions to radiologic contrast media.
2.3	**ICU** The fellow will learn:
2.3.1	To recognize complications arising in neurosurgical patients
2.3.2	To manage intravenous sedation for patients on mechanical ventilation
2.3.3	To manage emergency neurosurgical and neurotrauma procedures.
2.3.4	Use of fluids, vasoactive drugs and management of electrolyte disorders in ICU.
2.3.5	Insertion of central venous lines and arterial line with and without ultrasound guide.
2.3.6	To manage patients of subarachnoid hemorrhage.
2.3.7	Learn prevention and management of deep vein thrombosis
2.3.8	Management of acute stroke patients in ICU
2.3.9	Management of other critically sick neurological patients like status epilepticus,encephalitis, meningitis, multiple sclerosis etc.
2.3.10	Bronchoscopy in patient with diseased lungs and for collection of samples

	for microbiology and culture.
2.3.11	Percutaneous dilatational tracheostomy
2.3.12	Management of difficult airway and specialized equipments
2.3.13	Learn to manage nutritional requirements in ICU
2.3.14	Methodology of plasmapheresis in Myasthenia gravis and Guillain Barre Syndrome patients.
2.4	**Preanesthetic Clinic**
2.4.1	Preanesthetic evaluation of patients for elective neurosurgical procedures.
2.4.2	The preoperative lab investigations needed and any special test required.
2.4.3	Execute comprehensive history taking and clinical examination in all neurosurgical patients posted for all types of surgeries, nonoperating room anesthesia.
2.4.4	Demonstrate proficiency in identifying and evaluating neurosurgical patients with difficult airways.
2.4.5	Learn consent taking for perioperative elective & emergency neurosurgical patients

3. Affective Domain	
S.No.	Competencies
3.1	Demonstrate respect, compassion, and integrity towards neurosurgical patients and their families, while being responsive to their needs and societal expectations, and maintaining an unwavering commitment to excellence in neuroanesthesia & neurocritical care.
3.2	Adopt ethical principles in all aspects of neuroanesthesia & neurcritical practice/research. Professional honesty and integrity, humility, informed consent, counselling and recognize patients' rights and privileges.
3.3	Demonstrate proficient communication skills in exchanging information and collaborating effectively with patients and their families from diverse socioeconomic and religious backgrounds, as well as with colleagues and other healthcare professionals.
3.4	Effectively work with other members of the health care team, including referring physicians from other specialties, nurses, and technicians, and to implement a treatment plan.
3.3	Maintain meticulous and timely medical documentation, ensuring clarity, accuracy, and completeness to support continuity of care and facilitate interdisciplinary communication.
3.4	Recognize and address patient and family conflicts promptly, seeking appropriate assistance when necessary to ensure patient-centered care and resolution of ethical dilemmas.
3.5	Exhibit the ability to communicate effectively during crisis or interpersonal conflicts within the operative team, fostering a supportive environment and ensuring safe patient care through clear and decisive communication.
3.6	Demonstrate effective collaboration in the care of neurological, medical and neurosurgical patients, contributing expertise to interdisciplinary teams to optimize patient outcomes and care delivery.
3.7	Effectively teach undergraduate medical students, junior post-graduates, nurses and technician.
3.8	Lead or participate in team-based discussions or conferences focused on neurosurgical anesthesia and patient care, including preparation through knowledge update and active engagement in patient rounds to enhance clinical decision-making and outcomes.
3.9	Communicate efficiently and comprehensively when handing over patient care responsibilities to another healthcare team, ensuring continuity of care and patient safety through accurate information transfer.
3.9.1	Demonstrate the ability to critically analyze and learn from medical errors or critical incidents, fostering a culture of continuous improvement and patient safety within the neuroanesthesia practice.

3.9.1	Adhere to ethical standards and maintain professionalism while using social media platform for teaching, learning, and communicating.

DURATION OF THE PROGRAM:

12 Months

ELIGIBILITY CRITERIA:

1. Post MD/DNB in Anesthesiology from an institute/ university recognized by MCI/NMC or equivalent degree.
2. 1-year experience of Senior Residency post-MD/DNB in an institute/university recognized by MCI/NMC.

