ALL INDIA INSTITUTE OF MAEDICAL SCIENCES

KALYANI

DEPARTMENT OF ANAESTHESIOLOGY

AND CRITICAL CARE

Postgraduate Curriculum

Doctor of Medicine

Anaesthesiology

PREAMBLE

Anaesthesia services are an essential part of any hospital. Anaesthesiologists are skilled and primarily involve in Operation Theatre Services, Critical Care management of sick patients and any in-hospital medical emergencies. The Department of Anaesthesia and Intensive Care of AIIMS Kalyani has 2 faculties, 4 senior residents and 2 junior residents (non-academic) at present. We are gradually gaining our strength in-terms of manpower and infrastructure.

The department has a well-equipped Pre-Anaesthesia Check-up (PAC) clinic in the OPD complex for evaluation of surgical patients. Four operation theatres in the OPD complex are being equipped with the high-end anaesthesia workstation, defibrillator, infusion pumps, arterial blood gas analyser, patient warming system and other instruments to provide safe anaesthesia during surgery. Eighteen modular operation theatres are under construction in the IPD complex. Non-operating room anaesthesia (NORA) services are available in the 3T MRI room and a 10+13 bedded Intensive Care Unit in the in-patient department to provide critical care services.

In addition to the patient care and infrastructure development the department is also involved in academic activities for undergraduate medical students, nursing officers/students and operation theatre technicians. Seminars, Journal clubs and workshops are regularly conducted among senior residents and faculty members.

PROGRAMME GOALS

A post graduate specialist having undergone the required training in anesthesiology should be competent to handle effectively medical problems and should be aware of the recent advances pertaining to his/her specialty. She/he should be highly competent anesthesiologist with broad range of skills that will enable him/her to practice anesthesiology independently. The course content should ensure that the candidate not only acquires the necessary aptitude and motor skills to become a competent anaesthesiologist but should also learn the art of teaching Anaesthesiology to students, nurses and paramedical staff. She/he is also expected to know the principles of research methodology and modes of consulting library. She/he should attend conferences, workshops and CMEs regularly to upgrade his/her knowledge.

The PG training should have clear objective, is competency based, is well planned and evaluated, and is

supervised and delivered by well trained teachers. It should have special emphasis on attitude and behavior, safety, communication, presentation, audit, teaching, ethics and law and management.

SPECIFIC LEARNING OBJECTIVES

1. **Theoretical knowledge**: The student should have fair knowledge of basic sciences (Anatomy, Physiology, Biochemistry, Microbiology, Pathology, Pharmacology, Statistics and Physics) as applied to Anaesthesia. The student should acquire in-depth knowledge including recent advances. He/she should be fully conversant with the bedside procedures (diagnostic and therapeutic) and have knowledge of latest diagnostics and therapeutics procedures available including radiological methods.
2. **Teaching**: The student should learn the basic methodology of teaching and develop competence in teaching medical/paramedical students. The student should be familiar with the latest teaching (computer and power point presentation) modes including simulators training and evidence based medical education.
3. **Attitude development**: The student should develop attitude that leads to appropriate communication with colleagues to function in a group in Operating Room /Intensive Care Unit, and develop the ability to function as a leader in the operating room.

SPECIFIC COMPETENCIES

The student during the training program, should acquire the following competencies:

A. Cognitive domain:

1. A thorough knowledge of the pharmacokinetics and pharmacodynamics of anaesthetic drugs and adjuncts.
2. Knowledge of cardiovascular, respiratory neurological, hepatobiliary, renal and endocrine homeostasis and related drugs as relevant to patients undergoing anaesthesia.
3. Relevant anatomy, physiology and biochemistry.
4. A basic idea of the relevant physical principles involved in the construction and functioning of equipment used in anaesthesia and monitoring.

5. Knowledge to attain expertise of the commonly used techniques in general, regional and local anaesthesia.
6. A clear-cut concept of unconsciousness and its implications.
7. Relevant knowledge about chronic intractable pain and its management.
8. Relevant knowledge to manage patients in intensive therapy unit.
9. Relevant knowledge of medical Statistics
10. Knowledge & Expertise in Cardiopulmonary resuscitation

B. Affective Domain:

1. Should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.
2. Always adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to information and second opinion.
3. Develop communication skills to word reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and for effective teaching.

