

JSS Academy of Higher Education & Research

(Deemed to be University)

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Sri Shivarathreeshwara Nagara Mysuru - 570015, Karnataka

Regulation & Syllabus

MD ANAESTHESIOLOGY

2020

Preamble

The main aim of post graduate education is to create specialists who can provide quality health care in their respective fields and bring about progress in science with research and training. They should be competent enough to handle medical problems independently and be updated with the recent advances in their specialty.

The competency-based curriculum for postgraduate (PG) course in Anaesthesia should acknowledge the needs of the community, both regional and global. A postgraduate trained in Anaesthesia should acquire a broad range of skills for its effective application in various elective and emergency situations. The cognitive, psychomotor, and affective domain are all taken into consideration to inculcate effective health care delivery to the patients. Teaching medical and paramedical students, learning the basic principles of research methodology and various methods of utilizing the library are few of the important skills to be practiced during post graduate training. Attending conferences, workshops and CMEs regularly are essential to keep themselves abreast with the current concepts.

The purpose of creating this document is to provide specific guidance to teachers and learners about the knowledge, skill, and attitude to be acquired in a specific time frame during the PG course. It contains information about the defined outcomes expected from the learner during the course by means of periodic assessment. However, this curriculum needs to be updated periodically in order to keep up with the changing trends and to disseminate the same knowledge.

Specific learning objectives

Training of Anaesthesia postgraduates should have clear objectives, is competency based, is well planned for teaching and evaluation, and supervised and delivered by expert teachers. In contrast to earlier methods special emphasis is placed on attitude and behaviour, safety, communication, presentation, audit, teaching, ethics, law, and management. The student is expected to acquire in depth knowledge of Anaesthesia and related topics from updated multiple prescribed, standard textbooks and journals. The prevalence of regional health issues should be given special attention. Recent advances must be updated with priority for improving the knowledge, skills and for future progression.

Specific learning objectives

1. Theoretical knowledge: The student should have fair knowledge of applied basic sciences including their recent advances and diagnostic and therapeutic implications (anatomy, physiology, biochemistry, pathology, microbiology, pharmacology, statistics, and physics) as applied to Anaesthesia.
2. Teaching: The student should have basic knowledge of training and be competent enough to teach medical/ paramedical students (undergraduates and interns). The latest technological adaptations and simulation techniques should be incorporated into that evidence based medical education.
3. Attitude development: The student should develop an attitude of nontechnical skills such as effective communication and team work along with leadership qualities in the operation theatre (OT)/intensive care unit(ICU)/ procedural room.

GOAL: The postgraduate course in MD Anaesthesiology should enable a medical graduate to become a competent specialist who can provide safe anaesthesia service to the patient along with efficiency, knowledge and skills in educational technology for teaching, medical, dental and health sciences and conduct research in bio-medical sciences.

PROGRAM OUTCOMES

The program outcomes define the overall goals for student achievement upon completion of the degree. The goal of MD anaesthesiology is to train a doctor to become a competent clinician, teacher, and researcher in anaesthesiology.

PO1: Demonstrate the ability to adhere to the highest standards of anaesthesia practice with interpersonal and interprofessional communication skill, understands his/her limitations in terms of knowledge, skill, techniques and complies with the available resources.

PO2: Demonstrate the ability to evaluate, plan, administer anaesthesia, provide post operative care and pain relief, and manage complications of elective and emergency cases for specialty, super specialty surgeries (with or without comorbid conditions) and become highly competent anaesthesiologist with broad range of clinical skills.

PO3: Demonstrate the knowledge of performing basic and advanced cardiac life support (ACLS)

PO4: Demonstrate the knowledge and skills to manage critically ill patients in intensive care units.

PO5: Demonstrate the knowledge and skills of management of acute and chronic pain.

PO6: Demonstrate the ability to acquire new knowledge and skills to be a lifelong learner, educate medical, paramedical professionals, perform research activities, capable of innovations in teaching methodology, record keeping, anaesthesia audit and handle medico-legal aspects in anaesthesia.

COURSE OUTCOMES

The subjects included in each paper from the entire course will constitute a course and the relevant outcomes are therefore defined as per the requirement of the student. Some of the outcomes may be restricted to acquisition of knowledge while some require skill acquisition too.

Paper I: Basic Sciences

CO1: Demonstrate the acquisition of comprehensive knowledge of basic sciences relevant to anaesthesia practice.

CO2: Demonstrate the acquisition of comprehensive knowledge of the pharmacodynamics, pharmacokinetics, drug interactions, emergency, non-emergency drugs, IV fluids, blood and blood products used in anaesthesia practice.

CO3: Demonstrate the knowledge and skill to optimise and manage the patients with various comorbid conditions in anaesthesia practice.

CO3: Demonstrate the knowledge of important gas laws in anaesthesia practice and working principles.

CO4: Demonstrate the knowledge of how anaesthesia has progressed to this advanced stage of safe practice systems, history of anaesthesia and the pioneers in anaesthesia.

CO5: Demonstrate the knowledge and skill of usage of the anaesthesia equipments along with the vaporisers, various equipment, gadgets, invasive and non-invasive monitoring in anaesthesia practice.

CO6: Demonstrate the knowledge and skill to assess, diagnose, interpret the investigations, optimise, grade the patient with a detailed history, physical examination, relevant investigations, counselling, providing advice and obtaining consent in the pre anaesthetic examination.

Paper II- Clinical Anaesthesia

CO1: Demonstrate the knowledge and skill to manage the optimised physiology of central nervous system under anaesthesia and in various pathological states of the brain including traumatic brain injury and ECT.

CO2: Demonstrate the knowledge and skill to manage a case of polytrauma.

CO3: Demonstrate the knowledge and skill to manage anaesthesia for elective and emergency cases in pregnancy, gynaecological cases, neonatal and paediatric surgeries.

CO4: Demonstrate the knowledge and skill to manage cardiac patients posted for elective or emergency non-cardiac surgeries, surgical and nonsurgical vascular and cardiac interventions, patients with respiratory comorbidities posted for elective or emergency thoracic or nonthoracic surgeries.

CO5: Demonstrate the knowledge and skill of anaesthetic management of patients with obesity and/or endocrine disorder coming for elective or emergency surgeries.

CO6: Demonstrate the knowledge and skill of managing patients undergoing laparoscopic and robotic surgeries.

Paper III-Clinical Anaesthesia

CO1: Demonstrate the knowledge and skill of managing patients undergoing various gastrointestinal and renal procedures, patients with renal or hepatic dysfunction coming for incidental surgeries- either open or laparoscopic surgeries.

CO2: Demonstrate the knowledge and skill of managing emergency or elective ENT/ophthalmological/orthopaedic/plastic /reconstructive/ dental procedures.

CO3: Demonstrate the knowledge and skill of managing emergency or elective procedures in geriatric patients.

CO4: Demonstrate the knowledge and skill of performing central neuraxial blockade and peripheral nerve blocks and management of airway/difficult airway management in elective or emergency cases.

CO5: Demonstrate the knowledge and skill of monitored anaesthesia care.

CO6: Demonstrate the knowledge and skill of managing emergency or elective procedures in a patient with haematological disorder, embolisms, thrombosis, managing elective or emergency blood and blood product transfusion including massive transfusion.

Paper IV- Recent advances, Pain and Critical Care

CO1: Demonstrate the knowledge and skill of monitoring, prognosticating and managing patients in post anaesthesia care unit and critical care setting.

CO2: Demonstrate the knowledge of pathophysiology of various chronic pain syndromes and their management.

CO3: Demonstrate the knowledge of managing patients in palliative care.

CO4: Demonstrate the knowledge of biostatistics, research methodologies, simulation-based learning, ultrasonography in anaesthesia, various sterilization and disinfection methodologies, patient safety standards in the OT and ICU

CO5: Demonstrate the knowledge of brain death, managing patients for organ procurement and transplantation.

CO6: Demonstrate the knowledge and skill of managing anaesthesia for day care surgeries, non-operating room surgeries, anaesthesia in patients in extreme environments and management of disaster situations.

OBJECTIVES

The Goal of MD Anaesthesiology is to train a doctor to become a skilled, competent clinician, a knowledgeable teacher and researcher in Anaesthesiology. At the end of three-year training in anaesthesiology the student should be able to

1. Apply the knowledge acquired into safe anaesthesia practice.
2. Acquire skills that are professionally competent enough to deliver safe anaesthesia which is evidence based.
3. Make an early diagnosis of a crisis and manage as an efficient perioperative physician.
4. Take responsibility as a team leader in a crisis.
5. Provide effective BLS and ACLS.
6. Communicate well with the patient, patient attenders, interdepartmental staff, colleagues, students, and other supporting personal in the place of work.
7. Educate medical and paramedical professionals with innovations in teaching methodology.
8. Integrate anaesthesia with other disciplines as and when needed.
9. Give scope for newer ideas and research.
10. Follow professionalism and ethics of the highest standard.
11. Accurately document the anaesthetic management and events.
12. Practice medico legal responsibilities.

