Curriculum

DrNB Super Specialty

Cardiac Anaesthesia

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I. GOALS AND OBJECTIVES OF THE PROGRAMME:

DrNB Cardiac Anaesthesia course is designed to train candidates in the principles and practice of Cardiac anesthesia and intensive care and also to function as faculty/consultant in Cardiac anesthesia along with perioperative, intensive care and pain management.

1. Programme Goal

i. To produce competent super specialist Anesthesiologists and to cater the need of the community.
ii. To be aware of contemporary advances and development in the discipline concerned.
iii. To practice at secondary and tertiary level of health care delivery system.
iv. To provide the expertise with special skills and intensive monitoring in perioperative period for the needy patients in super specialty departments.
v. To provide structured training programme including academic activities in the form of the catered training, lectures, case discussions, journal review and mortality – morbidity meeting and to improve the knowledge and skill in the specialty.
vi. The goals of educating the cardiac anesthesiologist are
vii. Mastery of the knowledge, skills, and techniques required to practice cardiac anesthesiology,
viii. A working knowledge of the principles and concepts that underlie the practice, and
ix. To acquire judgment, expertise, and the ability to be a consultant to those who seek advice outside and inside the discipline of anesthesiology. The student must also learn how to solve unforeseen problems and to answer important questions, in addition to mastering the technical skills and acquiring the available knowledge.

2. Programme Objectives

The objectives of the course are to impart thorough and comprehensive training to the candidate in the various aspects of this specialty to enable him/her:

i. To function as a member of faculty/consultant in the specialty
ii. To carry out and to help in conducting applied research in the field of cardiac anesthesia
iii. To plan and to set-up independent cardiac anaesthesia unit catering to cardiothoracic vascular surgery and intensive cardiac care and Cath Lab.

II. TEACHING AND TRAINING ACTIVITIES:

The fundamental components of the teaching programme should include:

1. Case presentations & discussion- once a week
2. Seminar – Once a week
3. Journal club- Once a week
4. Grand round presentation (by rotation departments and subspecialties)- once a week
5. Faculty lecture teaching- once a month
6. Clinical Audit-Once a Month
7. A poster and have one oral presentation at least once during their training period in a recognized conference.

The rounds should include bedside sessions, file rounds & documentation of case history and examination, progress notes, round discussions, investigations and management plan) interesting and difficult case unit discussions.

The training program would focus on knowledge, skills and attitudes (behavior), all essential components of education. It is being divided into theoretical, clinical and practical in all aspects of the delivery of the rehabilitative care, including methodology of research and teaching.

i. Theoretical: The theoretical knowledge would be imparted to the candidates through discussions, journal clubs, symposia and seminars. The students are exposed to recent advances through discussions in journal clubs. These are considered necessary in view of an inadequate exposure to the subject in the undergraduate curriculum.
ii. Symposia: Trainees would be required to present a minimum of 20 topics based on the curriculum in a period of three years to the combined class of teachers and students. A free discussion would be encouraged in these symposia. The topics of the symposia would be given to the trainees with the dates for presentation.
iii. Clinical: The trainee would be attached to a faculty member to be able to pick up methods of history taking, examination, prescription writing and management in rehabilitation practice.
iv. Bedside: The trainee would work up cases, learn management of cases by discussion with faculty of the department.
v. Journal Clubs: This would be a weekly academic exercise. A list of suggested Journals is given towards the end of this document. The candidate would

summarize and discuss the scientific article critically. A faculty member will suggest the article and moderate the discussion, with participation by other faculty members and resident doctors. The contributions made by the article in furtherance of the scientific knowledge and limitations, if any, will be highlighted.

vi. Research: The student would carry out the research project and write a thesis/ dissertation in accordance with NBE guidelines. He/ she would also be given exposure to partake in the research projects going on in the departments to learn their planning, methodology and execution so as to learn various aspects of research.

