

Dr.NTR University of Health Sciences

Vijayawada

SYLLABUS

“POST DOCTORAL FELLOWSHIP

COURSE IN PAEDIATRIC

ANAESTHESIA”

for the academic year 2018-19

FELLOWSHIP COURSE IN PAEDIATRIC ANAESTHESIA

- 1. Proper name of the course:** Fellowship course in Paediatric anaesthesia

- 2. Duration of the course:** One year

- 3. I. Eligibility criteria for admission:** M.D / D.N.B.(Pediatrics) recognized by the Medical Council of India / National Board of Examinations.
II. Intake capacity: 2 per year

- 4. Complete curriculum of the course:**
 - I. Statement of Goals & Specification of Objectives:**
 - A. Goal**
 1. To acquire the specialized fund of knowledge, clinical judgment, and technical skills required for a super specialist anaesthetist to independently provide safe, evidence-based anesthetic care for a wide variety of pediatric patients. This includes children of all ages with and without associated medical co-morbidities, undergoing surgical or diagnostic procedures, both simple and complex.

 2. To develop as a clinical teacher and to learn how to supervise the anaesthetic care of less experienced anaesthesiology residents during their paediatric anaesthesia rotation.

 3. To gain a familiarity with research methods and help carry out a research project.

 4. To create an environment that encourages and instructs the fellow to become a life-long learner.

 - B. Objectives**
 1. After completing the fellowship in Paediatric Anaesthesia, the fellow is expected to acquire the clinical expertise, skills

and knowledge required by an anaesthetist to provide special anaesthetic care to paediatric patients and infants undergoing surgical procedures in all major sub specialities of neonatology and paediatrics.

2. The fellow gains expertise in providing anaesthesia for a variety of radiologic imaging/ interventional studies, minor invasive/diagnostic procedures and radiation therapy for infants and young children.
3. The fellow will acquire special experience in pre and post operative care of children.
4. Participation in research and other scholarly activities during the fellowship period is mandatory.

On completion, the fellow will be able to

- * Provide safe anaesthesia care for infants and children undergoing routine surgical, diagnostic and therapeutic procedures
- * Resuscitate neonates, infants and children
- * Manage children on the acute pain service
- * Provide critical perioperative care for neonates, infants and children
- * Recent advances in the practice of pediatric anaesthesia

II. Course Content:

a. Basic principles in paediatric anaesthesia

- Special characteristics of paediatric anaesthesia
- Respiratory physiology in infants and children
- Cardiovascular physiology
- Regulation of fluids and electrolytes
- Thermal regulation
- Pharmacology of paediatric anaesthesia

b. General approach to paediatric anaesthesia

- Preoperative preparation
- Anaesthesia equipment and monitoring
- Induction of anaesthesia and endotracheal intubation
- Intra and postoperative management
- Blood conservation
- Pain management in infants and children
- Regional anaesthesia and analgesia

c. Clinical management of special surgical problems

- Anaesthesia for neonates and premature infants
- Anaesthesia for general, urologic and plastic surgery
- Anaesthesia for ear, nose and throat surgery

- Anaesthesia for ophthalmic surgery
- Anaesthesia for orthopedic surgery
- Anaesthesia and sedation for procedure outside the OR
- Paediatric outpatient anaesthesia
- Anaesthesia for organ transplantation
- Anaesthesia for trauma
- ICU management and ventilation in children

d. Associated problems in Paediatric Anaesthesia

- Malignant hyperthermia
- Cardiopulmonary resuscitation of infants and children
- Syndromes and their anaesthetic implications
- Systemic disorders and anaesthesia

III. Course Description in detail:

a. 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 fetal to neonatal circulation including the effect on vascular and cardiac structures (conversion from parallel to series circulation), fetal hemoglobin 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 fetal to adult hemoglobin.
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, apnea, anemia, intraventricular hemorrhage, retinopathy of prematurity, and hypoglycemia.
6. Understand the basis of pharmacokinetic and pharmacodynamic differences of anesthetic 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.

