

Guidelines
for
Competency Based Training Programme
in
DNB- Cardiac Anaesthesia



NATIONAL BOARD OF EXAMINATIONS

Medical Enclave, Ansari Nagar, New Delhi-110029, INDIA
Email: mail@natboard.edu.in Phone: 011 45593000

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PREAMBLE

DNB 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.

PROGRAMME GOAL

1. To produce competent super specialist Anesthesiologists and to cater the need of the community.
2. To be aware of contemporary advances and development in the discipline concerned.
3. To practice at secondary and tertiary level of health care delivery system.
4. To provide the expertise with special skills and intensive monitoring in perioperative period for the needy patients in super specialty departments.
5. 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.

The goals of educating the cardiac anesthesiologist are

- (a) Mastery of the knowledge, skills, and techniques required to practice cardiac anesthesiology,
- (b) A working knowledge of the principles and concepts that underlie the practice, and
- (c) 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.

PROGRAMME OBJECTIVES

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

- (a) To function as a member of faculty/consultant in the specialty

(b) To carry out and to help in conducting applied research in the field of cardiac anesthesia

(c) To plan and to set-up independent cardiac anaesthesia unit catering to cardiothoracic vascular surgery and intensive cardiac care and Cath Lab.

ELIGIBILITY CRITERIA FOR ADMISSIONS TO THE PROGRAMME

(A) DNB Cardiac Anaesthesia Course:

1. Any medical graduate with ***DNB/MD (Anesthesiology)*** qualification ,who has qualified the ***Entrance Examination*** conducted by NBE and fulfill the eligibility criteria for admission to DNB ***Super Specialty*** courses at various NBE accredited Medical Colleges/ institutions/Hospitals in India is eligible to participate in the Centralized counseling for allocation of DNB Cardiac Anaesthesia seats purely on merit cum choice basis.
2. Admission to 3 years DNB Cardiac Anaesthesia course is only through ***Entrance Examination*** conducted by NBE and Centralized Merit Based Counseling conducted by National Board of Examination as per prescribed guidelines.

Duration of Course:

3 Years

Every candidate admitted to the training programme shall pursue a regular course of study (on whole time basis) in the concerned recognized institution under the guidance of recognized post graduate teacher for assigned period of the course.

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.

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.

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.

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.

Bedside: The trainee would work up cases, learn management of cases by discussion with faculty of the department.

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.

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.

SYLLABUS

GENERAL

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

BASIC CURRICULUM

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

Operative Observations

- Operative DIRECT CARE (Conduct of anaesthesia)
- Post-operative care and pain relief
- Research Projects/Exchange Programme with other Centers
- Examinations — Basic Sciences

(Theory and Practical) Clinical Practice of Anaesthesia ,Allied Sciences & Recent advances

Detailed Syllabus :

I. BASIC SCIENCES

ANATOMY:

- Heart: Embryology, development of heart, pulmonary and vascular anatomy, coronary artery anatomy

PHYSIOLOGY:

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

PATHOPHYSIOLOGY :

- Shock, Heart & Hemodynamic failure, Congenital defects, COPD, Cardiopulmonary reserves, acquired cardiac & pulmonary diseases.
- Vascular pathology

- Immunological and metabolic response during CPB.
- Total Circulatory Arrest.
- Altered Lung function, infection prevention,, diagnosis and management.

PHARMACOLOGY :

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

PHYSICS :

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

II. CLINICAL SCIENCES

- Anaesthesia for Cardio-thoracic & Vascular Surgery:

- Anaesthesia for diagnostic procedures in adults & Paediatric age groups
- Anaesthesia for - Cardiac Surgery: For closed & Open heart surgery.
- Anaesthesia Vascular Surgery: Aortic surgery, carotid artery surgery.
- Anaesthesia for Thoracic procedures.