FEE: As per institutional policy

SELECTION METHOD:

- 25 Marks MCQ Test based on neuroanesthesia.
- 25 MCQs of 1 mark each
- No Negative Marking
- Merit list will be displayed for eligibility

SYLLABUS:

Basic sciences	• Neuroanatomy Gross and applied anatomy of the brain, spinal cord, peripheral and autonomic nervous system • Neurophysiology

	Applied physiology of the brain and spinal cord, CSF circulation, CPP, cerebral autoregulation, ICP, brain protection • Neuropharmacology Basic pharmacodynamics, pharmacokinetics of various drugs used in neurosurgical patients • Neuropathology and neuromicrobiology
Clinical science	• Anesthetic management of various neurosurgical cases- brain tumors, neurovascular lesions, spinal cord pathologies, TBI, stroke, endovascular neurosurgery, pediatric neurosurgery, etc • Intraoperative positioning • Perioperative basic and advanced monitoring- EEG (Electroencephalogram), Depth of anesthesia monitoring evoked potential, TCD (Transcranial doppler), NIRS (Near Infrared Spectroscopy), USG (Ultrasonography), TTE (Transthoracic Echocardiography), POCUS (Point Of Care USG), ONSD (Optic Nerve Sheath Diameter), cardiac output monitoring, etc • Emergency neurological conditions and their management techniques- TBI (Traumatic Brain Injury), spinal cord injury, Stroke, SAH (subarachnoid hemorrhage) • Neuroimaging • Neurorehabilitation • Understanding and management of specific neurological conditions- status epilepticus, Guillian-Barre syndrome, myasthenia gravis, stroke, meningitis • Principles of neurointensive care • Brain death
General principles of neuroanesthesia and neurocritical care	• Principles of consent taking • Communication skills • Infection control

	• Responsibilities in neurosurgery OT and ICU • Medical ethics • Biomedical waste management • Behaviour and team work
Research	• Basic biostatistics and research methodology

TEACHING & LEARNING ACTIVITIES:

Training includes:

Sr No	**Teaching/Learning Activity**	**Frequency**
1.	Clinical Case presentation	Once a fortnight
2.	Clinical grand rounds	Once a fortnight
3.	Operative procedure perioperative planning and discussion	Before every case
4.	Journal Club	Once a fortnight
5.	Seminars/Webinars	Once a fortnight
6.	Neurosurgery / Neurology meet	Once a fortnight
7.	Mortality and Morbidity meets – Dept Audit	Once a month
8.	Research review	Once

Teaching of Anaesthesiology Post Graduate students by the PDCC student will be part of the training.

TENTATIVE SCHEDULE FOR TRAINING:

Sl. No.	Speciality	Duration
1.	**Neurosurgery OT**	**09 months (+15 days*)**
2.	**Surgical ICU /Neurosurgical ICU / Trauma ICU**	**1 month**
3.	**NORA (Non-Operating Room Anesthesia)**	**1 month**
4.	**Neurology**	**07 days**
5.	**Neuroradiology**	**07 days**

*** Observership at AIIMS New Delhi (OPTIONAL) – 15 days**

RESEARCH PROJECT

- The candidate can conduct a clinical study during the training period.

SIX MONTHLY PROGRESS REPORTS:

- Six monthly progress reports will be submitted to the academic section in the prescribed format and signed by the head of the department.

ATTENDANCE:

Every Candidate should have an attendance of at least 80% in clinical work and of the total number of classes conducted in a calendar year from the date of commencement of the term to the last working day as notified by the Institution. A candidate lacking a prescribed percentage of attendance will not be eligible to appear for the final examination.

ASSESSMENT METHODS:

The formative & Summative Examination Pattern is as follows:

(i) Formative Examination: -

• One month prior to summative exam and pattern is as summative exam.