b. 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, anaesthetic 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 that include difficult airways, e.g., Pierre Robin, Treacher-Collins, etc.
5. Know the anaesthetic implications of cerebral palsy, seizure disorders, hydrocephalus, neuromuscular diseases, muscular dystrophies, and diseases of the neuromuscular junction and neuromuscular transmission.
6. Understand the anaesthetic implications for pyloric stenosis, gastro-oesophageal reflux, renal disease and liver disease in the paediatric patient.
7. Understand the anaesthetic implications and perioperative management of inherited disorders of coagulation (e.g. haemophilia) and hemoglobinopathies (e.g., sickle cell disease).
8. Know the anaesthetic considerations for children with oncologic disease and who have had chemotherapy.
9. Know the anaesthetic implications of children with a newly diagnosed anterior mediastinal mass.
10. Understand the anaesthetic considerations for Trisomy 21.

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 Pediatric Advanced Life Support (PALS).

Skills

14. Perform a preoperative evaluation and participate in an anaesthetic care 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 anesthetic 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 anesthesia in a pediatric patient with gastroesophageal reflux.
22. Plan an anesthetic 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.

c. 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 pediatric breathing circuits to provide oxygen and anesthesia.
5. Understand the factors determining the speed of inhalation induction in pediatric 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 anesthesia 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 pediatric patient.
9. Understand the differences between the pediatric airway and the adult airway and the effects on pediatric 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 pediatric doses of intravenous anesthetic 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 anesthetics in infants and children.

15. Understand the indications and contraindications for spinal and epidural anesthesia and peripheral blocks in infants and children plus side effects and complications.
16. Understand the post-operative anesthetic complications for pediatric 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 a parent-present induction of general anesthesia, if allowed by the institution.
21. Use a precordial or esophageal stethoscope for an anesthetic.
22. Perform inhalation inductions on pediatric patients of all ages.
23. Monitor patient temperature and perform warming methods on a neonates, infants and children.
24. Appropriately choose and administer fluids to pediatric patients of all ages.
25. Calculate allowable blood loss for children of all ages.
26. Demonstrate the ability to estimate blood loss in pediatric patients.
27. Perform mask ventilation, LMA placement and intubation on pediatric patients of all ages.
28. Appropriately manage upper airway obstruction, laryngospasm, and bronchospasm in pediatric patients.
29. Perform commonly used regional analgesic techniques in pediatric patients.

d. Anesthesia for Pediatric Surgical Procedures: -

Knowledge

1. Know the pathophysiology, indications for surgical intervention, and anesthetic implications for the following common pediatric and neonatal surgical conditions:
 - a. congenital diaphragmatic hernia (CDH)
 - b. inguinal hernia
 - c. intussusception
 - d. necrotizing enterocolitis (NEC)

- e. omphalocele and gastroschisis
 - f. pyloric stenosis
 - g. otitis media requiring myringotomy and tube placement
 - h. obstructive sleep apnea or recurrent tonsillitis requiring adenotonsillectomy
 - i. acutely bleeding tonsil
 - j. esophageal foreign body
 - k. tracheal or bronchial foreign body
 - l. retropharyngeal abscess
 - m. epiglottitis
 - n. hydrocephalus requiring ventriculo-peritoneal (VP) shunt insertion or revision
 - o. myelomeningocele
 - p. blocked tear ducts requiring lacrimal duct probing and irrigation
 - q. open globe injury
 - r. strabismus
 - s. scoliosis
 - t. craniosynostosis
 - u. cleft lip or palate
 - v. tracheoesophageal fistula
 - w. pediatric trauma
 - x. pediatric burns
2. Understand the age-related changes and pathophysiology of intracranial pressure (ICP) in children.
 3. Know the pathophysiology and treatment of the oculocardiac reflex.
 4. Understand the implications of subcutaneous infiltration of epinephrine in pediatric patients.
 5. Understand the implications of providing pediatric anesthesia for radiation therapy, CT scan, MRI, and additional procedures outside of the traditional OR environment.