PAEDIATRIC:

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

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

ADULT :

Anaesthesia for ischemic heart disease, valvular heart disease, vascular disease, adult congenital heart surgery

- Electrophysiological & Arrhythmia surgery. Heart transplant, heart lung transplant, ventricular assist devices
- Anaesthetic techniques for pulmonary surgery: Diagnostic & elective. Emergency procedures for lung surgery. One - Lung anaesthesia and Ventilation, Physiology (gas exchange & airway dynamics).
- Anaesthesia during emergency surgery and cases directly emerging from Cath Lab after Cath Lab complication.
- Anaesthesia in patients for diagnostic & palliative procedures in Cardiology, Radiology, Cath Lab (outside operative rooms). Invasive cardiology procedure.
- Anaesthesia management of re-surgery.

- Management for Post Op. ventilation care, prolonged ventilation, weaning, Control of Pain - its techniques & agents. Postoperative pain management during ventilation care.
- PAC, Intra op. monitoring, Cardiac output and coagulation monitoring.
- Preoperative risk scores
- Heart & lung transplant
- Acid base management (ph stat, alpha stat)

CARDIOPULMONARY BYPASS:

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

INTENSIVE CARE MANAGEMENT:

- Protocols for sub-system care, cerebral, Renal, Hepatic & others.
- Ventilatory Care, weaning of Ventilatory support. Parenteral Nutrition, control of infection.
- Renal failure, bedside dialysis techniques
- Postoperative management of single ventricular repair
- Hepatic failure

- ICU monitoring technique in postoperative pain management
- ICU Management, especially after neonatal surgery ventilatory support in neonates, ECMO programme for neonates and children
- Intensive coronary care
- Cerebral monitoring
- NIV Nutrition
- Sepsis, ARDS, antibiotics, antifungals, poisoning with cardiothoracic drugs

III ALLIED SCIENCES

- Relevant to practice of safe quality Cardiac Anaesthesia
- Cardiac Surgery: Surgical technique, curative surgery, Palliative procedures risk evaluation, Prognosis, Robotic surgery.
- 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.
- **Biotechnology** : Various mechanical & electronic equip. Animal experiments, materials used for CPB techniques, VAD. IABP, Laser for TMR, ECMO
- **Statistics** : Bio Statistics
- **Research Methodology**
- **Hospital Administration** : Sterilization/Gas supply, equipment maintenance, ambient air control and infection control techniques in OT
- **Microbiology**-Infection control, prevention, diagnosis and management.

Monitoring in Anaesthesia:

Invasive & Non-Invasive monitoring techniques for Peri -operative period

- Understanding of basic concepts of monitoring

- Indications, cost effectiveness, complications
- Equipment usage & knowledge of accessories and their management

Knowledge of the following monitoring:

- Cardiac functions : ECG, ABP, Ventricular Pressures, Calculation of cardiac output, Vascular resistance, Flow, Echo, Dopplers & (CAT, PET, NMR)
- Pulmonary functions : PFT which includes Blood gases, Acid-base and Pulmonary Airway mechanics. Coagulation Profile, Temperature, renal, B. Sugar and other biochemical monitoring
- Neuromuscular blockade : Recent advances in monitoring. BIS cerebral oximetry, Evoked potential monitoring, CNS monitoring during CPB.
- NIRS- Near Infrared Spectroscopy for monitoring in Anesthesia

RECENT ADVANCES:

Knowledge of recent developments in field of Cardio thoracic & Vascular surgery

- Cardiology- PTCA, Balloon embolectomy etc.
- Heart - lung transplant - physiology, pharmacology (Anaesthetic consideration) - Donor - recipient Selection, Immunosuppression etc.
- Cardiac assist devices
- Artificial heart, IABP, LHAD
- Advances Pulm. support - ECMO, High frequency Ventilation
- Blood substitutes
- Current advances and concepts in drugs, equipments, and monitoring methods
- 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.
- Foetal cardiac surgery

MISCELLANEOUS:

