

Competency Based Fellowship programme in Paediatric Anaesthesiology

- **GOALS:**

The goals of training candidates selected for the Paediatric Fellowship Programme is to facilitate the development of knowledge, attitude and skills necessary to provide advanced peri-operative care for paediatric patients.

- **PROGRAM OUTCOMES:**

.1 **COGNITIVE DOMAIN-**

- i. Physiology of the neonate, the premature and children.
- ii. Anatomic variations in neonates and children.
- iii. Pharmacology and variations in neonates and children
- iv. Difficult airway management and devices used.
- v. High risk children: Those on ventilators, those with heart diseases, severe asthma etc.
- vi. Neonatal and paediatric emergencies: NEC (necrotizing enterocolitis), Diaphragmatic hernia, trachea-oesophageal fistula, volvulus, torsion testis, appendicitis etc.
- vii. Bronchoscopy for foreign body.
- viii. Fluid management in neonates, children and high risk patients.
- ix. Local Anaesthetic Pharmacology as applied to children and neonates.
- x. Neuraxial & systemic opioids, NSAID's, and non-opioid adjuncts for analgesia in children and neonates.
- xi. Spinal, Epidural, Caudal and Combined spinal epidural (CSE) Anaesthesia for paediatric and neonatal usage.
- xii. Regional Anaesthesia for paediatric and neonatal usage.

xiii. Complications of anaesthesia and regional blocks in children:
Recognition & Treatment.

xiv. Point of care ultrasound in Anaesthesia for paediatric usage

.2 AFFECTIVE DOMAIN:

Attitudes including communication skills and professionalism-

1. Demonstrate effective exchange of information and collaboration with children and their families of difference socioeconomic and religious backgrounds, colleagues and other health professionals.
2. Maintain comprehensive and clear medical documentation in a timely manner
3. Recognize and identify patient and family conflicts and get assistance when appropriate and required
4. Communicate effectively in situations of crisis or difficult interpersonal conflicts in the operative team thereby ensuring safe patient care
5. Ability to work effectively with other team members as a consultant caring for paediatric medical and surgical patients
6. Ability to facilitate team based discussions or conferences related to paediatric patient care which includes updating knowledge prior to managing a complex case and active discussion on patient rounds
7. Effectively communicate when handing over patients to another team.
8. Consider cost of medications, devices and procedures when making a clinical decision
9. Have the ability to analyse a medical error or a critical incident

.3 PSYCHOMOTOR DOMAIN:

1. Appropriately administer anaesthesia to all age groups and account for differences in drug volume of distribution, MAC, protein binding, metabolism, and excretion.
2. Perform a preoperative evaluation and participate in an anaesthetic for a paediatric patient with congenital heart disease.

3. Perform a preoperative evaluation and present an anaesthetic plan for a paediatric patient with an upper respiratory tract infection (URI). Develop a decision process for proceeding with elective surgery in a child with an acute or recovering URI.
4. Identify and evaluate the child with a difficult airway.
5. Be able to evaluate and institute appropriate therapy for a child with respiratory failure.
6. Plan an anaesthetic for a child with a neuromuscular disease.
7. Develop a plan for the perioperative management of a child with sickle cell disease.
8. Develop a plan for the perioperative management of a child with a congenital bleeding disorder.
9. Describe a plan for the induction of anaesthesia in a paediatric patient with gastroesophageal reflux.
10. Plan an anaesthetic for the prematurely born child.
11. Using PALS, be able to preside over the resuscitation of a child in cardiac arrest, or with a life-threatening hemodynamic disturbance or arrhythmia.
12. Perform appropriate preoperative evaluation of neonates, infants and children.
13. Obtain informed consent from a parent and assent from an appropriately aged child.
14. Administer premedication to a child.
15. Perform inhalation inductions on paediatric patients of all ages.
16. Monitor patient temperature and perform warming methods on a neonates, infants and children.
17. Appropriately choose and administer fluids to paediatric patients of all ages.