C. Psychomotor domain

At the end of the course, the student should acquire skills in the following broad areas and be able to:

1. Plan and conduct anaesthesia, recovery, and postoperative pain relief for elective and emergency surgery related to all surgical specialties.
2. Carry out basic life support (BLS) and advanced life support (ALS) and train medical and paramedical staff in BLS and ALS.
3. Manage unconscious patients: Airway management and long term management of unconscious patient.
4. Manage patients admitted to an intensive care unit.
5. Manage patients suffering from chronic intractable pain.
6. Organize the Hospital environment to manage mass casualty situation
7. Critically review and acquire relevant knowledge from the journals about the new development in the specialty.
8. Should be able to participate in anesthesia audit.

SYLLABUS

1st Year:

1) Anatomy –

i) Diaphragm, larynx and upper and lower airway

ii) Relevant, anatomy for regional anaesthesia and venous cannulations

iii) Anatomy of Orbit of the Eye, Base of skull, Vertebral Column, spinal cord, and meninges, axilla, 1st rib, Intercostal space etc.

2) Principles of physics and use of equipment in anaesthesia

i) Anaesthesia machine - checking the machine and assembly of necessary items.

ii) Airway equipment including tracheostomy. Equipment for airway management- mask, LMA, fibreoptic laryngoscopes; other devices like Combi tube etc.

iii) Breathing systems continuous flow systems, draw over system - Assembly and checking.

iv) Monitoring in Anaesthesia with concepts of minimal monitoring.

v) Safety in Anaesthesia Equipments.

vi) Medical gases - storage and central pipeline system.

3) Physiology

Theories of mechanism of production of anaesthesia,respiratory, cardiovascular, hepatobiliary, renal and endocrine system,pregnancy, blood groups, muscle & neuromuscular junction, ECG, regulation of temperature &metabolism, stress response, cerebral blood flow and ICP.

4) Pharmacology

i) General pharmacological principles.

ii) Concepts of pharmacokinetics and pharmacodynamics.Uptake and distribution of inhaled anaesthesia agents.

iii) Drugs used in Anaesthesia,

iv) Drugs used for treatment of diseases and interaction of these with anaesthetic agents.

5) Theoretical background of the commonly used anaesthetic techniques of general and regional anaesthesia.

i) GA - Intravenous, Inhalational, Endotracheal etc. using spontaneous and controlled mode of ventilation.

ii) RA - Spinal, epidural and local.

6) Biochemistry relevant to fluid balance & Blood Transfusions, Artificial Blood. & Perioperative fluid therapy. Acid base homeostasis in health and diseases.

7) Documentation and medico-legal aspects of anaesthesia. Stress the importance of accurate documentation.

8) Theoretical background on disorders of:

i) Cardiovascular system.

ii) Respiratory system

iii) Hepatobiliary system.

iv) Urinary system.

v) Endocrine system

vi) Pregnancy.

9) Cardiopulmonary Resuscitation; Theories of cardiac pump, thoracic pump Thoracic pump and defibrillation. Resuscitation of a patient with overdose of drug/poisons. Management of

unconscious patients. Resuscitation of a severely injured patient.
10) Neonatal resuscitation.
11) Introduction to Research methodology, Random clinical trials etc. Basics of biostatistics.
12) Preoperative assessments and medication - general principals.
13) Introduction to anatomical, physiological, pharmacological and biochemical aspects of pain and pain management.
14) Introduction to artificial ventilation.
15) Oxygen therapy
16) Introduction to the operation theatre, recovery rooms (concepts of PACU), ICU.
17) Recovery from anaesthesia.
18) Shock - pathophysiology, clinical diagnosis and management.
19) Pulmonary function tests - principles and applications.
20) Effect of positioning.

2nd Year

1) Relevant anatomy of each system
2) Physics of equipment used in anaesthesia Medical gases - gas plant, central pipeline Scavenging system. Reducing valves Anaesthesia machine, Humidifiers Flow meters Vaporizers - Characteristics and functional specifications. Breathing systems - Assembly, functional analysis, flow, Minimum monitoring standards requirements, APL and flow directional valves.
3) Sterilization of equipment.
4) Computers, Utility, computer assisted learning and data storage. Computerised anaesthesia records.
5) Pharmacology of drugs used in cardiovascular, respiratory endocrine, renal diseases and CNS disorders.
6) Acid-base and electrolyte balance and Interpretation of blood gases and other relevant biochemical values, various function tests and basics of measurement techniques,ECG.
7) Principles of monitoring equipment used for assessment of
i) Cardiac function viz. Rhythm, pulse, venous and arterial pressures, cardiac output,
ii) Temperature
iii) Respiratory function viz., Rate volumes, compliance, resistance, blood gases.
iv) Intracranial pressure,
v) Depth of anaesthesia
vi) Neuromuscular block.
8) Working principles of ventilators.
9) Special anaesthetic techniques as relevant to outpatient anaesthesia, hypotensive anaesthesia, anaesthesia in abnormal environments and calamitous situations.
10) Associated medical disorders in surgical patients - anaesthesia implications and management.
11) Anaesthetic management in special situations - Emergency, ENT, Ophthalmology, Obstetrics, Obstetric analgesia, Plastic, Dental, Radio-diagnosis and Radiotherapeutic procedures,paediatric, orthopaedic, geriatric anaesthesia and Day care anaesthesia .
12) Anaesthesia outside the OR and in special situation Principle of management in Trauma, disorders and mass casualties
13) Rural anaesthesia - anaesthesia for camp surgery.
14) Medical statistics relevant to data collection, analysis, comparison and estimation of significance.
15) Journal clubs.