1. Cardiac Risk and Cardiovascular Testing.
2. Cardiovascular Imaging.
3. The Adult Cardiac Catheterization Laboratory: Diagnostic & Therapeutic Procedures.
4. Cardiac Electrophysiology: Diagnosis & Treatment.
5. Cardiac Physiology.
6. Coronary Physiology and Atherosclerosis.
7. Molecular and Genetic Cardiovascular Medicine.
8. Systemic Inflammation.
9. Pharmacology of Anesthetic Drugs.
10. Cardiovascular Pharmacology Section III MONITORING.
11. Evolution of Echocardiography.
12. Intraoperative Echocardiology.
13. Decision-Making and Perioperative Transesophageal Echocardiography.
14. Monitoring of the Heart and Vascular System.
15. Electrocardiographic Monitoring.
16. Central Nervous System Monitoring.
17. Coagulation Monitoring.
18. Myocardial Revascularization.
19. Valvular Heart Disease: Replacement and Repair.
20. Congenital Heart Disease in Adults.
21. Thoracic Aortic Surgery.
22. Uncommon Cardiac Diseases.
23. Anesthesia for Heart and Lung Transplantation.
24. Pulmonary Thromboendarterectomy.
25. Cardiac Pacing and Electroversion.
26. Procedures in The Hybrid Operating Room.
27. New Approaches to the Surgical Treatment of End-Stage Heart Failure.
28. Management of Cardiopulmonary Bypass and Organ Protection.
29. Update on Extracorporeal Devices & Related Technologies.
30. Fluid & Blood Management During Cardiac Surgery.
31. Coagulation Disorders and Cardiac Surgery.
32. Discontinuing Cardiopulmonary Bypass.
33. Postoperative Cardiac Recovery and Outcomes.
34. Postoperative Cardiovascular Management.
35. Postoperative Respiratory Care.
36. Central Nervous System Dysfunction.
37. Long-term Complications and Management.
38. Pain Management for the Postoperative Cardiac Patient
39. Basic Life Support.
40. Advanced Cardiac Life Support
41. End of life care
42. Declaration of brain death
43. Management of organ donation

- 44. Regional anaesthesia for cardiothoracic and vascular procedures
- 45. Cardiac and thoracic trauma
- 46. Bronchoscopy
- 47. History- Cardiac Anaesthesia, cardiac surgery, ECMO, cardiology

POSTINGS:

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

Competencies (SKILLS CARDIOVASCULAR ANESTHESIA):

I. Goals

A. 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.

B. Develop technical and monitoring skills necessary for cardiovascular anaesthesia

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

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

E. 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:

1. Different types of pumps - pulsatile and nonpulsatile
2. Physiology of hypothermia and cardiac and cerebral protection
3. Effects of bypass on volumes of distribution and clearance of anaesthetic drugs and anaesthetic maintenance, including amnesia

II. Objectives

A. 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

B. Develop and understanding of the major issues involved in the perioperative care of the child with congenital heart disease

C. Insert vascular catheters or cannulas for adult and paediatric patients and obtain measurements from them as follows:

1. 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:
 - a. Waveform
 - b. Normal tracing

- c. Pathologic tracing
- d. Pulmonary artery wedge tracings
- 2. Mixed venous oxygen saturation
- 3. Thermomodulation cardiac output observe/know about a Transesophageal echocardiography (TEE) probe and interpret TEE images

D. Manage care during cardiac surgery as follows:

- 1. Blood replacement
- 2. Monitoring the effect of heparin
- 3. Postcardiopulmonary bypass coagulopathy Rationale for various therapies such as aprotinin designed to prevent Coagulopathy

E. Know following procedures and anaesthetic implications:

- 1. Aortic repairs
- 2. Congenital repairs - paediatric
- 3. Coronary artery bypass grafting and valves - adults
- 4. Electrophysiology
- 5. Thoracic surgery
- 6. Transplantation - heart and lungs

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

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

G. Non Invasive cardiac output monitoring- various techniques

THESIS PROTOCOL & THESIS

The candidates are required to submit a thesis at the end of three years of training as per the rules and regulations of NBE.

Guidelines for Submission of Thesis Protocol & Thesis by candidates

Research shall form an integral part of the education programme of all candidates registered for DNB degrees of NBE. The Basic aim of requiring the candidates to write a thesis protocol & thesis/dissertation is to familiarize him/her with research methodology. The members of the faculty guiding the thesis/dissertation work for the candidate shall ensure that the subject matter selected for the thesis/dissertation is **feasible, economical and original**.