III. SYLLABUS:

1. General

i. History of Anaesthesia for cardiothoracic & vascular surgery
ii. Natural History of Cardiac & Pulmonary diseases
iii. Demography Diagnosis, Pre-Op. evaluation & Preparation for surgery

2. Basic Curriculum

i. Basic sciences include applied Anatomy, Physiology, Pharmacology, Physics, Biochemistry, microbiology, Coagulation studies.
ii. Monitoring
iii. Cardio Vascular diagnostic and therapeutic techniques
iv. Special consideration — Cardio pulmonary bypass
v. Drugs related to anaesthesia of CPB, Pharmacokinetics during CPB Pulmonary Life-Support — Advanced cardiac life support
vi. Infection Control
vii. Team work, Communication skills, Ethics, Medico legal Aspects of Cardio
viii. Thoracic and Vascular Anaesthesia and Documentation.

3. Operative Observations

i. Operative DIRECT CARE (Conduct of anaesthesia)
ii. Post-operative care and pain relief
iii. Research Projects/Exchange Programme with other Centers
iv. Examinations — Basic Sciences
v. (Theory and Practical) Clinical Practice of Anaesthesia, Allied Sciences & Recentadvances

Detailed Syllabus: Basic Sciences

1. Anatomy: Heart: Embryology, development of heart, pulmonary and vascular anatomy, coronary artery anatomy

2. Physiology:

i. Cardiac: Cellular Physiology, Haemodynamics, Role of Autonomic nervous system on Cardiovascular Function, Cardiac functions, Action Potential
ii. Cardiac rhythm
iii. Blood Physiology, Coagulation
iv. Acid Base and Electrolyte Balance
v. Pulmonary, Open & Closed chest ventilation. Ventilation / perfusion mismatch.
vi. Pulmonary airway mechanics, one lung ventilation.
vii. Thoracotomy and pulmonary physiology.
viii. Renal, Hepatic, CNS, Endocrine System, etc.
ix. Metabolic effects of surgery
x. Endocrine response to anaesthesia and surgery
xi. CBF, ICP, autoregulation
xii. PFT and Interpretation

3. Pathophysiology:

i. Shock, Heart & Hemodynamic failure, Congenital defects, COPD, Cardiopulmonary reserves, acquired cardiac & pulmonary diseases.
ii. Vascular pathology
iii. Immunological and metabolic response during CPB.
iv. Total Circulatory Arrest.
v. Altered Lung function, infection prevention, diagnosis and management.

4. Pharmacology:

i. Total circulatory arrest, Pharmacokinetics & Pharmacodynamics of Anaesthetic and Vasoactive drugs.
ii. Biochemical reactions and applied concepts.
iii. Drugs related to anaesthesia practice,
iv. Cardiovascular drugs.
v. Antibiotics for ICU use Bronchodilator.
vi. Antiarrhythmic drugs, nitric oxide.

5. Physics:

i. Basic principles, analyzing, measuring & monitoring devices and its role in interpretation of the results.
ii. Electronics, computing of patients data.
iii. Laser in cardiac surgery,
iv. robotic technique.
v. Equipment: Computer application, maintenance, Monitoring,
vi. use of Electronics in Documentation & analysis of data,
vii. Equipment in OT, Equipment for transport of patients,
viii. ICU equipment
ix. Physics for ECHO

6. Clinical Sciences

i. Anaesthesia for Cardio-thoracic & Vascular Surgery
ii. Anaesthesia for diagnostic procedures in adults & Paediatric age groups
iii. Anaesthesia for - Cardiac Surgery: For closed & Open heart surgery.
iv. Anaesthesia Vascular Surgery: Aortic surgery, carotid artery surgery.
v. Anaesthesia for Thoracic procedures.

7. Paediatric: Basic haemodynamics, palliative procedures, Pre-op. preparations & special care in monitoring, Fluid balance & airway management

i. Anaesthesia for neonatal simple & complex cardiac surgery
ii. Anaesthesia management for re-surgery
iii. Paediatric diagnostic procedures in Cath Lab & echocardiography
iv. Invasive therapeutic techniques like ASD devices, stent in major vessels, coil embolization.
v. Paediatric lung surgery.