Competencies related to basic sciences in anaesthesiology.

At the end of the three-year course in MD Anaesthesiology the student should have acquired the cognitive(knowledge), affective domain and psychomotor (skill) competencies encompassing basic sciences and clinical aspects of anaesthesia. The affective domain is very important in the practice of anaesthesiology

as the student has to learn the finer aspects of communication, professionalism, ethics and team work. The cognitive domain deals with the knowledge acquired and its anaesthetic implications with respect to each system as well as physical components involved in anaesthesia practice, e.g. anatomy of the airway, the gas laws and its application, research methodologies, history of anaesthesia, etc. Anatomy and physiological component is defined with each system, whereas in general the cognitive domain includes:

A. Cognitive domain

1. Anatomy and physiology of all the organ systems in the body (mentioned later with each system)
2. Regulation of all the bodily functions -temperature, blood pressure, stress response etc
3. Pathological changes in various disease states.
4. Pharmacology
 - General principles of pharmacology
 - Concept of pharmacokinetics and pharmacodynamics
 - Uptake and distribution of IV and inhalational anaesthetic agents
 - Drugs in Anaesthesia practice -premedication, induction agents (IV and inhalational), neuromuscular blocking agents, reversal agents, local anaesthetic drugs, sedatives, hypnotics, analgesics-opioid and nonopioid.
 - Vasopressors, inotropes, vasodilators, bronchodilators, antihypertensives
 - Steroids, anti-diabetic medications, anti-platelet, anti-coagulants, psychiatry medications, anti-epileptic medications, neuro protective drugs
 - Adverse drug reactions
 - Drug-drug interactions, drug-food interactions
 - IV fluids and electrolytes
 - Blood and blood products
5. Principles of physics and equipment use in Anaesthesia
 - Gas laws and their applications in Anaesthesia, ICU
 - Anaesthesia machine
 - Monitoring equipment in the OT and ICU
 - Vaporisers
 - All airway equipment including fiberoptic bronchoscope and video laryngoscope.
 - Masks, airways, endotracheal tubes, supraglottic airway devices, tracheostomy devices
 - Jet ventilation
 - Breathing systems
 - Peripheral nerve stimulators
 - Neuromuscular monitors
 - BIS monitor
 - Invasive vascular monitor
 - Medical gas supply system
 - Fluidics, electricity, diathermy
 - Ultrasound? TEE
 - Pacemaker
 - LASER
 - Mechanical ventilators/non-invasive ventilators/ other oxygenation devices
 - Nebulizers
 - Safety and sterilisation of anaesthetic equipment.
 - Syringe pumps/infusion pumps
 - Use of simulators
6. Biochemistry
 - Blood investigations as relevant to anaesthesia practice
 - Biochemical reactions in the various physiological and pathological states
 - Interpretation of the biochemical reports
7. Computer in Anaesthesia
 - Internet searches, knowledge about how to implement computer programmes in anaesthesia, data collection and storage, methods for improvement in teaching learning methodology using computers are few of the important tasks to be known by the students in anaesthesiology.
8. Medical audits

The student should take part in relevant audits of the department for the quality improvement assurance programmes. This will enable the student to be responsible for protocol formation and implementation.

9. History of Anaesthesia

Relevant history, evolution in Anaesthesia practice and important personalities who have contributed to the progress of Anaesthesia should be acknowledged by the postgraduates.

10. Research methodology

Randomised clinical trials and

Basics of biostatistics.

Demonstrate ability to collect, analyse and write a thesis.

11. Ethics and medicolegal aspects in anaesthesiology

The code of medical ethics as proposed by National Medical Council should be followed by the postgraduates.

Affective domain

This represents the emotional, psychological, moral, ethical, professional domain of the student. The affective domain is common across all specialities and concerned subjects of anaesthesiology and hence is listed below. Since the interaction of the anaesthesiology student is with patients and relatives, interdepartmental and intradepartmental seniors, colleagues and juniors, teachers, peers, students, all other supportive personnel in the OT, ICU, peripheries etc the following qualities are essentially acquired by a student of anaesthesiology:

1. Demonstrate ability to communicate adequately, effectively, and respectfully with teachers, surgeons, and patients.
2. The postgraduate student should be the most important member in a teamwork, cooperate and maintain good communication skills and respect with colleagues, OT, and critical care staff.
3. Communicate well with the patients' caretakers to regularly update the condition of the patient. The documentation of the counselling-verbal, video or written must be done in periodic intervals and consent obtained for all procedures.
4. Be empathetic towards patients and relatives, especially breaking bad news.
5. To counsel and prepare the patients relatives when all options seem impossible and there is no prospect of survival
6. Be able to communicate the best possible clinical diagnosis, respect their rights including the right to information and another opinion.
7. To communicate in an appropriate manner the importance of organ donation in potential or brain-dead patients.
8. Effective communication with the operating surgeon or the person who is performing the procedure to understand the requirements intraoperatively or during the procedure.
9. Effective communication with the OT staff, critical care faculty and nursing staff.
10. Confirmation of the patient, site, side of the surgery-WHO surgical safety checklist.
11. Understand the limitations of interventions in patients.
12. Appropriate timely documentation with due authorisation of the same.
13. Prioritisation of patients must be done as and when needed.
14. Acquire capacity of not letting his/her personal beliefs, prejudices and limitations come in the way of duty.
15. Communicate effectively with peers, students, and teachers in various teaching learning activities in a manner that encourages participation and shared decision-making.
16. The post graduate student should adhere to the ethical principles.
17. Hospital based protocols and rules must be strictly followed.
18. Issues with consent, laws, and medicolegal aspects.
19. Maintain highest degree of morality when a female patient is cared for.
20. Strict aseptic precautions to be always followed in all areas of work wherever applicable.
21. Isolation protocols of various infective diseases to be followed.
22. Personal safety precautions like radiation hazard, needle stick injuries etc to be taken and educate the same to other OT personnel.
23. Allocation of available resources to high-risk patients

24. Call for help as soon as the requirement or problem is detected.
25. Take part in regular audits of the department.
26. Legal aspects related to tubectomy; death of a patient has to be clearly understood.
27. Proper handover of patients whether verbal or written is an essential component of learning during postgraduation.
28. Maintain the principles of closed loop communication when managing a crisis.
29. Information and documentation to the patient and relatives regarding any anaesthetic complications that is of relevance for future management.
30. Manage emotional separation of baby from the parents prior to surgery.
31. Familiarise with the patient, especially paediatric patients, and the guardians, so that separation anxiety is reduced.

Clinical anaesthesia

As mentioned earlier the cognitive and psychomotor/ skills differ with each subdivision in anaesthesia, hence these components are defined separately.

Neuro Anaesthesia

The postgraduate working in neuro anaesthesia must understand the complexities of maintaining intracranial pressure, how the anaesthetic management and the drugs affect the various functions of the brain. The conservative management of these patients in ICU has to be given importance as small variations in the physiology can bring about significant change in the brain function.

Cognitive

- Anatomy, physiology, and effect of drugs on the cerebral blood flow and volume, intracranial pressure, and cerebral metabolic rate of oxygen
- Effect of biochemical parameters on brain physiology and pathology
- Anaesthetic implications of spinal cord trauma
- Principles of neurological monitoring
- Subarachnoid haemorrhage and vasospasm
- Guillain- Barre disease
- Myasthenia gravis-implications of the drugs used for its management.
- Myasthenic syndrome
- Dystrophia myotonic
- Muscular dystrophy
- Degenerative disorders of brain and spinal cord
- Convulsions and its management including anaesthetic implications of anticonvulsants.
- Tetanus
- Diagnosis of air embolism
- Neuroprotective drugs
- Anaesthetic implications of MRI
- Relevant investigations of the CNS
- EEG and evoked potentials
- Recognise early warning signs.