Guidelines for Thesis Protocol

The protocol for a research proposal (including thesis) is a study plan, designed to describe the background, research question, aim and objectives, and detailed methodology of the study. In other words, the protocol is the 'operating manual' to refer to while conducting a particular study.

The candidate should refer to the NBE Guidelines for preparation and submission of Thesis Protocol before the writing phase commences. The minimum writing requirements are that the language should be clear, concise, precise and consistent without excessive adjectives or adverbs and long sentences. There should not be any redundancy in the presentation.

The development or preparation of the Thesis Protocol by the candidate will help her/him in understanding the ongoing activities in the proposed area of research. Further it helps in creating practical exposure to research and hence it bridges the connectivity between clinical practice and biomedical research. Such research exposure will be helpful in improving problem solving capacity, getting updated with ongoing research and implementing these findings in clinical practice.

Research Ethics: Ethical conduct during the conduct and publication of research is an essential requirement for all candidates and guides, with the primary responsibility of ensuring such conduct being on the thesis guide. Issues like Plagiarism, not maintaining the confidentiality of data, or any other distortion of the research process will be viewed seriously. The readers may refer to standard documents for the purpose.

The NBE reserves the right to check the submitted protocol for plagiarism, and will reject those having substantial duplication with published literature.

PROTOCOL REQUIREMENTS

1. All of the following will have to be entered in the online template. The thesis protocol should be restricted to the following word limits.
 - Title : 120 characters (with spacing) page
 - Synopsis [structured] : 250-300
 - Introduction : 300-500
 - Review of literature : 800-1000
 - Aim and Objectives : Up to 200
 - Material and Methods : 1200-1600
 - 10-25 References [ICMJE style]
2. It is mandatory to have ethics committee approval before initiation of the research work. The researcher should submit an appropriate application to the ethics committee in the prescribed format of the ethics committee concerned.

Guidelines for Thesis

1. The proposed study must be approved by the institutional ethics committee and the protocol of thesis should have been approved by NBE.
2. The thesis should be restricted to the size of 80 pages (maximum). This includes the text, figures, references, annexures, and certificates etc. It should be printed on both sides of the paper; and every page has to be numbered. Do not leave any page blank. To achieve this, following points may be kept in view:
 - a. The thesis should be typed in 1.5 space using Times New Roman/Arial/ Garamond size 12 font, 1” margins should be left on all four sides. Major sections viz., Introduction, Review of Literature, Aim & Objectives, Material and Methods, Results, Discussion, References, and Appendices should start from a new page. Study proforma (Case record form), informed consent form, and patient information sheet may be printed in single space.
 - b. Only contemporary and relevant literature may be reviewed. Restrict the introduction to 2 pages, Review of literature to 10-12 pages, and Discussion to 8-10 pages.
 - c. The techniques may not be described in detail unless any modification/innovations of the standard techniques are used and reference(s) may be given.
 - d. Illustrative material may be restricted. It should be printed on paper only. There is no need to paste photographs separately.

3. Since most of the difficulties faced by the residents relate to the work in clinical subject or clinically-oriented laboratory subjects, the following steps are suggested:
 - a. The number of cases should be such that adequate material, judged from the hospital attendance/records, will be available and the candidate will be able to collect case material within the period of data collection, i.e., around 6-12 months so that he/she is in a position to complete the work within the stipulated time.
 - b. The aim and objectives of the study should be well defined.
 - c. As far as possible, only clinical/laboratory data of investigations of patients or such other material easily accessible in the existing facilities should be used for the study.
 - d. Technical assistance, wherever necessary, may be provided by the department concerned. The resident of one specialty taking up some problem related to some other specialty should have some basic knowledge about the subject and he/she should be able to perform the investigations independently, wherever some specialized laboratory investigations are required a co-guide may be co-opted from the concerned investigative department, the quantum of laboratory work to be carried out by the candidate should be decided by the guide & co-guide by mutual consultation.
4. The clinical residents are not ordinarily expected to undertake experimental work or clinical work involving new techniques, not hitherto perfected OR the use of chemicals or radioisotopes not readily available. They should; however, be free to enlarge the scope of their studies or undertake experimental work on their own initiative but all such studies should be feasible within the existing facilities.
5. The DNB residents should be able to freely use the surgical pathology/autopsy data if it is restricted to diagnosis only, if however, detailed historic data are required the resident will have to study the cases himself with the help of the guide/co-guide. The same will apply in case of clinical data.
6. Statistical methods used for analysis should be described specifically for each objective, and name of the statistical program used mentioned.

