

Fellowship in Paediatric Anaesthesia  
Department of Anaesthesiology and Critical  
Care



All India Institute of Medical Sciences (AIIMS)  
Jodhpur, Rajasthan, India

# Curriculum for Fellowship in Paediatric Anaesthesia

## In the Department of Anaesthesiology and Critical Care

Department of Anaesthesiology and Critical Care is providing quality anaesthesia services to paediatric patients ranging from premature low birth weight baby to adolescent. Anaesthesia services are provided for paediatric general surgical, laparoscopic, endoscopic, thoracoscopic, ENT, orthopaedic, neurosurgical and urologic procedures. Paediatric general anaesthesia including one lung ventilation and paediatric regional anaesthesia including caudal epidural, lumbar epidural, thoracic epidural, paediatric spinal and ultrasound guided peripheral nerve blocks are routinely performed. We have given anaesthesia to a rare conjoint twin separation surgery. Apart from that, paediatric cardiac surgery will also be started soon. The fellow candidate will have opportunity to work in paediatric and neonatal critical care units.

### 1. Objectives of the course:

To impart thorough and comprehensive training to the candidate the various aspects of this specialty to enable the candidate:

- (a) To function as a faculty / consultant in the specialty
- (b) To carry out and help in conducting applied research in the field of paediatric anaesthesia
- (c) To plan and set-up independent paediatric anaesthesia unit in future.

### 2. Course contents/ Syllabus:

The trainee shall maintain a log book of the work assigned to them. The curriculum shall include:

## I. Paediatric Developmental Principles

### Knowledge

1. Define Preterm, Prematurity, Neonate, Infant, and Child.
2. Understand the terms Gestational Age and Post-Conceptual Age.
3. Understand the transition from foetal to neonatal circulation including the effect on vascular and cardiac structures (conversion from parallel to series circulation), foetal haemoglobin and blood gas values, arterial and pulmonary artery pressure changes, and ventricular function.
4. Understand normal airway and respiratory development, cardiac development, neurologic development, renal development and hematopoietic development including the conversion of foetal to adult haemoglobin.
5. Understand the effect of prematurity upon organ system development and the short and long-term risks of prematurity including respiratory distress syndrome, bronchopulmonary dysplasia, apnoea, anaemia, intraventricular haemorrhage, retinopathy of prematurity, and hypoglycaemia.
6. Understand the basis of pharmacokinetic and pharmacodynamic differences of anaesthetic agents between neonates, infants and children.

## **Skills**

7. Appropriately administer anaesthesia to all age groups and account for differences in drug volume of distribution, MAC, protein binding, metabolism, and excretion.

## **II. Coexisting Paediatric Diseases**

### **Knowledge**

1. Understand the anatomy and pathophysiology of common cyanotic and acyanotic congenital heart lesions including ventricular septal defect, atrial septal defect, patent ductus arteriosus, critical aortic stenosis and coarctation, pulmonary stenosis, tetralogy of Fallot, and transposition of the great arteries.
2. Understand the anaesthetic implications for children with congenital heart disease including associated syndromes, preoperative assessment, SBE prophylaxis, anesthetic cardiovascular effects, and the effects of an intracardiac shunt on intravenous and inhalation induction of general anaesthesia.
3. Understand the pathophysiology and anaesthetic implications of obstructive sleep apnoea, asthma, and acute upper respiratory tract infection.
4. Learn the common congenital syndromes with difficult airways, e.g., Pierre Robin, Treacher-Collins, Trisomy 21 etc.
5. Learn congenital syndromes affecting anaesthesia management eg. Mucopolysacchroidosis, in-born errors of metabolism etc.
6. Know the anaesthetic implications of cerebral palsy, seizure disorders, hydrocephalus, neuromuscular diseases, muscular dystrophies, and diseases of the neuromuscular junction and neuromuscular transmission.
7. Understand the anaesthetic implications for pyloric stenosis, gastro-oesophageal reflux, renal disease and liver disease in the paediatric patient.
8. Understand the anaesthetic implications and perioperative management of inherited disorders of coagulation (e.g. haemophilia) and hemoglobinopathies (e.g., sickle cell disease).
9. Know the anaesthetic considerations for children with oncologic disease and who have had chemotherapy.
10. Know the anaesthetic implications of children with a mediastinal mass.
11. Understand the anaesthetic considerations for a child with a latex allergy.
12. Know the residual medical problems in children born premature (e.g., bronchopulmonary dysplasia) and the potential impact on anaesthetic care.
13. Know the essentials of Paediatric Advanced Life Support (PALS).