Psychomotor

- Preoperative assessment and optimization of patients with neurological diseases
- Spine examination
- Planned intracranial surgery- vascular disease, tumours and posterior fossa lesions
- Spinal surgery
- Emergency neurosurgery
- Patient positioning during neurosurgery and anaesthetic implications
- Post operative management of neurosurgical patients
- Conservative management of traumatic brain injury patient
- Resuscitation and transfer to OT
- Insertion of central/ arterial lines
- Monitoring
- Management of air embolism
- Traumatic brain injury and anaesthetic implications

- Anaesthesia for pituitary disease with endocrinological effects(acromegaly)-trans sphenoidal surgery
- Intracranial pressure management
- Cerebrospinal fluid drainage
- Cerebral protective strategies
- Management of raised intracranial pressure by various methods and drugs
- Management of fluid and electrolyte imbalance
- Ventilatory management of neurosurgical patients
- Management of organ donation patients
- Anaesthetic management for interventional neurological procedures

Obstetrics

This branch poses a greater challenge for anaesthesiologist as two patients are cared for simultaneously. Hence It is important for the anaesthesia postgraduate to understand the impact of pregnancy on anaesthetic management as well as the anaesthetic implications on pregnancy.

Cognitive

- Relevant anatomy, physiology and pharmacology in pregnancy and labor
- Placental physiology and drug transfer across the placenta
- Stages of labor and its relevance in anaesthesia
- Coexisting medical diseases and pregnancy
- Recognize early warning signs.
- Maternal morbidity and mortality
- Fasting in pregnancy and labour, aspiration risk and prophylaxis

Psychomotor

- Preoperative assessment and optimisation
 - Airway and spine examination
 - Labour analgesia technique-epidural, subarachnoid, inhalational technique
 - Management of failure of regional blocks
 - Management of complications of regional Anaesthesia techniques
 - Conversion of labour analgesia to operative Anaesthesia
 - Anaesthesia for caesarean section -regional and general Anaesthesia techniques
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- Anaesthesia for non-delivery procedures-manual removal of placenta, PPH
 - Postdelivery analgesia
 - Management of emergencies in obstetric Anaesthesia:
 - Pre-eclampsia
 - eclampsia
 - antepartum haemorrhage
 - postpartum haemorrhage
 - maternal collapse
 - maternal seizures
 - respiratory distress
 - maternal cardiac arrest
 - amniotic fluid embolism
 - difficult airway
 - unresponsive mother
 - Optimisation of comorbid conditions
 - Management of HELLP syndrome
 - Management of twin pregnancies
 - Management of premature delivery
 - Perimortem caesarean section
 - Management of difficult/ failed intubation
 - Neonatal resuscitation
 - Management of thromboprophylaxis
 - Gynaecological procedures during pregnancy
 - Management of nonobstetric emergencies

Gynaecology

This system emphasises the need to know the various comorbid conditions and its optimisation prior to surgery and anaesthesia.

Cognitive

- Relevant anatomy and physiology
- Laparoscopic surgeries and anaesthetic implications

Psychomotor

- Preoperative assessment and optimization of comorbid conditions
- Anaesthesia technique depending on the patient and surgical requirement.
- Laparoscopic surgeries and its anaesthetic implications.
- Management of complications
- Steps for prevention of complications strategies

General surgery

Elective or emergency surgical procedures involving the various organ systems in the body requires careful assessment and optimisation of the comorbid conditions.

Cognitive

- Relevant anatomy and physiology for common surgical procedures
- Implications of various anaesthetic procedures for complex surgeries
- Anaesthesia for emergency surgeries-polytrauma management, intestinal perforations
- Management of comorbidities and its anaesthetic implications
- Malnourished patient coming for anaesthesia
- Endocrinal surgeries of various organs-thyroid surgery
- Anticipation of complications

Psychomotor

- Preoperative assessment and optimization
- Anaesthesia technique
- Monitoring
- Assessment of need for post operative ICU care
- Anaesthetic implications of laparoscopic surgery
- Management of complications
- Strategies to prevent and manage complications.

Orthopaedic Anaesthesia

Patients in orthopaedics can present with varied complications, the relevance of pain relief should be well understood by the anaesthesia resident.

Cognitive

- Anatomy of the nerve supplying the area (dermatomes)
- Pharmacology of the drugs used for the block and its potential complications.
- Complications of patient positioning
- Complications of bone cement
- Tourniquet application and its complication

Psychomotor

- Preoperative assessment and optimisation
- Airway difficulties especially in patients with rheumatoid arthritis and spine injury
- Central neuraxial blockade and peripheral nerve blocks
- On arrival nerve blocks
- Anaesthesia for emergency surgeries

- Resuscitation and management of patients with polytrauma
- Anaesthesia for joint replacement, dislocations, reconstructive surgeries, tendon repairs
- Problems of positioning patients under anaesthesia
- Anaesthesia for scoliosis surgeries
- Postoperative analgesia
- Fat embolism
- DVT prophylaxis
- Neurovascular deficits and pressure sores
- Blood loss and replacement
- Compartment syndrome
- Constant monitoring

Otorhinolaryngology(ENT)

Being a shared airway in neck, nose and throat surgeries, it is prudent that the anaesthesiology student understands the importance of being an expertise and anticipating airway problems and managing the same.

Cognitive

- Relevant anatomy and physiology of ear, nose and throat
- Precautions during the use of LASER
- Complications and precautions in post radiotherapy patients
- Preoperative assessment and optimization
- Airway assesment
- Management of patients with difficult airway, sleep apnoea, stridor
- ENT emergencies-post tonsillectomy bleeding, stridor, epiglottitis, Ludwig's angina, foreign bodies in the airway, tumours causing airway obstruction.
- Provide smooth operating conditions
- Requirement of throat pack/ removal of throat pack
- Hypotensive Anaesthesia/ methods to reduce intraoperative bleeding-tranexamic acid etc
- Smooth extubation
- Postoperative monitoring and care
- Monitor respiration and airway obstruction
- Prevention of postoperative nausea vomiting
- Local Anaesthesia techniques
- Specialised equipment's in ENT surgeries-ventilating bronchoscopes, laryngoscopes, LASER, gags and tubes
- Major head and neck surgery
- Emergency airway management including front of neck access
- Postoperative management

Geriatric anaesthesia

The geriatric physiology has a significant effect on the drugs and hence a good understanding is very essential.

Cognitive

- Anatomy and physiological changes in the geriatric population
- Anaesthetic implications of these changes
- Affect of the changes on the pharmacodynamics and kinetics
- Comorbid conditions affecting anaesthetic management
- Frailty and nutritional aspects in geriatrics
- Psychological assessment

Psychomotor

- Preoperative assessment and optimization
- Cognitive assessment and effect of frailty following anaesthesia
- Patient positioning under anaesthesia
- Prevention of hypothermia
- Management of postoperative analgesia

- Management of fluid and electrolyte imbalance

Hematology

The impact of hematological disorder on anaesthesia has to be understood, the massive transfusion protocol which can save lives in trauma or hypovolemic shock

Cognitive

- Effects of hematological disorders on anaesthesia
- Effects of anaesthesia on the preexisting hematological disorder
- Maximum allowable blood loss
- Protocol for massive transfusion
- Complications of massive transfusion
- Blood products

Psychomotor

- Management of massive transfusion
- Assessment of blood loss

Obesity and bariatric anaesthesia

The anaesthesiology postgraduate should anticipate the complications of anaesthetising an obese patient and be prepared to manage the same. Patients posted for bariatric surgery are at increased risk due to the complications of obesity and the surgery itself.

Cognitive

- Anatomical and physiological effects of obesity
- Multiple risk factors
- Comorbid conditions and their effects
- Complications of bariatric surgery
- DVT prophylaxis

Psychomotor

- Management of difficult airway
- Patient positioning
- Postoperative ventilation

Robotic surgery

Cognitive

- Principles of robotics
- Precautions, advantages, disadvantages and complications during robotic surgery
- Anaesthetic implications

Psychomotor

- Airway management
- Maintenance of anaesthesia
- Emergency management of intraoperative complications

Onco anaesthesia

The cancer cells have various pathological manifestations in the body that could alter the drug dynamics and kinetics

Cognitive

- Effect of cancer on the physiology
- Hypoalbuminaemia
- Effect of chemotherapeutic drugs on anaesthesia
- Effect of radiation on anaesthesia

Psychomotor

- Difficult IV canulation
- Difficult airway
- Management of pain

Cardiac Anaesthesia

The intricacy of cardiac function has to be thoroughly understood by the student to manage the complex cardiac surgeries, the unstable rhythms and variations in the hemodynamics