General Layout of a DNB Thesis:

- **Title-** A good title should be brief, clear, and focus on the central theme of the topic; it should avoid abbreviations. The Title should effectively summarize the proposed research and should contain the PICO elements.

- **Introduction-** It should be focused on the research question and should be directly relevant to the objectives of your study.
- **Review of Literature** - The Review should include a description of the most relevant and recent studies published on the subject.
- **Aim and Objectives** - The 'Aim' refers to what would be broadly achieved by this study or how this study would address a bigger question / issue. The 'Objectives' of the research stem from the research question formulated and should at least include participants, intervention, evaluation, design.
- **Material and Methods-** This section should include the following 10 elements: Study setting (area), Study duration; Study design (descriptive, case-control, cohort, diagnostic accuracy, experimental (randomized/non-randomized)); Study sample (inclusion/exclusion criteria, method of selection), Intervention, if any, Data collection, Outcome measures (primary and secondary), Sample size, Data management and Statistical analysis, and Ethical issues (Ethical clearance, Informed consent, trial registration).
- **Results-** Results should be organized in readily identifiable sections having correct analysis of data and presented in appropriate charts, tables, graphs and diagram etc.
- **Discussion**—It should start by summarizing the results for primary and secondary objectives in text form (without giving data). This should be followed by a comparison of your results on the outcome variables (both primary and secondary) with those of earlier research studies.
- **Summary and Conclusion-** This should be a précis of the findings of the thesis, arranged in four paragraphs: (a) background and objectives; (b) methods; (c) results; and (d) conclusions. The conclusions should strictly pertain to the findings of the thesis and not outside its domain.
- **References-** Relevant References should be cited in the text of the protocol (in superscripts).
- **Appendices** -The tools used for data collection such as questionnaire, interview schedules, observation checklists, informed consent form (ICF), and participant information sheet (PIS) should be attached as appendices. Do not attach the master chart.

Thesis Protocol Submission to NBE

1. DNB candidates are required to submit their thesis protocol within 90 days of their joining DNB training.
2. Enclosures to be submitted along with protocol submission form:
 - a) Form for Thesis Protocol Submission properly filled.
 - b) Thesis Protocol duly signed.
 - c) Approval letter of institutional Ethical committee. (*Mandatory, non receivable of any one is liable for rejection*)

Thesis Submission to NBE

1. As per NBE norms, writing a thesis is essential for all DNB candidates towards partial fulfillment of eligibility for award of DNB degree.
2. DNB candidates are required to submit the thesis before the cut-off date which shall be 30th June of the same year for candidates appearing for their scheduled December final theory examination. Similarly, candidates who are appearing in their scheduled June DNB final examination shall be required to submit their thesis by 31st December of preceding year.
3. Candidates who fail to submit their thesis by the prescribed cutoff date shall NOT be allowed to appear in DNB final examination.
4. Fee to be submitted for assessment (In INR): 3500/-
5. Fee can be deposited ONLY through pay-in-slip/challan at any of the Indian bank branch across India. The challan can be downloaded from NBE website www.natboard.edu.in
6. Thesis should be bound and the front cover page should be printed in the standard format. A bound thesis should be accompanied with:
 - a. A Synopsis of thesis.
 - b. Form for submission of thesis, duly completed
 - c. NBE copy of challan (in original) towards payment of fee as may be applicable.
 - d. Soft copy of thesis in a CD duly labeled.
 - e. Copy of letter of registration with NBE.
7. A declaration of thesis work being bonafide in nature and done by the candidate himself/herself at the institute of DNB training need to be submitted bound with thesis. It must be signed by the candidate himself/herself, the thesis guide and head of the institution, failing which thesis shall not be considered.