18. Secure venous access, both peripheral and central in indicated patients.
19. Calculate allowable blood loss for children of all ages.
20. Demonstrate the ability to estimate blood loss in paediatric patients.
21. Perform mask ventilation, LMA placement and intubation on paediatric patients of all ages.
22. Appropriately manage upper airway obstruction, laryngospasm, and bronchospasm in paediatric patients.
23. Perform commonly used regional analgesic techniques in paediatric patients.
24. Learn procedures like cricothyroidotomy, fibreoptic intubation, venesections, umbilical artery catheterisation, fluid resuscitation.
25. Learn the basics of Echocardiography and Ultrasound.
26. Develop the ability to choose appropriately between endotracheal intubation, laryngeal mask airway, or facemask ventilation for any paediatric surgical procedures.
27. Conduct of Minimal access surgery (laparoscopy and thoracoscopy) in neonates, infants and children.
28. Conduct Monitored Anaesthesia care/ General anaesthesia for anesthesia for procedures outside the Operating room like MRI/ CT/ Endoscopy/ Cath Lab.
29. Lung isolation techniques in thoracic surgery and the devices available in the appropriate age group.
30. Develop the ability to appropriately manage intraoperative hypoxemia.

31. Develop the ability to appropriately manage intraoperative hypocarbia or hypercarbia.
 32. Develop the ability to appropriately manage intraoperative hypotension or hypertension.
 33. Develop the ability to appropriately manage intraoperative bradycardia or tachycardia.
 34. Develop the ability to appropriately manage intraoperative increased ICP.
 35. Demonstrate the ability to develop and carry out a plan to manage and treat postoperative pain in children across all age groups.
 36. Learn and perform epidural catheterisation in neonates and infants.
 37. Learn the use of Patient Controlled Analgesia pumps.
 38. Demonstrate the ability to treat refractory postoperative pain in children of all ages.
 39. Be able to evaluate and treat common complications of analgesic therapy in children (e.g., nausea, vomiting, pruritus, and ventilatory depression)
 40. Be able to evaluate and manage children with epidural analgesic therapy and breakthrough pain.
 41. . Management of paediatric mechanical ventilation and ICU care.
 42. Knowledge of newer ventilator strategies e.g. High frequency oscillatory ventilation, ECMO, use of Nitric oxide.
- **DURATION OF THE PROGRAM: 12 months**

- ELIGIBILITY: Anaesthesiologist with MD/DNB degree

- SYLLABUS:

1) Basic embryology and development including:

- i) Transition from intrauterine to extrauterine life
- ii) Neonatal physiology including transition from neonatal period to infancy
- iii) Physical and emotional developmental milestones

2) Anatomical and physiological differences between small children and adults

- a. Airway and respiratory system
- b. Cardiovascular system
- c. Water, electrolyte balance and renal function
- d. Liver and gastrointestinal tract
- e. Central nervous system
- f. Haematology
- g. Immune system
- h. Endocrine system
- i. Metabolism and temperature control

3) Pharmacological differences in drug kinetics and dynamics of:

- a. inhalational agents, intravenous induction and maintenance agents
- b. Opioids and non-opioid analgesics
- c. Local anaesthetic agents
- d. Muscle relaxants
- e. Adjuncts (anti-emetics and antimuscarinics)

4) Preoperative assessment and preparation

- a. History taking and clinical examination - interaction with children
- b. Criteria for preoperative investigations
- c. Pre operative management of patients with
 - i. URTI
 - ii. Heart murmurs
 - iii. Bronchial asthma
 - iv. Diabetes
- d. Selection for day care and discharge criteria
- e. Fasting guidelines

- f. ASA physical status grading
- g. Communication with child and family
- h. Age related behaviour and anxiety
- i. Management of uncooperative children
- j. Nonpharmacological interventions
- k. Anxiolytic premedication
- l. Consent

5) Equipment, techniques and monitoring

- a. Equipment
 - i) Oral, nasopharyngeal airways
 - ii) Laryngeal masks and other supraglottic devices
 - iii) Endotracheal and tracheostomy tubes (plain, cuffed, preformed, armoured, Cole, laser)
 - iv) Laryngoscopes (curved and straight blades, video laryngoscopes, fiberoptic bronchoscopes)
- b. Breathing circuits
 - i. Jackson Rees modification of Ayre's t-piece
 - ii. Circle absorption breathing system
- c. Anaesthesia machine
- d. Ventilators