Cognitive

- Interpretation of ECG, CXR, echo and TEE
 - Interpretation of invasive and non-invasive cardiovascular monitoring
 - Interpretation and significance of Stress test, Cardiac catheterization
 - Radionuclide scanning
 - Appropriate indications/ drugs/dosage for antibiotic prophylaxis for infective endocarditis
 - Cardiopulmonary bypass and their complications
 - Off pump coronary surgeries
 - Adequate heparinisation and reversal
 - Coagulopathy and its management
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- Temperature management and patient rewarming methods
 - Different aspects of cardiac pacing
 - Postoperative management of cardiac surgical patient-analgesics, sedation, ventilatory and hemodynamic management.
 - Diagnosis of cardiac tamponade
 - Intra-aortic balloon counter pulsations
 - Extracorporeal membrane oxygenation
 - Congenital heart disease in paediatrics
 - Reversal of shunts under anaesthesia
 - Congenital heart disease in an adult patient and its anaesthetic implications
 - Drugs affecting the heart inotropes, vasopressors. Antiarrhythmics
 - Types of valves that can be replaced
 - Anticoagulation to be followed following valve replacement.
 - Infective endocarditis prophylaxis
 - Risk stratification of cardiac patients
 - Cardiac patients coming for non-cardiac patients
 - Intraoperative cardiac complications including arrhythmias
 - Anaesthesia for procedures in ICU including emergency re-sternotomy, cardioversion, tracheostomy, pericardial tamponade
 - Early warning signs
 - Management of pericardial tamponade

Psychomotor

- Induction and maintenance of cardiac patients undergoing cardiac surgeries
- Central venous cannulation
- Arterial cannulation
- Volume replacement
- Postoperative ICU care-analgesia, monitoring of vital parameters, inotropic support, ventilatory support and weaning, extubation, external and internal pacing.
- Cardiopulmonary resuscitation and use of internal defibrillators

Thoracic Anaesthesia

Anaesthesia for any thoracic surgeries is complex due the ventilatory parameters being altered and thus the physiology of respiration in pathological states and anaesthesia has to be well understood

Cognitive

- Interpretation and significance of the various pulmonary function tests

- Anaesthetic techniques for bronchoscopy
- methods of oxygenation including apneic oxygenation
- Use of fiberoptic bronchoscope in thoracic Anaesthesia
- One lung ventilation and its anaesthetic implications
- Lung isolation techniques
- indications, contraindications, complications of lung isolation
- Ventilatory strategies in lung isolation
- Use of bronchial blockers

Psychomotor

- Preoperative assessment and optimization of patients with pulmonary disease posted for thoracic surgery
- Induction and maintenance of Anaesthesia for minor thoracic procedures including bronchoscopy
- Single and double lumen tube placement for thoracic surgery
- Induction and maintenance of Anaesthesia for major thoracic procedures
- One lung ventilation
- Management of pneumothorax and chest drains
- Postoperative management of thoracic surgery including analgesia
- Ventilation strategies in thoracic surgeries
- Postoperative Ventilatory support and extubation

Paediatric Anaesthesia

Paediatric anaesthesia includes management of preterm newborn babies to children up to 16 years of age

Cognitive

- Understanding the anatomical and physiological changes in neonates and paediatric age group
- Anaesthetic implications including transitional circulation
- Anaesthetic implications of various medical and surgical problems in children of all age groups.
- Preoperative fasting, hypoglycaemia and electrolyte balance
- Anaesthetic equipment used in paediatrics
- Safe transport of critically ill paediatric patients
- Anatomical, physiological, and pharmacological differences in neonates and adults
- Neonatal equipment including monitoring
- Drugs and their dilutions used in Anaesthesia
- Susceptibility to malignant hyperthermia
- Thermoregulation
- Associations with syndromes and their anaesthetic implications

Psychomotor

- Preoperative assessment and optimization
- Anaesthetic technique and analgesia
- Neonatal resuscitation
- IV fluids-type and dosage
- Congenital anomalies requiring surgical correction in the neonatal period-tracheoesophageal fistula, diaphragmatic hernia, exomphalos, gastroschisis, intestinal obstruction, pyloric stenosis
- Premature and ex-premature neonates-additional precautions to be taken
- prevention of malignant hyperthermia
- Basic life support in all paediatric age group
- Securing IV line
- Induction and maintenance during elective and emergency Anaesthesia procedures
- Paediatric airway management techniques
- Management of children for diagnostic and therapeutic procedure under sedation anaesthetic management of foreign body bronchus, oesophagus, congenital diaphragmatic hernia, trachea oesophageal fistula, thoracotomy, video assisted thoracoscopic procedures
- Maintenance of glucose, fluids, and temperature balance
- Strategies for the management of paediatric anaesthetic emergencies-loss of airway, laryngospasm, failed venous access, apnoea, anaphylaxis.
- Postoperative multimodal analgesia in paediatrics including regional Anaesthesia.

Transplant Anaesthesia

The physiological aspects of major fluid shifts, biochemical alterations and the preoperative preparation is of prime importance to the anaesthesiology student

Cognitive

- Basic pathophysiology of renal and liver failure
- Preoperative optimization, preparation, management, and complications of renal and liver transplantation
- Anaesthetic implications of cadaveric and live donor transplantation
- Massive blood transfusion, massive transfusion protocol and coagulopathy in liver transplantation
- Interpretation of arterial blood gas analysis
- Thrombo elastogram (TEG) and rotational thromboelastogram
- Dialysis, care of fistulas, grafts, and its anaesthetic implications
- Renal replacement therapies
- Postoperative management of a renal and liver transplant patient
- Management of a braindead organ donor
- Basic principles of anaesthetizing an immunocompromised patient
- Aseptic precautions to be followed

Psychomotor

- IV lines
- Arterial line
- Anaesthetic management of cadaveric and live donor transplant-donor and recipient
- Monitoring of donor and recipient
- Maintenance of hemodynamic stability
- Post operative monitoring
- Postoperative analgesia
- Anaesthetic management of post-transplant patient coming for incidental surgery
- Fluid and electrolyte balance

Plastic surgery

The anatomical implications of reconstructive surgery, blood loss, and fluid shifts have to be given priority

Cognitive

- Anatomy relevant to the structure to be operated and the nerve supply of the area
- Burns and its anaesthetic implications
- Nerve injuries and its anaesthetic implications
- Aseptic precautions in acute burns patient

Psychomotor

- Preoperative assessment and optimization
- Airway management in acute burns
- Airway management in patients with burn scars around the neck and face
- Fluid and electrolyte management in burns
- Anaesthetic implications in reconstructive surgeries-mainly airway management in facial surgeries
- Fluid and blood replacements in major reconstructive and amputation surgeries
- Postoperative care after major surgeries-analgesia, airway management, blood, and fluid replacement
- Regional blocks

Nephro/Urology

The student is expected to know the detailed fluid and electrolyte balance mechanisms in the body, the various factors responsible for maintenance of homeostasis.

Cognitive

- Anatomy and physiology of the renal system
- Assessment of renal function
- Fluid and electrolyte imbalance and its management
- Acid-base abnormalities and its correction

- Renal failure types and its management
- Anaesthesia for urological procedures in patients with spinal cord injuries
- Transurethral resection of prostate, its complications and management
- Renal transplantation (mentioned under transplant anaesthesia)

Psychomotor

- Regional techniques for various urological procedures
- Anaesthesia for major procedures like cystectomy, nephrectomy
- Management of complications of TURP

Ophthalmic Anaesthesia

The post graduate needs to pay special emphasis to this branch because the age group is in extremes and wide adoption of local anaesthetic techniques.

Cognitive

- Preoperative assessment
- Anatomy relevant to local anaesthetic blocks
- Choice of local or general Anaesthesia in relation to the patient (paediatric age group) and surgery (cataract, strabismus, open eye injury, retinal surgeries)
- Management of high intraocular pressure
- Anaesthetic drugs and their effects on the eye.
- Local anaesthetic technique/ Topical Anaesthesia-their complications
- Sub-Tenon's block
- Glaucoma surgery
- Postoperative care
- Various reflexes of the eye(oculo cardiac etc) and their implications during surgery and anaesthesia
- Anaesthetic implications of emergency eye surgeries

Psychomotor

- Assessment and optimization even in day care procedures
- Anaesthetic management of patients posted for lacrimal surgery like syringing, dacrocysto rhinostomy
- Anaesthetic management of strabismus surgery
- Intraocular pressure management
- Topical Anaesthesia- interactions
- Local anaesthetic techniques
- Airway maintenance under sedation and general Anaesthesia
- Postoperative care

Dental/ Maxillo-facial Anaesthesia

The post graduate should be trained in this field which caters to extremes of age and can present with varied airway difficulties.