8. Adult: Anaesthesia for ischemic heart disease, valvular heart disease, vascular disease, adult congenital heart surgery

i. Electrophysiological & Arrhythmia surgery. Heart transplant, heart lung transplant, ventricular assist devices
ii. Anaesthetic techniques for pulmonary surgery: Diagnostic & elective. Emergency procedures for lung surgery. One - Lung anaesthesia and Ventilation, Physiology (gas exchange & airway dynamics).
iii. Anaesthesia during emergency surgery and cases directly emerging from Cath Lab after Cath Lab complication.

iv. Anaesthesia in patients for diagnostic & palliative procedures in Cardiology, Radiology, Cath Lab (outside operative rooms). Invasive cardiology procedure.
v. Anaesthesia management of re-surgery.
vi. Management for Post Op. ventilation care, prolonged ventilation, weaning, Control of Pain - its techniques & agents. Postoperative pain management during ventilation care.
vii. PAC, Intra op. monitoring, Cardiac output and coagulation monitoring.
viii. Preoperative risk scores
ix. Heart & lung transplant
x. Acid base management (ph stat, alpha stat)

9. Cardiopulmonary Bypass:

i. Perfusion technology (principles, equipment, oxygenators, haemofiltration)
ii. Hypothermia, techniques & protocols
iii. Myocardial Protection
iv. Haemodilution
v. Anticoagulation, Pharmacology, Monitoring methods
vi. Side-effects, complications & management of CPB.
vii. Vital organ system care -cerebral, cerebral protection, cerebral monitoring, renal, hepatic protection.
viii. Total circulatory arrest, left heart bypass Anaesthesia management during CPB Pharmacokinetics & pharmacodynamics of drugs during CPB.

10. Intensive Care Management:

i. Protocols for sub-system care, cerebral, Renal, Hepatic & others.
ii. Ventilatory Care, weaning of Ventilatory support. Parenteral Nutrition, control of infection.
iii. Renal failure, bedside dialysis techniques
iv. Postoperative management of single ventricular repair
v. Hepatic failure
vi. ICU monitoring technique in postoperative pain management
vii. ICU Management, especially after neonatal surgery ventilatory support in neonates, ECMO programme for neonates and children
viii. Intensive coronary care
ix. Cerebral monitoring
x. NIV Nutrition
xi. Sepsis, ARDS, antibiotics, antifungals, poisoning with cardiothoracic drugs

11. Allied Sciences:

i. Relevant to practice of safe quality Cardiac Anaesthesia
ii. Cardiac Surgery: Surgical technique, curative surgery, Palliative procedures risk evaluation, Prognosis, Robotic surgery.
iii. Cardiology: Pre-op. evaluation, patho-physiology, Electrophysiology, Diagnostic Radiology Procedures-ECG, x-ray Angiography, Cardiac Cath. Echo-Cardiography, Nuclear studies, their interpretations & management Special procedures: Pacing, Cardioversion, PTCA, etc. Automated cardioverters, invasive procedures for arrhythmia i.e. ablation of abnormal pathway.
iv. Biotechnology: Various mechanical & electronic equip. Animal experiments, materials used for CPB techniques, VAD. IABP, Laser for TMR, ECMO
v. Statistics: Bio Statistics
vi. Research Methodologys
vii. Hospital Administration: Sterilization/Gas supply, equipment maintenance, ambient air control and infection control techniques in OT
viii. Microbiology-Infection control, prevention, diagnosis and management.

12. Monitoring in Anaesthesia: Invasive & Non-Invasive monitoring techniques for Peri -operative period

i. Understanding of basic concepts of monitoring
ii. Indications, cost effectiveness, complications
iii. Equipment usage & knowledge of accessories and their management Knowledge of the following monitoring:
iv. Cardiac functions: ECG, ABP, Ventricular Pressures, Calculation of cardiac output, Vascular resistance, Flow, Echo, Dopplers& (CAT, PET, NMR)
v. Pulmonary functions: PFT which includes Blood gases, Acid-base and Pulmonary Airway mechanics. Coagulation Profile, Temperature, renal, B. Sugar and other biochemical monitoring
vi. Neuromuscular blockade: Recent advances in monitoring. BIS cerebral oximetry, Evoked potential monitoring, CNS monitoring during CPB.
vii. NIRS- Near Infrared Spectroscopy for monitoring in Anesthesia