3rd Year:

1. Anaesthesia for patients with severe cardiac, respiratory, renal and hepatobiliary disorders posted for unrelated surgery.
2. Principles of anaesthetic management of neuro/ cardiac/ thoracic / vascular/ Transplantation/ burn and plastic surgery.
3. Principles of neonatal ventilation and critical care.
4. Management of patients in shock, renal failure, critically ill and/or on ventilator.
5. Principles of one lung anaesthesia
6. Chronic pain therapy and therapeutic nerve blocks.
7. Selection, purchase, maintenance and sterilization of anaesthesia and related equipment.
8. Principles of human resources and material management.
9. General principles of medical audit

TEACHING AND LEARNING METHODS

1. Didactic lectures
2. Seminars, journal clubs, symposia, tutorials, case discussions, and research presentations.
3. Reviews and guest lectures.
4. Bedside teaching, grand rounds, interactive group discussions and clinical demonstrations for clinical/practical learning.
5. Hands-on training in performing various procedures (medical/surgical concerning his specialty) and ability to interpret various tests/investigations.
6. Exposure to newer specialized diagnostic/therapeutic procedures concerning his/her subject
7. A postgraduate student of a postgraduate degree course in broad specialties/super specialties would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which should be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.
8. Log books shall be maintained regularly and should be checked and assessed periodically by the faculty members imparting the training.
9. The postgraduate students shall be required to participate in the teaching and training program of undergraduate students and interns.
10. Department will encourage e-learning activities.
11. Simulators should be used for the events of high importance but infrequent occurrence and where there may be high risks to the patients. The simulators can also be used for assessment purposes.

Suggested Time Frame for Training the PG Students:

The student should be taught as per the following schedule to acquire the skills:

1. **First 6 months**:

- During the first 6 months, the student should be taught expertise in the management of uncomplicated cases not belonging to any super specialty (ASA I and II cases). To start with, the student will observe and slowly become independent in giving general anaesthesia and spinal anaesthesia to ASA I and II cases for minor and major surgery, under graded supervision.
- The postgraduate student should learn the basic principles of safe and effective anaesthesia, resuscitation, and both the prevention and treatment of pain, perioperative care of the surgical patient, care of handling equipments, basic techniques in anaesthesia, and anaesthetic pharmacology, and electrical safety.
- He/she should select the thesis topic and submit the protocol for his thesis.

Next 18 months

- The student should widen his experience and should be able to undertake anaesthetic care of all routine cases, assist in the anaesthetic care for routine obstetric practice, understand basic principles of critical care, pain management, and participate in audit.
- The student should be trained in administration of general anaesthesia and regional anaesthesia for ASA I to V under supervision. The student should be able to give extradural block (EDB) lumbar and thoracic, Spinal Block, and Peripheral Nerve Blocks under supervision, and use of Ultrasound machine for giving blocks and venous cannulation. The student should learn paediatric and trauma life supports and maintain skills for basic and advanced cardiac life support.

It is advised that they should be posted in the following specialties: general surgery including gastrointestinal surgery, transplant, ENT, Urology, Obstetrics, Dental Surgery, Eye, ICU, Pain Clinic and peripheral theatres like ECT, radiodiagnostic and therapeutic procedures (CT scan, MRI scan, angiography).

The student should be able to analyze data and write a thesis. He/she should be able to present scientific data.

Last 12 months

- Thesis should be submitted minimum of 6 months before the final MD examination.
- The post graduate student should be given experience of various super-specialties like cardiothoracic and vascular surgery, neurosurgery and transplantation, and paediatric surgery. The student should be able to plan and administer anaesthesia to all emergency patients under supervision including patients for Cardiac, Neurosurgery, Pediatric surgery, and for all major surgeries. The aim at the end is to be competent and independent soon after the third year of junior residency in providing anaesthesia to elective and emergency cases.
- The post graduate student should be able to manage critically ill patients and treat intractable pain. They should also know how to organize resources in case of mass casualty.