6) Techniques

- a. Anaesthesia in the neonatal period
- b. IV access skill
- c. Inhalational induction
- d. Maintenance of anaesthesia
- e. Management of laryngospasm
- f. Rapid sequence induction (RSI) and modified RSI
- g. Maintenance of normothermia
- h. Management of common problems during recovery (including criteria for discharge).
- i. Understand the postoperative anaesthetic complications for paediatric patients *e.g.*, stridor, croup, nausea/vomiting, pruritic, respiratory depression, emergence delirium, bleeding and their management

7) Monitoring

- a. Cardiovascular, respiratory, CNS, neuromuscular, temperature
- b. Indications for invasive monitoring

8) Management of the airway

- a. Assessment of the paediatric airway
- b. Identification of the child with a difficult airway or with congenital syndromes
- c. Airway obstruction, congenital and acquired
- d. Equipment required for management of the paediatric airway
- e. Basic and advanced paediatric airway skills
- f. Techniques for management of difficult airway
- g. Recognise, diagnose and manage complications with the difficult paediatric airway:
 - a. Management of the unanticipated difficult airway

9) Venous access

- a. Routine sites, appropriate cannula sizes and fixation of peripheral cannulae
- b. Central venous lines: indications, devices, techniques and complication
- c. Ultrasound guidance for vascular access
- d. Intraosseous access
- e. Long term care of central venous lines

10) Resuscitation

- a. Provide and understand concepts and algorithms of Basic Life Support, Pediatric Advanced Life Support and life support algorithms
- b. Causes of paediatric arrest
- c. Structured approach to assessing critically ill or injured children (airway, breathing, circulation, disability ABCD)
- d. Neonatal Resuscitation
- e. Choking Child
- f. Structured approach to initiating treatment in the seriously ill child
 - i) Breathing difficulties: airway emergencies, respiratory failure
 - ii) Child in shock: dehydration, acute blood loss
 - iii) Sepsis
 - iv) Anaphylaxis
 - v) Cardiac failure and abnormal cardiac rhythm
 - vi) Altered sensorium, raised intracranial pressure, meningitis, convulsions, metabolic coma

11) Major Crisis Management

Ability to independently identify and manage paediatric clinical crises and demonstrate leadership of the crisis response team

Ability to supervise other members in the paediatric anaesthesia team (residents, technicians, nurses, interns). Including management of malignant hyperthermia, anaphylaxis, major haemorrhage

12) Pain management including regional techniques

- a. Pain neurophysiology, nociception and the response to injury
- b. Analgesic pharmacology: paracetamol, NSAIDs, opioids
- c. Multimodal analgesia: range of drugs, routes of administration and techniques available for acute postoperative pain
- d. Oral/PR, continuous infusions, Patient/Nurse controlled analgesia
- e. Spinal/epidural, caudal, blocks e.g., of upper limb, lower limb, ilio-inguinal block, penile block
 - i) Use of adjuncts: ketamine, clonidine, fentanyl
 - ii) ultrasound guidance in regional blocks
- f. Non-pharmacological approaches of pain management
- g. Management of common complications of pain management
- h. How to set up Paediatric Pain Control Services
 - i) Protocols and Guidelines
 - ii) Ensure safety

13) Anaesthetic implications of congenital inherited conditions and syndromes:

Down, Pierre Robin, Goldenhar, Treacher Collins, Mucopolysaccharidoses, Apert's, Charge association, VATER, Osteogenesis Imperfecta

14) Anaesthetic implications for surgical procedures

a. General surgery

- i. Common problems of neonatal and small infant anaesthesia
- ii. Acute Abdomen and RSI
- iii. Laparoscopic surgery techniques and implications
- iv. Urology and renal transplantation

b. Ear, nose and throat surgery

- i) Associated anomalies and airway pathology e.g., choanal atresia
- ii) General anaesthetic considerations for laryngeal papilloma, bronchoscopy, the shared airway
- iii) Laser surgery
- iv) Post anaesthetic care