13. Recent Advances: Knowledge of recent developments in field of Cardio thoracic & Vascular surgery

i. Cardiology- PTCA, Balloon embolectomy etc.
ii. Heart - lung transplant - physiology, pharmacology (Anaesthetic consideration) - Donor - recipient Selection, Immunosuppression etc.
iii. Cardiac assist devices

iv. Artificial heart, IABP, LHAD
v. Advances Pulm. support - ECMO, High frequency Ventilation
vi. Blood substitutes
vii. Current advances and concepts in drugs, equipments, and monitoring methods
viii. Recent advances in Radiology, Cardio Thoracic Surgery, Cardiology, Cardio Pulmonary Bypass in relation to Perioperative care of the patient in Cardio Thoracic and Vascular Anaesthesia.
ix. Foetal cardiac surgery

14. Miscellaneous:

i. Cardiac Risk and Cardiovascular Testing.
ii. Cardiovascular Imaging.
iii. The Adult Cardiac Catheterization Laboratory: Diagnostic & Therapeutic Procedures.
iv. Cardiac Electrophysiology: Diagnosis & Treatment.
v. Cardiac Physiology
vi. Coronary Physiology and Atherosclerosis.
vii. Molecular and Genetic Cardiovascular Medicine.
viii. Systemic Inflammation.
ix. Pharmacology of Anesthetic Drugs.
x. Cardiovascular Pharmacology Section III MONITORING.
xi. Evolution of Echocardiography.
xii. Intraoperative Echocardiology.
xiii. Decision-Making and Perioperative Transesophageal Echocardiography.
xiv. Monitoring of the Heart and Vascular System.
xv. Electrocardiographic Monitoring.
xvi. Central Nervous System Monitoring.
xvii. Coagulation Monitoring.
xviii. Myocardial Revascularization.
xix. Valvular Heart Disease: Replacement and Repair.
xx. . Congenital Heart Disease in Adults.
xxi. Thoracic Aortic Surgery.
xxii. Uncommon Cardiac Diseases.
xxiii. Anesthesia for Heart and Lung Transplantation.
xxiv. Pulmonary Thromboendarterectomy.
xxv. Cardiac Pacing and Electroversion.
xxvi. Procedures in The Hybrid Operating Room.
xxvii. New Approaches to the Surgical Treatment of End-Stage Heart Failure.

xxviii. Management of Cardiopulmonary Bypass and Organ Protection.
xxix. Update on Extracorporeal Devices & Related Technologies.
xxx. Fluid & Blood Management During Cardiac Surgery.
xxxi. Coagulation Disorders and Cardiac Surgery.
xxxii. Discontinuing Cardiopulmonary Bypass.
xxxiii. Postoperative Cardiac Recovery and Outcomes.
xxxiv. Postoperative Cardiovascular Management.
xxxv. Postoperative Respiratory Care.
xxxvi. Central Nervous System Dysfunction.
xxxvii. Long-term Complications and Management.
xxxviii. Pain Management for the Postoperative Cardiac Patient
xxxix. Basic Life Support.
xl. Advanced Cardiac Life Support
xli. End of life care
xlii. Declaration of brain death
xliii. Management of organ donation
xliv. Regional anaesthesia for cardiothoracic and vascular procedures
xlv. Cardiac and thoracic trauma
xlvi. Bronchoscopy
xlvii. History- Cardiac Anaesthesia, cardiac surgery, ECMO, cardiology

15. Postings:

i. The posting is so designed that the trainee gets posted in various areas of the department, including operation theatre, postoperative ICU, Intensive coronary care unit, Cath. Lab, echo room, and cardiothoracic surgery department.

ii. Purpose of rotation in Cardiac Surgery is to understand overall patient management and to develop and improve perspective on Cardiac Anaesthesia Services. He or she will be learning invasive cardiovascular diagnostic and therapeutic procedures done in Cath Lab and emergency services from viewpoint of Cardiac Anaesthesia.

iii. The Trainee will participate in regular Joint Preoperative Meetings and discussions with Cardiac Surgeons, Cardiologists, Pediatricians, Physiotherapists, Nurses and Physicians for better patient management.

iv. Besides this a programme for invasive monitoring demonstrations, seminars, workshops, journal club will also be organized. In addition, soft skills: working in team, communication skills, leadership skills, ethics, techniques of documentation and knowledge of medico legal aspects will also be required to develop.