Rotation: Schedule for three years of MD Anaesthesia postings: The post graduate student should be exposed to the following areas of clinical anaesthesia practice:

1. Pre-anaesthesia clinic
2. Pain clinic
3. Recovery and Post anaesthesia Care Unit (PACU)
4. Intensive Care Units

5. Dialysis and transplant
6. All specialty theatres
7. Peripheral areas: Radiology, MRI, ECT and other interventional laboratories

The suggested schedule of the Operating Theatre can be as follows: This may change as per availability of specialties

S.No	Specialty	Duration (Months)
1.	General Surgery	5
2.	Urology	1
3.	Ophthalmology	1
4.	ENT	2
5.	Dental	1
6.	Orthopaedics/Trauma	3
7.	Obstetrics	3
8.	Gynaecology	3
9.	Paediatrics	2
10.	Burns/Plastic	1
11.	CTVS	2
12.	Neurosurgery	2
13.	ICU	3
14.	Pain	1
15.	Recovery	1
16.	Organ Transplant	1
17.	Peripheral Theatre (Radiology, Radiotherapy,ECT,Cath Lab)	2
18.	Elective	1

ASSESSMENT

Assessment is a vital part of any course and it is element where there is frequently considerable doubt. There are 2 major components:

A) Formative Assessment: Ongoing evaluation during the course – During each posting/ Module/ End Unit

B) Summative Assessment: Final assessment after 3 years and/at the end of each semester

A) Formative Assessment/ (Ongoing Evaluation)

Formative assessment will be conducted during each posting/module/unit. This will include the following:

I) Technical Skills Competency Evaluations:

Methods to be used

1) Performing anaesthetic management on real patients (check lists of each skill and competency including log book evaluation)
2) Simulators
3) Objective Structured Clinical Examination (OSCE)

This evaluation will be done either in the OT or ICU or PAC or Postoperative wards.

II) Problem Solving Cases:

Method to be used

1) Case presentations (evaluation by Peers)
2) Simulated case cards
3) OT discussions
4) OSCE

III) Attitude Development:

Method to be used

1) Ability to present seminars, discussion in class room (evaluation by Peers)
2) Talking to patients in pre-anaesthesia rounds
3) Operation theatre Management

IV) Cardiopulmonary Resuscitation:

Method to be used

1) Mannequins demonstration
2) Check lists for evaluation
3) OSCE

B)Summative Assessment (Final Assessment) and End Semester Assessment

I) Theory (Subject contents already outlined in curriculum)

Should consist of

a) Structured Essay Questions
b) Short Answer questions
c) Problem Solving Questions
d) Multiple choice Questions (MCQs).

Final Theory papers: 4 Papers

Paper I	Basic Sciences as applied to Anaesthesiology, including ethics, statistics, quality assurance, medicolegal aspects.	100 marks
Paper II	Anaesthesia in relation Associated Systems	100 marks
Paper III	Anaesthesia in relation to subspecialties such as cardiac, neuro, obstetrics and pediatrics etc.	100 marks
Paper IV	Intensive care Medicine, Pain Medicine and Recent advances in Anaesthesiology	100 marks

II) Practical

4 components: The practical examination should be structured and objective as possible

a) Clinical Cases

1 long case, 40 min, 100 marks
2 Short cases, 15 min each, 40 marks each

Structured Assessment (Long Case)

Total Marks - 100

1. Oral skills/presentation	10
2. Diagnosis/investigations	10
3. Preanaesthetic Preparation	20

4. Anaesthetic management	40
5. Post operative complications & management	20

b) OSCE: At least 10 OSCE stations with checklists 20 marks

c) VIVA-VOCE (Structured)

TOTAL MARKS: 200

Station 1 - ECG, X-rays, ABG Cards, Pulmonary function tests, Capnographs, clinical exercises card.	50
Station 2 - Anaesthetic Drugs, Emergency Drugs, IV Fluids, Nerve Bocks (skeleton)	50
Station 3 - Anaesthesia machine including circuits and Vaporizers, ETT, Supraglottic Airway devices, ICU Ventilator and oxygen therapy equipment.	50
Station 4 - Resuscitation equipments, resuscitation demonstration, Difficult Airway Equipment, monitoring equipments.	50

Total Marks

Theory (Papers 1-4) - 400 marks

Practical (Cases, OSCE, Viva Voce) - 400 marks

Grand Total - 800 marks

The candidate will be required to secure minimum 50% marks in theory and 50% marks in practicals andviva-voce separately, which is mandatory for passing the whole examination. Candidate failing in theorywill not qualify to take practical examinations.