Cognitive

- Preoperative assessment including screening for syndromes, other congenital anomalies
- Day care/ inpatient procedures
- Anaesthesia for dental extractions under sedation, local Anaesthesia, or general Anaesthesia especially in paediatric age group
- Implications of cleft lip and palate
- Potential hazards of shared airway
- Assessment and management of difficult airway including fiberoptic intubation
- Anaesthetic management of reconstructive surgeries
- Postoperative management of dental surgery patients including modalities of analgesia

Psychomotor

- Preoperative optimization-mentally and physically disabled
- Pre and postoperative instructions to patients, counselling of the Anaesthesia technique and possible complications
- Choice of anaesthetic technique

- Airway management-intubation through nasal, oral, submental, fiberoptic intubation or surgical airway
- Use of alternate airway like supraglottic airway device
- Anaesthetic management of cleft lip and palate
- Prevention of aspiration-use of throat packs and their care
- Use of mouth props and other surgical equipment
- Appropriate monitoring
- Postoperative management of difficult airway-mechanical ventilation, management of patent endotracheal tube, extubation
- Management of airway emergencies
- Conscious sedation for dental procedures -patient selection, type of procedure, risk of aspiration, airway patency and drugs administered are important aspects

Practice based competencies

There are many procedures in anaesthesia which require multiple skills to be performed.

General Anaesthesia

Cognitive

- Basic knowledge relevant to general anaesthesia including anatomy, physiology, and pharmacology
- Pathology for which the patient is posted for surgery
- Aspiration risks and prophylaxis
- Difficult airway protocols-anticipated and unanticipated.
- Selection of the drugs and the technique, airway management depending on the requirement of the surgery and the patient, availability of the device.

Psychomotor

- Preoperative assessment and optimisation
- Preoperative equipment check
- Evaluation of the airway
- Preparation of workstation
- Securing a patent IV canula with appropriate IV fluids
- Techniques of preoxygenation
- Apnoeic oxygenation techniques
- Airway management including bag mask ventilation, nasal and oral airway placement, endotracheal intubation, supraglottic airway device placement.
- Securing and confirmation of the airway
- Securing a shared airway
- Monitoring of ventilatory parameters, gas parameters
- Extubation of normal and difficult airways
- Rapid sequence induction
- Difficult airway trolley
- Administer airway Anaesthesia for awake intubation
- preparation for awake intubation
- Management of Obstructed airway
- Use of videolaryngoscope
- Steps of Fiberoptic intubation through the oral and nasal route.
- Alternative methods of intubation/oxygenation including emergency cricothyroidotomy
- Follow the airway drill for can't intubate, can't oxygenate situation
- Placement and confirmation of double lumen tube (DLT)
- Anaesthetic technique for laryngoscopy, bronchoscopy, and tracheostomy
- Intubation using fiberoptic scope through the supraglottic airway device
- Elective trans-tracheal ventilation to support oxygenation
- Management of Complications of difficult airway
- Extubation of difficult airway
- Maintenance of depth of anaesthesia in the intraoperative period
- Maintaining homeostasis in the intraoperative period
- Smooth extubation
- Prevention and management of any complications

Regional Anaesthesia

Regional Anaesthesia is an integral component in Anaesthesia specialty. All postgraduates should acquire the technique of central neuraxial blockade with knowledge of other regional blocks as opportunity permits them.

Cognitive

Basic knowledge relevant to regional Anaesthesia including anatomy, physiology, and pharmacology

- Advantages, disadvantages, risk, benefits, indications, contraindications
- Physics involved in ultrasound imaging
- Effects, side effects and possible complications
- Anticoagulation and regional Anaesthesia
- Specific drugs depending on the pharmacological profile and patient profile
- Any additives to be added

Psychomotor

- Preoperative preparation and optimization
- Patent IV canula with IV fluids
- Central neuraxial blockade
 - Spinal Anaesthesia
 - Epidural block (all levels)
 - Combined spinal & epidural
 - caudal
- Major nerve blocks (landmark guided and peripheral nerve stimulator)-able to perform at least one method for upper and lower limb surgery respectively-
 - Brachial plexus
 - Sciatic
 - Femoral
- Minor nerve blocks (landmark guided)
 - Superficial cervical plexus block
 - Truncal blocks (intercostal, inguinal ,paravertebral, TAP block, penile)
 - Upper limb (axillary, elbow, wrist and digital)
 - Lower limb (popliteal, ankle and digital)
- Miscellaneous- airway blocks, ophthalmic blocks, topical blocks, intravenous regional Anaesthesia (IVRA), local infiltration and intra-articular.
- Recognition and management of complications and adverse effects of drugs used in regional Anaesthesia.
- Ultrasound in regional Anaesthesia:
 - Ability to apply proper pressure, alignment, rotation, tilting movement
 - Maintain proper ergonomics of patient, monitor and performer
 - Maintain alignment for in plane and out of plane techniques
 - Ability to identify blood vessels and to use needle visualisation pre-sets
 - Ability to highlight and reach the target, needle tip visualization
 - Ability to appreciate spread of drug
- Management of a patient receiving regional Anaesthesia (including sedation and supplement for GA)
- Management of a patient receiving regional blocks in the post operative period (post operative analgesia)

Monitored Anaesthesia Care

The postgraduate should be well versed with the knowledge of providing sedation for minor procedures in the OT and outside the OT as in endoscopy, electro convulsive therapy (ECT), cardiac catheterisation lab and MRI suite

Cognitive

- MRI compatibility and Anaesthesia
- Problem with ergonomics in NORA-endoscopy, MRI, cath lab
- Patient position and the complications associated like securing the airway
- Monitoring
- Selection of drugs
- Criteria for discharge using modified Aldrete's scoring
- Lack of trained manpower in NORA
- Radiation exposure in endoscopy, CT room and cath lab
- Lack of familiar environment- hence availability of the drug and placement of the same should be familiar

Psychomotor

- Preoperative assessment and optimization
- Airway management preparation
- Adequate monitoring
- Assessment of depth of anaesthesia
- Drug administration
- Management of complications during the procedure
- securing the airway in an emergency situation.
- management of complications
- Post procedure care and monitoring
- Follow the discharge criteria for shifting from recovery area to the ward

Post Anaesthesia care unit (PACU)

This is an extended part of the OT where proper monitoring and patient care is very essential by the postgraduates. Patients will be shifted to PACU after receiving any kind of Anaesthesia.

Cognitive

- Early warning signs in PACU, specific for that age group which are the following:
 - Airway compromise
 - Unresponsiveness
 - Respiratory depression/ apnea
 - Arrhythmia
 - Hypertension/ Hypotension
 - Tachycardia/ Bradycardia
 - Signs of haemorrhage
 - Post operative hypothermia
 - Post obstructive pulmonary oedema
- Assessing patient recovery and discharge criteria (using modified Aldrete's score) from PACU to the ward, ICU or home

Psychomotor

- Frequent monitoring as and when required depending on the patient and surgical requirement
- Assess the patient on arrival to PACU
 - Pain
 - Post operative nausea vomiting
 - Urinary retention/ Adequate urine output
 - Apnea/ respiratory depression
 - Airway obstruction -laryngo/bronchospasm
 - Unresponsiveness
 - Haemodynamic instability
 - Bleeding from the operative site
 - Delayed emergence from Anaesthesia
 - Post operative shivering
 - Emergence delirium
 - Fast tracking after day-care surgery

Intensive care unit

The postgraduate should be highly involved in the care of patients in ICU as the appropriate early diagnosis and management will improve the outcome.

Cognitive

- Identify the critically ill patients who require ICU care -for eg-shock, trauma, burns, poisoning, sepsis, metabolic etc.
- Infection control practices and control of nosocomial infections.
- Use of appropriate personal protective equipment
- Diagnose the cause of the critical situation using clinical and investigatory parameters
- Various antidotes for poisoning, symptomatic management and antivenom therapy
- Appropriate antibiotic policy to be followed
- Principles of oxygen therapy
- Interpretation of investigations
- Application of the scoring system
- Prognostication
- Appropriate use of inotropes, vasodilators, vasopressors along with their doses
- Interpretation of ABG and calculated correction of the abnormalities
- Interpretation of X Rays
- Knowledge about sterilization practices in ICU
- Electrolyte imbalance
- Prevention of bed sores
- Percutaneous tracheostomy
- Prevention of aspiration
- Transthoracic echocardiography
- Transesophageal echocardiography
- Extracorporeal membrane oxygenation (ECMO)
- Intra aortic balloon pump support

Psychomotor

- Justification and mastery in using various invasive and non-invasive monitoring parameters in ICU
 - Electrocardiogram
 - Non invasive blood pressure
 - Capnography
 - Pulse oximetry
 - Invasive arterial BP
 - Central venous pressure monitoring
 - Pulmonary artery pressure
 - Chest Ultrasonography
 - Repeated assessment in ICU using the various scoring systems and clinical and investigative methods to know the worsening or improvement of patient condition.
 - Ryles tube insertion
- Insertion of central venous lines and arterial lines as per the indications and follow protocols during insertion, analyse the data after insertion
- Asepsis during the invasive procedures and thereafter
- Managing hemodynamic instability using various inotropes
- Oxygen therapy,
 - invasive and non invasive ventilation
- Airway management including surgical airway (percutaneous tracheostomy)
- Management of postoperative complications
- Management of coagulopathies
- Glycaemic control
- Nebulisation
- Dilution of the drug and setting up of infusion
- Maintenance of acid base balance
- electrolyte correction
- Administration of nutritional support-enteral or parenteral