Period of Posting in Various Units The trainee will be posted in different specialties and during of this posting will be as following:

Cardiac anaesthesia 2 years

CTVS	3 months
Cath Lab	2 months
Echo lab	1 month
ICCU	1 month
Paediatric ICU	1 month
Research experience	1 month (optional)
Perfusion	15 days
Post op cardiac surgical ICU	2 months

Elective posting 3 months to learn recent techniques (to go to other centers, national or international)

Intensive Coronary Care Unit During their posting in CCU for one month, the candidate is required to attend the CCU rounds and to learn for himself the coronary intensive care in addition to the ventilatory care.

Topics to be included in all subjects:

Biostatistics, Research Methodology and Clinical Epidemiology

Ethics

Medico legal aspects relevant to the discipline

Health Policy issues as may be applicable to the discipline

IV. COMPETENCIES (SKILLS CARDIOVASCULAR ANESTHESIA):

1. Goals

i. Understand cardiac physiology. Develop knowledge of cardiovascular anaesthesia (anaesthesia for the patient with cardiovascular disease). Choose appropriate anaesthetic techniques for patients with different types of cardiovascular disease and the skills for lifelong continuing education.

ii. Develop technical and monitoring skills necessary for cardiovascular anaesthesia

iii. Administer anaesthesia for a wide variety of cardiothoracic Cases and develop interest in further Learning.

iv. Perform a thorough preoperative assessment of the patient undergoing cardiovascular surgery.

v. Know intraoperative anaesthetic management for the patient undergoing cardiopulmonary bypass. Know how cardiopulmonary bypass is instituted and discontinued Understand cardiopulmonary bypass and discuss the mechanical aspects of it as follows:
   a. Different types of pumps - pulsatile and nonpulsatile
   b. Physiology of hypothermia and cardiac and cerebral protection
   c. Effects of bypass on volumes of distribution and clearance of anaesthetic drugs and anaesthetic maintenance, including amnesia

2. Objectives

i. Know how and why to use of inotropic support, vasodilators, and antiarrhythmic drugs that may be necessary before but are especially necessary after cardiopulmonary bypass
ii. Develop and understanding of the major issues involved in the perioperative care of the child with congenital heart disease
iii. Insert vascular catheters or cannulas for adult and paediatric patients and obtain measurements from them as follows:
   a. Arteries Internal jugular vein and the subclavian vein Pulmonary artery (Swan-Ganz) catheters and initiate appropriate therapy in response to changes in the following pulmonary artery (PA) variables:
      - Waveform
      - Normal tracing
      - Pathologic tracing
      - Pulmonary artery wedge tracings
      - Mixed venous oxygen saturation
      - Thermomodilution cardiac output observe/know about a Transesophagealechocardiograpy (TEE) probe and interpret TEE images
iv. Manage care during cardiac surgery as follows:
   a. Blood replacement
   b. Monitoring the effect of heparin
   c. Postcardiopulmonary bypass coagulopathy Rationale for various therapies such as aprotinin designed to prevent Coagulopathy
v. Know following procedures and anaesthetic implications:
   a. Aortic repairs
   b. Congenital repairs - paediatric
   c. Coronary artery bypass grafting and valves - adults
   d. Electrophysiology
   e. Thoracic surgery

f. Transplantation - heart and lungs

vi. Work as a team member with fellow anaesthesiologists, surgeons, perfusionists, and nurses

vi. Maintain good clinical judgment under stress and act quickly and accurately in diagnosis, interpretation, and treatment of intraoperative problems Evaluation to Determine Goal Achievement

vii. Non Invasive cardiac output monitoring- various techniques.

V. LOG BOOK:

A candidate shall maintain a log book of operations (assisted / performed) during the training period, certified by the concerned post graduate teacher / Head of the department / senior consultant.

This log book shall be made available to the board of examiners for their perusal at the time of the final examination.

The log book should show evidence that the before mentioned subjects were covered (with dates and the name of teacher(s) The candidate will maintain the record of all academic activities undertaken by him/her in log book.

1. Personal profile of the candidate
2. Educational qualification/Professional data
3. Record of case histories
4. Procedures learnt
5. Record of case Demonstration/Presentations
6. Every candidate, at the time of practical examination, will be required to produce performance record (log book) containing details of the work done by him/her during the entire period of training as per requirements of the log book. It should be duly certified by the supervisor as work done by the candidate and countersigned by the administrative Head of the Institution.
7. In the absence of production of log book, the result will not be declared.