(ii) Summative Examination: -

• Paper of 50 Marks

• MCQs: 20 x 1=20 Marks

• Short Notes: 4 x 5 Marks =20 Marks

• LAQ: 1 x 10 Marks=10 Marks

• Practical of 50 Marks

Topic	Details	Marks
Clinical cases	**Case 1**	**15 Marks**
	Case 2	**15 Marks**
Table viva-voce		**20 Marks**
	Instruments & Drugs	**5**
	Radiology (CT/MRI/DSA)	**5**
	Neuromonitoring	**5**
	ABG & POCUS	**5**

	Total	**50 Marks**

ELIGIBILITY TO APPEAR FOR SUMMATIVE EXAM: -

• 40% Marks in formative exam separately in Theory & Practical

• 75% Attendance

6. For certification the Qualifying marks will be 50% Marks Separately in Theory & Practicals in the Summative exam.

7. Repeat Summative Exam in 45 Days after results.

CONTRIBUTING DEPARTMENTS

Department of Anesthesiology & Critical Care, AIIMS Nagpur

Department of Neurosurgery, AIIMS Nagpur

Department of Neurology, AIIMS Nagpur

Department of Radiology, AIIMS Nagpur

LOGBOOK

Every candidate shall maintain a logbook/work diary and record his/her participation in the training programs conducted by the department such as journal reviews, seminars, etc. The logbook shall be scrutinized and certified by the respective guides and the Head of the Department and Head of the Institution and presented during practical/clinical examination.

Observership (Optional):

The student may undertake a one-month external posting at an institute of their choice [any one from among the following institutes (1) Department of Neuroanesthesiology and Critical Care, AIIMS, New Delhi, (2) Department of Anesthesiology and Critical Care, PGIMER, Chandigarh, (3) Department of Neuroanesthesiology and Neurocritical Care, NIMHANS, Bangalore (4) Department of Neuroanesthesiology and Critical Care, SCTIMST, Thiruvananthapuram, (5) Department of Neuroanesthesiology and Critical Care, JIPMER, Pondicherry, subject to approval from the completed authority. No TA/DA will be provided. Submission of an attendance certificate and posting completion certificate is mandatory. The accommodation at these institutes will be provided by the Institute (subject to availability) and no traveling allowance (TA) or dearness allowance (DA) will be given to the candidate.

PASSING CRITERIA:

To pass the examination the candidate must secure 50% marks in each head of theory and practical separately.

AWARD OF FELLOWSHIP:

Candidates who fulfill the requirements mentioned above shall be eligible for the fellowship.

RECOMMENDED LEARNING RESOURCES

Recommended Textbooks:

1. Miller's textbook of Anaesthesia
2. Cotterel and Patel "Neuroanesthesia"
3. Cotterel and Young "handbook of Neuroanesthesia"
4. Dorsch and Dorsch "Understanding anesthesia equipment"

5. Greenberg's "Handbook of Neurosurgery"
6. Torbey's "Neurocritical care"
7. Ropper's "Neurointensive Care"
8. Jesse B Hall "Principles of Critical care"
9. Youman's "Neurosurgery"
10. Ever's "Anesthetic Pharmacology"
11. David Sidebottom's "Peri-operative transesophageal echocardiography"
12. Paul Brazis "Localization in neurological diseases"
13. Aage R Moller "Intra-operative Neurophysiological monitoring"
14. Peter Roux's "Monitoring in Neurocritical care"
15. Arun K Gupta's "Essentials in Neuroanaesthesia and Neurointensive care"
16. Aviva Petrie's "Medical statistics at a glance"

Recommended Journals:

1. Journal of neurosurgical anesthesiology (lippincot)
2. Journal of neuroanesthesia and critical care (Thieme)
3. Neurocritical care
4. Critical care medicine
5. Neurosurgery
6. Journal of Neurosurgery
7. Asian journal of Neurosurgery
8. Neurology India
9. Anesthesiology
10. Anesthesia-Analgesia
11. International Anesthesiology clinics
12. Best practices in Anesthesia

13. Anesthesia tutorial of the Week

14. British Journal of Anaesthesia

15. European Journal of Anaesthesia