Skills

6. Develop the ability to choose appropriately between endotracheal intubation, laryngeal mask airway, or facemask ventilation for any paediatric surgical procedures.
7. Be able to choose whether or not to place an intravenous catheter during a general anaesthetic.

8. Be able to place an intravenous catheter in a pediatric patient.
9. Develop a plan when intravenous catheter placement fails.
10. Develop the ability to appropriately manage intraoperative hypoxemia.
11. Develop the ability to appropriately manage intraoperative hypocarbia or hypercarbia.
12. Develop the ability to appropriately manage intraoperative hypotension or hypertension.
13. Develop the ability to appropriately manage intraoperative bradycardia or tachycardia.
14. Develop the ability to appropriately manage intraoperative increased ICP.

e. Pediatric Pain Management: -

Knowledge

1. Understand methods for recognition and assessment of pain in different pediatric 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. Understand the pathophysiology and treatment of common chronic painful conditions in children (e.g., sickle cell disease, oncologic disease, reflex sympathetic dystrophy, etc.)

Skills

6. Demonstrate the ability to develop and carry out a plan to manage and treat postoperative pain in children across all age groups.
7. Demonstrate the ability to treat refractory postoperative pain in children of all ages.
8. Be able to evaluate and treat common complications of analgesic therapy in children (e.g., nausea, vomiting, pruritus, and ventilatory depression).
9. Be able to evaluate and manage children with epidural analgesic therapy and break-through pain.

10. Be able to evaluate a child for the use of patient-controlled analgesia (PCA), and demonstrate appropriate ordering of PCA for all age groups.

f. Medicolegal aspects: -

Summary

1. Scientific basis of paediatric anaesthesia
2. Preoperative assessment and preparation
3. Standard equipment, techniques and monitoring
4. Airway management
5. Venous access
6. Resuscitation
7. Difficult circulations and ventilation
8. Major hazards
9. Pain management including regional techniques
10. Congenital and inherited diseases
11. Haematology and oncology including blood transfusion
12. General surgery
13. Urology and renal transplantation
14. Ear, nose and throat surgery
15. Ophthalmic surgery
16. Dental and maxillofacial surgery
17. Cleft lip and palate, and plastic surgery
18. Orthopaedic surgery
19. Scoliosis surgery
20. Craniofacial surgery
21. Neurosurgery
22. Cardiac and thoracic anaesthesia
23. Sedation and anaesthesia outside theatres

5. Teaching scheme:

1. Teaching Learning Methods and Activities:

Learning in fellowship program shall be essentially "Autonomous & Self directed".

Fellows are encouraged to largely carry out self learning. They are expected to seek knowledge & skill on their own initiative. Sound knowledge of Paediatric anaesthesia is to be acquired entirely by self study & by participating in various teaching activities of the department.

The following organized learning experiences should be provided to the students.

- Case presentation & case management in OPD & Indoor wards: The student will present cases daily on clinical rounds to the faculty members of the department. The students shall be provided with facilities to manage cases of higher and greater complexity by allowing them graded responsibility.
- PG lectures, Seminars, symposia, panel discussions of suitable topics: These will be held once a week. Topics of common interest to fellows will be covered in the program.
- Journal clubs: These will be held once a week.
- Medical audit / fatality case discussions: This will be done once in 15 days.
- Interdepartmental meetings will be organized with related departments.
- Departmental clinical work: Research. The fellow will be also involved in various clinical research work being undertaken in the department by the faculty members.
- Teaching experience: The fellows will participate in all aspects of teaching specially practicals, demonstration & tutorials. During their tenure, they will be working under faculty members on rotation basis as per the allotment of the teaching schedule.
- Community services: The training of fellows will involve learning experience "Derived from" or "Targeted to" the needs of the community. It shall therefore be necessary to expose the students to community based activities.