THESIS

Objectives

1. The student would be able to demonstrate capability in research by planning and conducting systematic scientific inquiry & data analysis and deriving conclusion.
2. Communicate scientific information for health planning.

Guide for thesis

1. Chief guide will be from the department of Anaesthesiology
2. Co-guide(s) will be from the department or from other disciplines related to the thesis.

Submission of thesis protocol

It should be submitted at the end of six months after admission in the course.

-Protocol in essence should consist of:

a. Introduction and objectives of the research project.

b. Brief review of literature.

c. Suggested materials and methods, and (scheme of work)

d. Statistician should be consulted at the time of selection of groups, number of cases and method of study. He should also be consulted during the study.

e. Bibliography

- The protocol must be presented in the department of Anaesthesiology before being Forwarded to the Research Committee of the Institute.
- The protocol will be approved by the research committee appointed by the Dean/Principal to scrutinize the thesis protocol in references to its feasibility, statistical validity, ethical aspects, etc.

Submission of thesis

1. The thesis shall relate to the candidate own work on a specific research problem in accordance with the approved plan.

2. The thesis shall contain: Introduction, review of literature, material and methods, observations, discussions, conclusion and summary and reference as per index medicus.

3. Each candidate shall submit the thesis to the Dean, through Heads of the Departments, not later than six months prior to the date of commencement of theory examination in the subject.

Evaluation of thesis

1. The thesis shall be referred by the University evaluation to the examiners appointed by the University. The examiners will report independently to the Controller of Examinations and recommend whetherthe thesis is-

a) Approved
b) Returned for improvements as suggested or
c) Rejected

2. The thesis shall be deemed to have been accepted when it has been approved by atleast two externalexaminers and if the thesis is rejected by one of the external examiners it shall be referred to anotherexternal examiner (other than the one appointed for initial evaluation) whose judgement shall be finalfor purposes of acceptance or otherwise of the thesis.

3. Where improvements have been suggested by two or more of the examiners, the candidate shall be required to re-submit the thesis, after making the requisite improvements, for evaluation.

4. When a thesis is rejected by the examiners, it shall be returned to the candidate who shall have to write it again. The second thesis, as and when submitted shall be treated as a fresh thesis and processed.

5. Acceptance of thesis submitted by the candidate shall be a pre-condition for his/her admission to the written, oral and practical/clinical part of the examination. Provided that under special circumstances if the report from one or more examiners is not received by the time, the post-graduate examination is due, the candidate may be permitted provisionally to sit for the examination but the result be kept with held till the receipt of the report subject to thecondition that if the thesis is rejected then the candidate in addition to writing a fresh thesis, shall have to appear in the entire examination again.

6. A candidate whose thesis stands approved by the examiners but fails in the examination, shall not berequired to submit a fresh one if he/she appears in the examination in the same branch on a subsequentoccasion.

<u>Recommended Reading</u>

Books (latest edition)

1. Lee's Synopsis of Anaesthesia
2. Clinical Anesthesiology by Morgan
3. Miller's Anesthesia

4. A practice of Anaesthesia by Wylie and Churchill-Davidson
5. Clinical Anaesthesia by Barash, Cullen and Stoelting
6. Textbook of Anaesthesia by Aitkenhead Rowbotham and Smith
7. Anaesthesia for neonates and infants by Smith
8. Pharmacology and Physiology for Anaesthetists by Stoelting
9. Principles of Obstetric Anaesthesia by Craford
10. Basics of Anaesthesia by Pardo and Miller
11. ICU Book, Paul Marino
12. Text Book of Critical Care, by Fink et al
13. Regional Anaesthesia, P Prithviraj
14. Practical Management of Pain, Raj
15.Anaesthesia and Co-existing Disease by Stoelting and Dierdorf
16. Understanding Anaesthesia Equipments, Dorsch and Dorsch
17. ECG by Shamroth/Goldman
18. Anatomy for Anaesthetists by Harold Ellis
19. Clinical Anesthesia by P.G.Barash
20. LongneckersAnaesthesiology- Mcgraw Hill

Other reference books:

1. Cucchiara and Michenfelder: Clinical Neuroanaesthesia
2. Cottrell and Smith: Anaesthesia and Neurosurgery
3. Complications in Anaesthesiology by Orkin
4. Complications in Anaesthesia by Raven
5. Airway management by JL Benumof
6. Obstetric Anaesthesia by Chestnut
7. Cardiac Anaesthesia by Joel Kaplan

Journals

03-05 international Journals and 02 national (all indexed) journals