- Respiratory support as per the patient requirements- invasive and non-invasive ventilation, management of their complications
- weaning methods
- Management of fluid balance
- blood and blood components replacement.
- DVT prophylaxis
- Aseptic precautions
- Tracheostomy tube care
- Replacement of blocked ETT/tracheostomy tube
- Prevention and management of hypothermia

Acute and chronic pain management

The student is expected to know the pain pathway based on which the pain relieving technique and the drug is selected

Cognitive

Relevant anatomy of pain pathway and physiology of pain

- Classification of patients according to the type of pain
- WHO pain treatment ladder
- Different modalities of pain therapy
- Indications for stimulation techniques such as transcutaneous electrical nerve stimulation (TENS), dorsal column stimulation etc.
- Practice about the guidelines for various modalities of pain
- Drugs used in pain therapy along with their complications, routes of administration, dosages, escalation/ de-escalation
- Principles of cancer and noncancer pain management- phantom limb pain, post herpetic neuralgia, complex regional pain syndrome, trigeminal neuralgia, myofascial pain, lower back pain, burns, chronic pancreatitis, peripheral vascular diseases
- Radio frequency ablation
- Indications, contraindications, complications of nerve blocks and other treatment strategies
- Chronic pain syndromes
- Patient-controlled analgesia (PCA), implantable drug delivery pumps
- Basic principles of palliative care
- Interpretation of investigative modalities like CT, MRI
- Use of ultrasound, fluoroscopy, CT scan for performing the blocks

Psychomotor

- Assessment of patients (both adults and paediatrics) including history and clinical examination, analysis of investigations
- Practice different modalities of chronic pain management-physical therapy, psychotherapy, (including cognitive behavioural approaches) neuro ablation, neuro augmentation, spinal opioid, interventional neuro-blockade, non-opioid analgesia.
- Invasive procedures in pain management-peripheral nerve blocks, ganglionic blocks, central neuraxial blockade
- technique and complications of chemical sympathectomy (lumbar sympathectomy, stellate ganglion block, celiac block)
- Epidural steroid injection and catheterization

Non operating room anaesthesia (NORA)

NORA has gained importance in recent times as more number of procedures are done in this setting. Unfamiliar environment, people, gadgets, radiation hazards, lack of timely help and ergonomical issues increase the complications of providing anaesthesia in this setting. MRI suite, endoscopy suite, cath lab are few examples of common places which the postgraduate has to be familiar with

Cognitive

- Type/requirement of anaesthesia
- Risk factors involved

Psychomotor

- Assessment in the preoperative period and optimisation
- Monitoring in the intraoperative and postoperative period.
- Periodic assessment in the post operative period
- Precautions to prevent hazards of radiation

Certifiable skills

Perform the psychomotor skills required essential for anaesthesia practice

Demonstrate individually:

- IV cannulation
- Central line and arterial line placement
- Ryles tube insertion
- Endotracheal intubation
- Placement of supraglottic airway device
- Placement of double lumen tube
- Bag mask ventilation
- Lumbar puncture
- Epidural catheterisation
- Breaking bad news
- Taking consent
- Reading ECG

Demonstrate under supervision:

- Ultrasound guided blocks
- Ultrasound of the lungs
- Use of videolaryngoscope
- Intubation using fiberoptic bronchoscope
- Front of neck access

Departmental resources

1. Operating room of all the speciality and super specialty subjects with relevant gadgets
2. Intensive care unit
3. Endoscopy suites/ Cath lab/ CT/MRI room
4. Pain clinic
5. PAE clinic and postoperative ward
6. Skill and simulation centre
7. Most of the relevant equipment for PG teaching and learning- ultrasound, fiberoptic bronchoscope etc

Teaching and learning methods

The following are the salient features in teaching learning methodologies.

1. Teaching will include seminars, journal clubs, symposia, tutorials, case discussions and research presentations.
2. Training in skill & simulation centre
3. Foundation course -both with the cadavers and in simulation lab for 1st year postgraduates
4. Reviews and guest lectures.
5. Bedside teaching, interactive group discussions and clinical demonstrations
6. Students will have hands-on training in performing various anaesthetic procedures
7. Ability to interpret investigations.
8. Exposure to newer therapeutic/ diagnostic approaches will be given
9. A postgraduate is required to present one poster, to read one paper at a national / state conference and to present one research paper for publication (either sent/ accepted for publication) during the training period
10. Logbooks will be maintained and assessed periodically by the faculty members
11. E-learning activities will be encouraged.

- A. Lectures:** Topics in basic sciences, applied anaesthesia and recent advances are taught by faculty members.
- B. Practical training:** bedside training to acquire skills is very important in the practice of anaesthesiology
- Communication skills
 - Airway management
 - Regional blocks
 - Securing invasive lines
 - Few diagnostic modalities like ultrasonography
 - Monitoring
 - Management of complications
 - Management of ventilation
- C. Journal club:** Minimum of 1 journal club per month and topics will include presentation and critical appraisal of original research papers published in peer reviewed indexed journals. The presenter(s) shall be assessed by faculty and grades recorded in the logbook.
- D. Student Seminar:** Minimum of 4 seminars per month. A teacher will be allocated for each seminar as faculty moderator. The student should be graded by the faculty and peers.
- E. Student Symposium:** Once every 3 months. A broad topic of significance will be selected, and each part shall be dealt by one postgraduate student. A teacher moderator will be allocated for each symposium and moderator should track the growth of students. All participating postgraduates should be graded by the faculty and peers.
- E. Hands on training in skill lab:** Hands-on experience on various techniques and procedures in the skill lab
- F. Interdepartmental colloquium:** Quarterly meetings between departments on topics of current/common interest

Syllabus (Course content)

The syllabus is divided year wise where in the postgraduate is expected to start from the basics in the first year and learn the more complexities as he/she progress into the final year.

Year wise division of the syllabus:

Orientation- the first-year postgraduate will be given orientation to the OT, ICU and the subject of Anaesthesia. The candidate will be assigned thesis guides to help them prepare protocols. Introductory lectures will be delivered to familiarize the student with the basics of Anaesthesia practice.

First year

Objectives- the first-year postgraduate will be taught expertise in the management of ASA I and II patients. To start with they will observe and gradually become independent in giving general Anaesthesia and spinal Anaesthesia to ASA I and II patients for minor and major surgeries under supervision of a consultant. He/she will be oriented towards selection and confirmation of the dissertation by the guide.

1. History of Anaesthesia
2. Good understanding of human anatomy and physiology relevant to the practice of anaesthesia
3. General pharmacological principles and detailed knowledge of anaesthesia related drugs.
4. Biochemical alterations in the body along with their anaesthetic implications
5. Applied physics and use of equipment's in anaesthesia
6. Gas laws, medical gas pipeline systems

7. Theoretical and practical background of commonly used anaesthetic techniques of general and regional anaesthesia
8. IV canulation, bag mask ventilation, insertion of airways, use of supraglottic airway device, endotracheal intubation.
9. Importance of documentation and medicolegal aspects
10. Cardiopulmonary resuscitation
11. General principles of preoperative assessment and medication
12. Introduction to operation theatre, ICU, and post anaesthesia care unit (PACU)
13. BLS and ACLS
14. Recovery from anaesthesia
15. Theoretical background to common disorders of:
 - Cardiovascular system
 - Respiratory system
 - Renal system
 - Hepatobiliary system
 - Endocrine system
 - Pregnancy
 - Paediatrics
16. Oxygen therapy
17. Introduction to research methodology, basics of biostatistics, health economics, medical audit

Second year

The student will gain knowledge and skill to anaesthetize ASA grade I, II, III, IV patients, manage patients in ICU and expertise in minor pain procedure. Data collection for dissertation will be done actively by the postgraduate