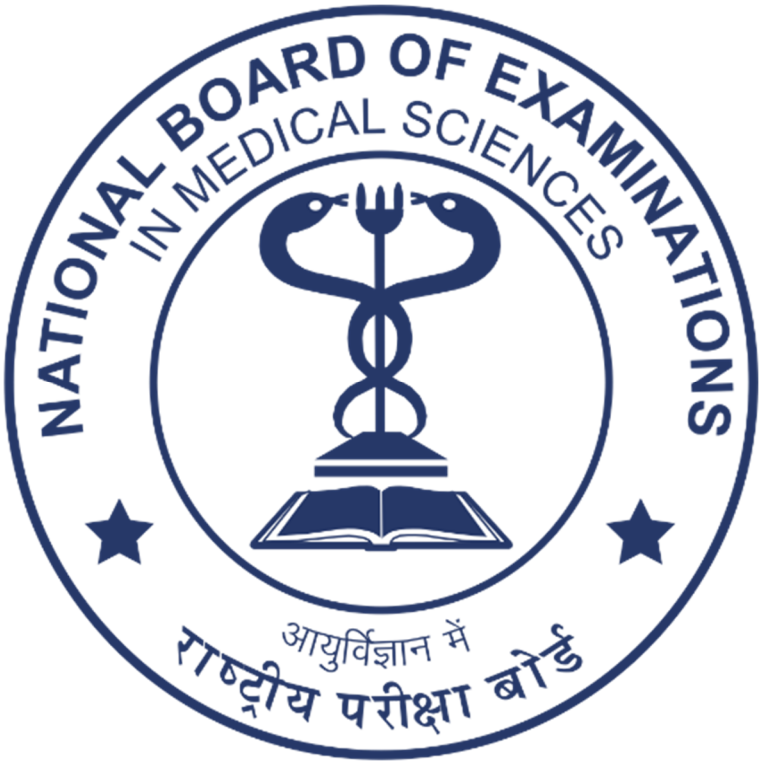
VI. RECOMMENDED TEXT BOOKS AND JOURNALS

List of Books

1. A Practical Approach to Cardiac Anesthesia, 3rd edition, Edited by Frederick A.Hensley, Jr., M.D., Donald E. Martin, M.D., Glenn P. Gravlee, M.D.
2. Kaplan's Cardiac Anesthesia- 7th edition- Elsevier
3. Oxford Textbook of Cardiothoracic Anaesthesia- R Peter Alston; Paul
4. Textbook of Critical care – Dr. Yatin Mehta, Jaypee Brothers
5. Paediatric Cardiac Anaesthesia- Dr Carol Lake
6. Comprehensive Textbook of Perioperative Transesophageal Echocardiography- Dr. Robert M.Savage
7. Anesthetic Management of Cardiac Surgery Maintenance.../C Scheeren.
8. Essentials of Cardiac Anesthesia- by Joel A. Kaplan,M.D.
9. Review of Cardiac Anesthesia with 2100 MCQs…Poonam Malhotra Kapoor
10. Cardiac Anaesthesia Principles and clinical practice by Fawzy G and Entafanous.
11. Cardiac Anaesthesia : A Practical Handbook: NianChih Hwang
12. Manual of Cardiac Anaesthesia –Jan L. Kramer
13. Cardiac and Vascular Anesthesia: The Requisites (Requisites in Anesthesia) hardcover-**28 May 2004 by Jacqueline Leung (Author)**

List of Journals

1. Journal of Cardiothoracic and Vascular Anesthesia
2. Cardiothoracic Anesthesia
3. Annals of Cardiac Anesthesia
4. Seminars in Cardiothoracic and Vascular Anesthesia
5. The Egyptian Journal of Cardiothoracic Anesthesia
6. Indian Heart Journal
7. Indian Journal of Cardiac Surgery



आयुर्विज्ञान में राष्ट्रीय परीक्षा बोर्ड

स्वास्थ्य एवं परिवार कल्याण मंत्रालय, भारत सरकार

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