Throughout the course of training the emphasis shall be on acquiring knowledge, skill and attitudes through first hand experiences as far as possible. The emphasis will be on self learning rather than on didactic lectures. **The entire period shall be 'in service' training program based on the concept of 'learn as you work' principle.**

2. Training program:

There will be structured training program. The students are expected to learn in phased manner starting with basic care progressing to advanced care management.

Paediatric critical care	- 4 weeks
Pre-anaesthetic evaluation of paediatric surgical patients	- 2 weeks
Paediatric surgical operation theatre	- 8 months
Post anaesthesia care of paediatric surgical patients	- 4 weeks
Perfusion technology training for paediatric patients	- 2 weeks
Interventional Procedures	- 4 weeks

3. Presentations:

In addition to attending all the academic sessions, the candidate needs to make a minimum number of presentations in these academic sessions during the training period of 1 year

Frequency

Presentations

- | | |
|--|-----------------|
| a. Seminars / Symposia | 1 per month |
| b. Journal club | 1 per month |
| c. Research conference at state level | - 1 |
| d. Research conference at national level | - 1 |
| e. Clinical case conference | 1 per month |
| f. Bedside presentation | 1 per month |
| g. Interdepartmental meeting
with Radiology / Pediatric
surgery and others | 1 per month |
| h. Grand rounds | 1 per week |
| i. Mortality meeting
and audit meeting | 1 per month |
| j. Record meetings | Once in 2 weeks |
| k. Teaching learning process will also take place during the daily
ward rounds and during teaching rounds | |

May be increased if required.

4. Log book

The fellows shall maintain a Record Book (Log Book) of the work carried out by them on day to day basis & training program undergone during the period of training including details of procedures carried out independently or assisted by the candidate. The log book will be checked by the faculty members imparting the

training. Candidates will be required to produce log book duly certified by the guide at the time of practical examination.

5. Development of attitude:

It is a very important aspect of management of newborns. It would be the constant endeavor of the faculty to develop desirable attitudes in the PG trainees during the course by personal examples, interaction and group discussion. Constant watch will be maintained during their work in the wards to ensure that this objective is being met. Although there will be no formal evaluation of attitude, some aspects of this domain would be covered during the formative evaluation for continued internal assessment.

6. Reference books:

- Smith's Anaesthesia for Infants and Children by Davis, Peter.
- Gregory's textbook of Paediatric Anaesthesia
- Hatch and Smner's Textbook of Paediatric Anaesthesia
- Miller: Miller's anaesthesia 7th ed. – 2009 – Churchill livingstone, an imprint of Elsevier.
- Manual of Pediatric Anesthesia by David Steward
- Understanding Paediatric Anaesthesia by Rebecca Jacob
- Fundamentals of Paediatric Anaesthesia by Arun Kumar Paul
- Pediatric and neonatal anaesthesia in a nutshell. Authors: Ann Black and Angus McEwan.
- Paediatric anaesthetic and emergency drug guide by Lynn Fitzgerald Macksey.
- Atlas of regional anaesthesia by Brown, David.
- Atlas of Ultrasound guided regional anaesthesia by Gray, Andrew.
- Caffey's paediatric diagnostic imaging by slovis, Thomas.
- Complications in Anaesthesia by Atlee, John.
- Manual of paediatric anaesthesia by Lerman, Jerrold.

- Regional anaesthesia and pain management: anaesthesia pocket consult for ipod by Burkey, Dell.
- Assisted ventilation of the neonate by Goldsmith, Jay.
- Paediatric Anaesthesia Quick Reference Book by Pradnya Sawant.
- A Practice of Anaesthesia for Infants and Children, 4th Edition
by Charles J. Cote, MD, Jerrold Lerman, MD and I. David Todres, MD

7. List of Journals (Previous three years):

- Clinical paediatric emergency medicine
- Pediatric Anesthesia: Principles and Practice - BJA - Oxford Journals.
- Pediatric Anesthesia - Wiley.
- Pediatric Anesthesia - Blackwell Publishing.
- The Society for Pediatric Anesthesia .
- European Journal of Anaesthesiology.