1. Relevant anatomy of each system including anatomy for regional anaesthesia and nerve blocks
2. Pharmacology of drugs used in cardiovascular, respiratory, endocrine, renal diseases and CNS disorders
3. Sterilisation and disinfection of OT
4. Computers, utility, computer associated learning and data storage, computerised Anaesthesia records.
5. Introduction to research methodology, randomised clinical trials, basics of biostatistics.
6. Interpretation of arterial blood gases, and other relevant biochemical values, specific organ function tests and basics of measurement techniques.
7. Arterial cannula placement, central venous cannulation double lumen tube placement
8. Paediatric intubation
9. Epidural catheter placement, combined spinal epidural, caudal epidural
10. Principles of monitoring equipment used for assessment of:
 - Cardiac function
 - Temperature
 - Respiratory function
 - Intracranial pressure
 - Depth of Anaesthesia
 - Neuromuscular blockade
11. Working principles of ventilators/ pacemakers/ defibrillators/LASER
12. Special anaesthetic techniques as hypotensive Anaesthesia, Anaesthesia in extreme climatic condition
13. Anaesthesia for day care procedures
14. Massive blood transfusion and following massive transfusion protocols
15. Anaesthetic management in
 - Patients with systemic diseases
 - Emergency situations
 - ENT
 - Ophthalmology
 - Obstetrics and obstetric emergencies
 - Paediatrics and paediatric emergencies
 - Plastic surgery
 - Endoscopy procedures
 - Geriatric patients
 - Radio diagnostic procedures

- Radiotherapeutic procedures
 - Inherited metabolic diseases
16. Medical statistics relevant to data collection, analysis, comparison and estimation of significance.
17. Intensive care management in terms of:
- Principles of ICU care
 - Mass casualty, triage
 - Prevention of nosocomial infection
 - Transport of the critically ill
 - Airway management and care
 - Coagulation disorders
 - Principle and strategies of Ventilation
 - Shock-pathophysiology and management
 - Nutrition
 - Psychological support of the patient and the family
 - Infection, sepsis, MODS, ARDS
 - DVT and pulmonary embolism-treatment and prevention
 - Respiratory failure
 - Analgesia, anxiolysis, and sedation
 - Management of the unconscious patient
 - Management of postsurgical patients in ICU
 - Trauma-poly trauma, near drowning, burns, poisoning
 - Brain death
 - Organ donation
 - Antibiotics and immunotherapy
 - Monitoring in ICU
18. Care of terminally ill
19. Third world anaesthesia

Third year

The postgraduate should plan and administer Anaesthesia to all patients undergoing cardiac, neuro, paediatric, transplant surgeries under supervision by consultant. Dissertation should be completed and submitted six months prior to the theory examination. The main aim is to produce competent, reliable and independent anaesthesiologist at the end of the training period.

1. Anaesthesia for patients with severe cardiac, renal, respiratory, hepatobiliary disorders posted for unrelated surgeries
2. Anaesthetic management of neuro/ cardiac/ thoracic/ vascular/ transplantation/ burns and plastic surgery
3. Neonatal intubation.
4. Multiorgan failure management
5. Management of patients in shock, renal failure, critically ill, and / or on a ventilator
6. Chronic pain therapy and therapeutic nerve blocks.
7. Anaesthesia for patients with morbid obesity
8. Principles of one lung ventilation
9. Infection control, cross contamination in OT and ICU
10. Selection, maintenance, and sterilization of Anaesthesia related equipment's
11. Principles of neonatal resuscitation
12. General principles of medical audit, critical incident reporting
13. Ethics and clinical trial
14. Hospital, ICU and OT design and planning
15. Working principles in skill and simulation lab

Common course work

These are mandatory certificate courses to be completed within one year of commencement of the batch and the candidate is eligible for the university examination only on having the certificate as evidence of completing the course.

1. Course in Research methodology

The postgraduate is required to complete an online course on research methodology, registration being done through the portal of the designated training institution.

2. Course in Ethics

The postgraduate student shall complete the course in ethics of good clinical practices conducted by the institution, medical audit, management, health economics, health information system, basic statistics, exposure to human behaviour studies, knowledge of pharmacy.

3. Basic and advanced Cardiac Life Support

The post graduate student shall complete the course and get duly certified

• District Residency Program*

- Manuscript writing, literature search, podium presentation, telemedicine, use of pubmed and other resources.

4. Manuscript writing, literature search, podium presentation,

5.

Additional skills to be acquired in the non-clinical setting (skills laboratory, manikins, simulation lab) but also supported by clinical exposure of the same.

I Year:

1. BLS / ACLS
2. IV cannulation
3. Preanesthetic examination
4. Communication and Consent
5. Ryles tube insertion
6. Bag mask ventilation
7. Diagnosis based on ECG
8. Chest and cardiac auscultation
9. Monitoring under anaesthesia
10. Lumbar puncture
11. Basic airway management in adults including jaw thrust- chin lift maneuvers, nasopharyngeal and oropharyngeal airway insertion, bag mask ventilation, supraglottic airway insertion, laryngoscopy, and endotracheal intubation.
12. Basic ventilation management in ICU

II Year

1. Central venous cannulation
2. Intra-arterial cannulation
3. Epidural block+ combined spinal epidural block
4. Basic airway management in obstetrics and paediatrics
5. Nasal intubation
6. Ultrasound thorax
7. Non invasive ventilation
8. Management of shock
9. Management of tension pneumothorax
10. Management of laryngospasm, bronchospasm
11. Management of intraoperative arrhythmias, cardiac arrest
12. Management of hypotension following spinal anaesthesia
13. Management of local anaesthetic systemic toxicity (LAST)
14. Double lumen tube insertion
15. Peripheral nerve blocks(blind)
16. Simple pain procedures
17. District Residency Programme

III year

1. Trans Esophageal ECHO Cardiography (TEE)
2. Trans thoracic ECHO cardiography

18. Management of difficult airway- Advanced airway management in adults including fiberoptic bronchoscopy, videolaryngoscopy.
3. Complex pain procedures
4. Management of PPH
5. Advanced ventilatory management in ICU
6. Management of polytrauma
7. Front of neck access- Retrograde intubation, Cricothyroidotomy, Tracheostomy
8. Neonatal intubation
9. Ultrasound guided nerve blocks

Rotation of postgraduates

The postgraduates will be posted to the following areas by rotation for clinical exposure

1. Pre-Anaesthesia examination clinic
2. All specialty and super specialty theatres
3. Recovery and post Anaesthesia care area
4. Intensive care units
5. Pain clinic
6. Peripheral areas-endoscopy, radiology, cardiac catheterisation lab, ECT, CT, MRI

The suggested schedule of the OT can be as follows subject to availability of all the specialties:

Operation theatre	Months
General surgery	3
Urology	1
Ophthalmology	1
Otorhinolaryngology	2
Dental	1
Orthopaedics	3
Gynaecology	3
Obstetrics	3
Paediatric surgery	2
Burns/ plastic	1
CTVS	2
Neurosurgery	2
ICU	4
Pain	1
Recovery	1
District Residency Program*	3
Endoscopy / MRI / Cath lab / ECT	2

***District residency programme (DRP)**

Postgraduate shall undergo a compulsory residential rotation of three months in district hospital/ District health system as a part of the course curriculum in the 2nd year of postgraduation. The postgraduate is termed as the district resident.

Duties of the district resident

The district resident will work under the overall guidance of the district specialists and district residency programme coordinator (DRPC). He/she would be serving in the areas pertaining to their specialty and encompass night duties.

Monitoring during DRP is by logbooks, supportive supervision and continuous assessment of performance. Attendance and performance of district residents will be tracked by DRPC of the district and the respective college. The district resident will remain in contact with the pg teachers of the parent medical college by phone and e communication for all purposes and participate in academic activities. DRPC will issue certificate of satisfactory completion of DRP.

Dissertation

Objectives

1. The student should be able to acquire capability in research by planning and conducting systematic scientific enquiry and data analysis and deriving conclusions.
2. Scientific data should be implemented for health improvement and safer practices.

Guide for dissertation

1. Chief guide will be allocated from the Department of Anaesthesiology as per the eligibility criteria
2. Co-guides are selected from the department or from the department related to the topic of dissertation

Submission of synopsis/protocol

Synopsis of the dissertation will be submitted at the end of six months after admission to the course, in the format prescribed by the institute:

I. Synopsis in essence should consist of:

1. Introduction and objectives of the research project
2. Brief review of literature
3. Materials and methodology of work
4. Statistical analysis
5. Bibliography

II. The protocol should be presented before the department faculty prior to submission to the Institutional Research Committee (IRC) for approval

III. Protocol will be scrutinized by the IRC in terms of feasibility, statistical validity, ethical aspects etc.

IV. IRC will forward the synopsis to Institutional Human Ethics Committee (IHEC) for review

V. Following the approval by IHEC, the synopsis will be sent to external reviewers for reviewing.

VI. Once confirmation is obtained from external reviewers it is registered with the Clinical Trial Registry of India, following which the actual study is carried out.