- v) Obstructive sleep apnoea following adenotonsillectomy
- c. **Ophthalmic surgery:** retinopathy of prematurity, glaucoma, corneal transplant, vitreoretinal surgery, squint
- d. **Dental, maxillofacial and plastic surgery**
 - i) Temporomandibular joint ankylosis
 - ii) Cleft lip and palate
 - iii) Craniofacial surgery
 - iv) Reconstructive surgery
- e. **Orthopaedic surgery**
 - i) Cerebral palsy
 - ii) Scoliosis surgery
 - iii) Trauma
- f. **Neurosurgery**
 - i) Hydrocephalus
 - ii) Meningomyelocele
 - v) Space occupying lesion
 - vi) Head injury
 - vii) Trans-sphenoidal surgery
- g. **Cardiac and thoracic surgery**
 - i) Management of the child with cardiac disease undergoing non-cardiac surgery
 - ii) Endocarditis prophylaxis
 - iii) Pathophysiology of common cardiac shunts like VSD/ASD/AVSD/PDA, cyanotic heart disease *e.g.*, Tetralogy of Fallot (including management of a 'spell'), transposition of the great arteries, coarctation of the aorta, valve stenosis, single ventricle
 - iv) Preoperative assessment and investigations including the implications of cyanotic heart disease, re-do surgery, pulmonary hypertension
 - v) Blood gas analysis
 - vi) Principles of cardiopulmonary bypass and cardioplegia
 - vii) Pharmacology of inotropes – types, uses & doses, antifibrinolytics, heparin, haemostasis and blood product use
 - viii) Thoracic surgery – one lung ventilation, VATS, thoracotomy
- 15) Anaesthesia/sedation in remote location**
 - a. CT, MRI
 - b. Interventional radiology – DSA
 - c. Cardiac catheterization

- d. Radiotherapy
- e. GE endoscopy

- TEACHING & LEARNING ACTIVITIES:

- Didactic lectures, suggested programme may include:

i) Orientation Lectures: To cover key topics in paediatric anaesthesiology, paediatric developmental stages, PALS, how the institution operating room, recovery room and preoperative system functions.

ii) Fellow lectures: On preselected topics

iii) Journal Club: Quarterly review of current paediatric anaesthesiology of select articles selected by the Fellow

iv) Case Discussions: Presentation of a recent challenging case presented by the Fellow

v) Conduct a prospective study during this period and it is desired that a paper/ poster presentation is done in a conference.

- Perioperative teaching by paediatric anaesthesiology faculty:

Active involvement in mentoring clinical management which includes:

i) Review of preoperative assessment of each patient by the anaesthesiology fellow prior to general /regional anaesthesia or sedation

ii) Discuss anticipated anaesthetic management prior to and during general / regional anaesthesia or sedation

iii) Informal discussion of topics related to the individual case

- TENTATIVE SCHEDULE FOR TRAINING:

	Speciality	Duration
1.	Paediatric Surgery OT	6 months
2.	NORA	2 months
3.	NICU/ Paediatric post surgical ICU	1 month
4.	Plastic Surgery/ ENT	1month
5.	Neuro/ Ortho	1 month
6.	Cardiac/ Ophthal	1 month

- **RESEARCH PROJECT:** One clinical study, preferably prospective or audit should be conducted during the training period.
- **SIX MONTHLY PROGRESS REPORT:** Six monthly progress report will be submitted to the academic section in the prescribed format, signed by the head of the department on 7th January and 7th July
- **ASSESSMENT METHODS:**
Formative: Ongoing assessment during the course – at the end of each posting / unit

Formative assessment

1. Technical skill competency evaluation:

- Performing anesthesia management in real patients

This evaluation will be done either in OT, PAC, Postop wards

- Problem solving cases :

Case presentation

OT discussion

- Oral skills

Ability to present seminars, discussion in classroom

talking to patients in pre-anesthetic checkup and post-operative rounds

Operation theatre management

Summative: Final assessment at the end of year .

Summative assessment

Final assessment will be done at the end of the year. It will be :

- A written exam — 100 marks
- A practical based assessment – 200 marks

Clinical cases	1 Long case	40min	100 marks
	2 Short case	15min each	30 marks each
Table viva-voce	Instruments , Drugs, Xray, Capnography,ABG	15min	20 marks
Conduct & Communication			20 marks

- LIST OF BOOKS MUST READ

- Principles and practice of Pediatric Anesthesia
- A Practise of anesthesia for infants and children
- PALS guidelines

Reference book

- Smiths anesthesia for infants and children
- Pediatric sedation outside of the operating room
- clinical anesthesia for the newborn and the neonate

- LIST OF JOURNALS

- Pediatric anesthesia journal
- British journal of anesthesia
- Indian journal of anesthesia