## Skills

14. Perform a preoperative evaluation and participate in an anaesthetic for a paediatric patient with congenital heart disease.
15. 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.
16. Identify and evaluate the child with a difficult airway.
17. Be able to evaluate and institute appropriate therapy for a child with respiratory failure.
18. Plan an anaesthetic for a child with a neuromuscular disease.
19. Develop a plan for the perioperative management of a child with sickle cell disease.
20. Develop a plan for the perioperative management of a child with a congenital bleeding disorder.
21. Describe a plan for the induction of anaesthesia in a paediatric patient with gastroesophageal reflux.
22. Plan an anaesthetic for the prematurely born child.
23. Using PALS, be able to preside over the resuscitation of a child in cardiac arrest, or with a life-threatening hemodynamic disturbance or arrhythmia.

### III. Anaesthetic Techniques

#### Knowledge

1. Understand the pre-operative issues relevant to the anaesthetic care of neonates, infants and children including: coexisting morbidities, medications, allergic reactions, labour and delivery history, maternal history, family history, the normal paediatric physical exam and the evaluation of abnormal findings.
2. Know the ASA guidelines for preoperative fasting including clears, breast milk and formula based upon patient age. Understand the appropriate ordering of preoperative laboratory testing and evaluation.
3. Know the options available for premedication including agents, routes and side-effects.
4. Understand the differences between the various paediatric breathing circuits to provide oxygen and anaesthesia.
5. Understand the factors determining the speed of inhalation induction in paediatric patients and the various agents currently available for inhalation induction including the benefits and side-effects of each.
6. Understand the regulation of temperature in infants and children and compensatory mechanisms, effects of anaesthesia on temperature and the consequences of hypothermia.
7. Know the differential diagnosis and management of perioperative hyperthermia.
8. Know the age-related fluid and electrolyte requirements for infants and children including calculation of deficit, intra-operative fluid

requirements, glucose requirements and the guidelines, indications and side effects for blood and blood product administration in the paediatric patient.

9. Understand the differences between the paediatric airway and the adult airway and the effects on paediatric airway management.
10. Know the various sizes of oral/nasal airways, facemasks, LMAs, blades for laryngoscopy and endotracheal tube sizes (cuffed and uncuffed) and their appropriate use in children of all ages.
11. Know the prevention, management and consequences of laryngospasm.
12. Know the paediatric doses of intravenous anaesthetic medications including induction agents, opiates, muscle relaxants, reversal agents and emergency medications including side-effects and contraindications.
13. Know the criteria for tracheal extubation and how to perform a deep extubation safely.
14. Know the therapeutic and toxic doses of local anaesthetics in infants and children.
15. Understand the indications and contraindications for spinal and epidural anaesthesia and peripheral blocks in infants and children plus side effects and complications.
16. Understand the post-operative anaesthetic complications for paediatric patients including stridor, croup, nausea/vomiting and emergence delirium and their management.

## **Skills**

17. Perform appropriate preoperative evaluation of neonates, infants and children.
18. Obtain informed consent from a parent and assent from an appropriately aged child.
19. Administer premedication to a child.
20. Perform inhalation inductions on paediatric patients of all ages.
21. Monitor patient temperature and perform warming methods on a neonates, infants and children.
22. Appropriately choose and administer fluids to paediatric patients of all ages.
23. Secure venous access, both peripheral and central in indicated patients.
24. Calculate allowable blood loss for children of all ages.
25. Demonstrate the ability to estimate blood loss in paediatric patients.
26. Perform mask ventilation, LMA placement and intubation on paediatric patients of all ages.
27. Appropriately manage upper airway obstruction, laryngospasm, and bronchospasm in paediatric patients.
28. Perform commonly used regional analgesic techniques in paediatric patients.
29. Learn procedures like cricothyroidotomy, fiberoptic intubation, venesections, umbilical artery catheterisation, fluid resuscitation.
30. Learn the basics of Echocardiography and Ultrasound.