Submission of dissertation

1. The dissertation will relate to the candidates own work on a specific research problem or a clinical case study in accordance with the approved plan
2. The dissertation shall be written in English printed or typed double spacing, on white bond paper 22x28 cm with a margin of 3.5 cm, bearing the matter on one side of paper only and neatly bound with the title, the name of the college and university printed on the format cover.
3. The dissertation shall have the following headings:
 - a. Introduction
 - b. Review of literature
 - c. Materials and methods
 - d. Observation
 - e. Discussion
 - f. Conclusion
 - g. Summary
4. References

Four copies of each dissertation shall be submitted to the Dean, through their respective Heads of Department not later than six months prior to commencement of subject specific theory exam.

5. Evaluation of dissertation

- a. The dissertation shall be referred by the University for evaluation to external reviewers appointed by the university. The dissertations will be evaluated and reported independently to the Controller of Examinations using Proforma for Dissertation Evaluation Form and recommend whether the dissertation is
 1. Accepted as submitted
 2. Accepted pending modifications as suggested
 3. Not accepted for reasons specified
- b. The dissertation shall be deemed to be accepted when it has been approved by at least two external reviewers (who are not the examiners for theory and practical examination), who will allocate marks from which an average will be taken.
- c. Acceptance of dissertation is a pre-requisite for his/ her admission to the theory, practical, viva voce examination. However, if the dissertation report from one or more of the reviewers is not received by the time the postgraduate is due for examination, he/she may be permitted

provisionally permitted to appear for the examination, but the result will be withheld till the report is received. If the dissertation is rejected, then the candidate in addition to writing a fresh dissertation, shall have to appear for the examination.

- d. Where improvements have been suggested by external reviewers, the candidate shall be required to re-submit the dissertation, after making the required improvements for evaluation.
- e. If the dissertation is rejected by one of the external reviewers, it shall be referred to another external examiner whose judgement shall be final for purposes of acceptance or rejection of the dissertation.
- f. If the dissertation is rejected by the reviewers, it is returned to the candidate who must re-write and submit as a fresh dissertation and processed
- g. A candidate whose dissertation is accepted, but fails in the examination, need to appear only in the subject examination without any re-submission of dissertation.

Log Book: Every student should maintain a logbook in which a record of the practical exercises completed, Seminars & journal clubs details, Conferences/ workshops/ CME details, teaching learning activities etc should be entered. The Log books shall be checked and assessed periodically by the faculty members imparting the training, duly scrutinized and certified by the head of the department and to be submitted to the external examiner during the final examination.

Assessment

Formative assessment will be done continually during the training programme, and it applies to medical knowledge, patient care, procedural and academic skills, interpersonal relationships, professionalism, self directed learning and ability to practice in the system. The student is assessed periodically as per categories listed in postgraduate appraisal form (Annexure I)

The Internal Assessment in theory and practical examination is conducted at the end of 1st, 2nd and 3rd year.

Periodic assessments during the MD training will be based on:

- Case presentation, case work up, case handling/management
- Assessment in skill lab
- Journal club
- Seminars
- Interdepartmental discussions
- Attendance at Scientific meetings, CME programmes (at least 02 each)

Summative assessment

Summative assessment is done at the end of training as per the postgraduate medical education regulations 2000.

The examinations will be organised based on grading or marking system to evaluate and to certify the student's level of knowledge, skill and competence at the end of training. obtaining a minimum 50%marks in theory as well as practical separately is mandatory for passing the examination.

Essential pre-requisites for appearing for examination include:

Eligibility criteria for university examination

Candidates will be eligible to appear for the university examinations after completion of three years with the following criteria:

1. Attendance of 80% per year
2. Submission of dissertation and acceptance by the reviewers
3. One research publication/acceptance letter
4. One poster and one podium presentation at national or regional conferences, pertaining to the subject as mentioned in the syllabus.
5. Completion of the log book

6. Certification of BLS/ ACLS course
7. Certification of basic course in biomedical research
8. Certification course in medical ethics
9. 3 formative assessments

University Examination pattern:

MD (Anaesthesiology) Examination	Theory	Practical	Viva-voce/ Pedagogy	Total
Maximum marks	400	200	100	700

Theory

4 papers-1 paper on each day-3 hours duration-100 marks each paper

2 long essays -20 marks each

3 short essays-10 marks each

6 short answers -5 marks each

Question papers are prepared based on the prescribed format as described in annexure 2

Paper I: Basic sciences as applied to anaesthesiology

- a) Anatomy
- b) Physiology
- c) Pharmacology
- d) Applied Physics
- e) Biochemistry
- f) Pathology
- g) History of anaesthesia
- h) Equipment used in anaesthesia including monitors
- i) Drugs used in anaesthesia

Paper II: Clinical practice of Anaesthesia:

- a) Neuroanaesthesia
- b) trauma
 - b) Paediatric anaesthesia
 - c) Obstetrics and gynaecology
- a) CVS
- b) RS
- c) Endocrine
- d) Obesity

Paper III: Clinical practice of Anaesthesia

- a) Gastro intestinal system
- b) Renal system
- c) ENT
- d) Ophthalmology
- e) Orthopaedics
- f) Geriatrics
- g) Plastic surgery
- h) Regional anaesthesia
- i) Airway management
- j) Hematology
- k) Dental anaesthesia

Paper IV: Intensive care medicine, Pain medicine and recent advances

- a) Critical care
- b) Post anaesthesia care unit
- c) Pain medicine
- d) Recent advances
- e) Bio statistics
- f) Simulation in anaesthesia
- g) Ultrasonography in anaesthesia
- h) Anaesthesia for organ procurement and transplantation
- i) Brain death
- j) Day care anaesthesia
- k) Non operating room anaesthesia
- l) Disaster management
- m) Patient care in extreme environment/ pressure and in space
- n) Robotic surgeries

Practical, viva voce, pedagogy

The practical examination is structured and consists of two sessions-morning and afternoon

- Morning-
 - 1 long case-30 min duration- history, examination, diagnosis, management and discussion-100marks
 - 2 short cases-15 min each- history relevant to Anaesthesia, clinical examination, diagnosis, discussion-50 marks each
- Afternoon
 - oral/ viva-voce conducted on four stations with one examiner on each station-20 marks each station
 - Station 1-ECG, X-Rays, ABG cards, Pulmonary function tests, Capnographs.
 - Station 2-Anaesthetic drugs, emergency drugs, IV fluids
 - Station 3- Anaesthesia machine including circuits and vaporizers, ETT, supraglottic airways, ICU ventilators, and oxygen therapy equipments
 - Station 4- Resuscitation equipment, demonstration of CPR, difficult airway equipment, monitors

Pedagogy -20 marks

Examiners- number of examiners will be 4- 2 externals and 2 internals.

Empanelling of the examiners will be done as per the rules and regulations of JSSAHER

Recommended reading:

Books (latest edition)

1. Lee's synopsis of Anaesthesia
2. Clinical Anaesthesia by Morgan
3. Cardiac Anaesthesia by Joel Kaplan
4. Clinical Anaesthesia by Barash, Cullen and Stoelting
5. Textbook of Anesthesia by Aitkenhead Rowbotham and Smith
6. Anaesthesia for neonates and infants by Smith
7. Pharmacology and Physiology for Anaesthetists by Craford
8. Principles of Obstetric Anaesthesia by Craford
9. Miller's Anaesthesia
10. Stoelting RK, Miller RD B Basics of Anaesthesia
11. ICU Book, Paul Marino
12. Textbook of Critical care, by Fink et al

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Annexure 2

Clinical Practice of Anaesthesiology

Time- 3 hours

Max. Marks-100

I. LONG ESSAYS

2 X 20 = 40 Marks

1. A two-day old infant with congenital hypertrophic pyloric stenosis is posted for pyloromyotomy. What are the likely biochemical abnormalities expected in this child? Explain in detail the optimization and management of this infant.
2. Explain in detail the anaesthetic management of a 25-year-old primi gravida 34 weeks gestation, known case of preeclampsia with BP of 160/100 mmHg now posted for Emergency LSCS.

II. Short Essays

3 X 10 = 30 Marks

3. Classify antiarrhythmic drugs. How would you treat a case of atrial tachycardia occurring during general anaesthesia?
4. Anaesthetic implications in obese patient.
5. Write in detail about lung compliance and bedside lung function test.

III. Short answers

6 X 5 = 30 Marks

6. Diastolic dysfunction.
7. Glasgow coma scale.
8. Thyroid storm.
9. Hypoxic pulmonary vasoconstriction.
10. Methods of ICP reduction in the intraoperative period.
11. Tests to evaluate autonomic dysfunction in diabetic patients.