#### **IV. Anaesthesia for Paediatric Surgical Procedures**

##### **Knowledge**

1. Know the pathophysiology, indications for surgical intervention, and anaesthetic implications for common paediatric and neonatal surgical conditions.
2. Understand the implications of pneumoperitoneum in the neonate and child and the physiologic changes due to carbodioxide insufflation.
3. Understand the haemodynamic changes in thoracoscopy and the physiology of one lung ventilation in children.
4. Understand the implications of providing paediatric anaesthesia for radiation therapy, CT scan, MRI, cardiac catheterisation lab and additional procedures outside of the traditional OR environment.

##### **Skills**

5. Develop the ability to choose appropriately between endotracheal intubation, laryngeal mask airway, or facemask ventilation for any paediatric surgical procedures.
6. Conduct of anaesthesia for Minimal access surgery (laparoscopy and thoracoscopy) in neonates, infants and children.
7. Lung isolation techniques in thoracic surgery and the devices available in the appropriate age group.
8. Develop the ability to appropriately manage intraoperative hypoxemia.
9. Develop the ability to appropriately manage intraoperative hypocarbia or hypercarbia.
10. Develop the ability to appropriately manage intraoperative hypotension or hypertension.
11. Develop the ability to appropriately manage intraoperative bradycardia or tachycardia.
12. Develop the ability to appropriately manage intraoperative increased ICP.

#### **V. Paediatric Pain Management and Intensive care**

##### **Knowledge**

1. Understand methods for recognition and assessment of pain in different paediatric age groups.
2. Know methods for treatment of acute postoperative pain in children.
3. Understand the age-related differences in use of opioid analgesics in children.
4. Know different regimens for postoperative epidural analgesia in children.
5. Familiarize with different nerve block techniques.
6. Understand the pathophysiology and treatment of common chronic painful conditions in children (e.g., sickle cell disease, oncologic disease, reflex sympathetic dystrophy, etc.)

7. Understand the principles of mechanical ventilation and modes of ventilatory support in neonates and children.

### **Skills**

8. Demonstrate the ability to develop and carry out a plan to manage and treat postoperative pain in children across all age groups.
9. Learn and perform epidural catheterisation in neonates and infants.
10. Learn the use of Patient Controlled Analgesia pumps.
11. Demonstrate the ability to treat refractory postoperative pain in children of all ages.
12. Be able to evaluate and treat common complications of analgesic therapy in children (e.g., nausea, vomiting, pruritus, and ventilatory depression).
13. Be able to evaluate and manage children with epidural analgesic therapy and break-through pain.
14. Learn the diagnosis and treatment of chronic pain in children.
15. Management of paediatric mechanical ventilation and ICU care.
16. Knowledge of newer ventilator strategies e.g. High frequency oscillatory ventilation, ECMO, use of Nitric oxide.

### **3. Teaching Learning methods:**

During the period of training candidates will follow in-service residency programme. She / he will work as senior resident and will be given gradually increasing responsibility - for independently managing the simple paediatric operations and decision making in intensive care management. The day to day work of the trainees will be supervised by the teachers for the course. The posting is so designed that the trainee will be posted in various areas like Operation Theatre, postoperative ICU, and Paediatric & Neonatal Intensive Care Unit. Besides this, seminars, case presentations, journal club will also be organized.

### **Research:**

1. See 20 cases of quality analysing and discussing which will be certified by the faculty of the department.
2. Present at one regional and one national conference.

### **Assessment:**

**Log book and continuous assessment.**

### **Exit Exam**

As per Institute Policy

### **Textbooks/Reference books/Journals:**

Text Books/Reference Books:

- Gregory's Pediatric Anesthesia
  - Smith's Anesthesia for Infants and Children, 9e
  - Cote & Lerman's A Practice of Anesthesia for Infants and Children
  - Handbook of Pediatric Anesthesia (Lange Medical Books)
  - A Practical Approach to Pediatric Anesthesia by Robert S. Holzman
- Journals:
- Pediatric anesthesia
  - Dedicated sections in journals like Anesthesiology, British Journal of Anaesthesia, Anesthesia Analgesia etc.