The detailed guidelines and forms for submission of Thesis

Protocol & Thesis are available at

www.natboard.edu.in.thesis.php

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.

Leave Rules

1. DNB Trainees are entitled to leave during the course of DNB training as per the Leave Rules prescribed by NBE.
2. A DNB candidate can avail a maximum of 20 days of leave in a year excluding regular duty off/ Gazetted holidays as per hospital/institute calendar/policy.
3. MATERNITYLEAVE:
 - a. A female candidate is permitted a maternity leave of 90 days once during the entire duration of DNB course.
 - b. The expected date of delivery (EDD) should fall within the duration of maternity leave.
 - c. Extension of maternity leave is permissible only for genuine medical reasons and after prior approval of NBE. The supporting medical documents have to be certified by the Head of the Institute/hospital where the candidate is undergoing DNB training. NBE reserves its rights to take a final decision in such matters.
 - d. The training of the candidate shall be extended accordingly in case of any extension of maternity leave being granted to the candidate.
 - e. Candidate shall be paid stipend during the period of maternity leave. No stipend shall be paid for the period of extension of leave.
4. Male DNB candidates are entitled for paternity leave of maximum of one week during the entire period of DNB training.
5. No kind of study leave is permissible to DNB candidates. However, candidates may be allowed an academic leave as under across the entire duration of training program to attend the conferences/CMEs/Academic programs/Examination purposes.

DNB COURSE	NO. OF ACADEMIC LEAVE
DNB 3 years Course (Broad & Super Specialty)	14 Days
DNB 2 years Course (Post Diploma)	10 Days
DNB Direct 6 years Course	28 days

6. Under normal circumstances leave of one year should not be carried forward to the next year. However, in exceptional cases such as prolonged illness the leave across the DNB training program may be clubbed together with prior approval of NBE.
7. Any other leave which is beyond the above stated leave is not permissible and shall lead to extension/cancellation of DNB course.
8. Any extension of DNB training for more than 2 months beyond the scheduled completion date of training is permissible only under extraordinary circumstances with prior approval of NBE. Such extension is neither automatic nor shall be granted as a matter of routine. NBE shall consider such requests on merit provided the seat is not carried over and compromise with training of existing trainees in the Department.
9. Unauthorized absence from DNB training for more than 7 days may lead to cancellation of registration and discontinuation of the DNB training and rejoining shall not be permitted.

10. Medical Leave

- a. Leave on medical grounds is permissible only for genuine medical reasons and NBE should be informed by the concerned institute/hospital about the same immediately after the candidate proceeds on leave on medical grounds.
- b. The supporting medical documents have to be certified by the Head of the Institute/hospital where the candidate is undergoing DNB training and have to be sent to NBE.
- c. The medical treatment should be taken from the institute/ hospital where the candidate is undergoing DNB training. Any deviation from this shall be supported with valid grounds and documentation.
- d. In case of medical treatment being sought from some other institute/hospital, the medical documents have to be certified by the Head of the institute/hospital where the candidate is undergoing DNB training.

- e. NBE reserves its rights to verify the authenticity of the documents furnished by the candidate and the institute/hospital regarding Medical illness of the candidate and to take a final decision in such matters.

11.

- a. Total leave period which can be availed by DNB candidates is $120+28 = 148$ days for 6 years course, $60+14=74$ days for 3 years course and $40+10 = 50$ days for 2 years course. This includes all kinds of eligible leave including academic leave. Maternity / Paternity leave can be availed separately by eligible candidates. Any kind of leave including medical leave exceeding the aforementioned limit shall lead to extension of DNB training. It is clarified that prior approval of NBE is necessary for availing any such leave.
- b. The eligibility for DNB Final Examination shall be determined strictly in accordance with the criteria prescribed in the respective information bulletin.

EXAMINATION

FORMATIVE ASSESSMENT

Formative assessment includes various formal and informal assessment procedures by which evaluation of student's learning, comprehension, and academic progress is done by the teachers/ faculty to improve student attainment. Formative assessment test (FAT) is called as "Formative" as it informs the in process teaching and learning modifications. FAT is an integral part of the effective teaching. The goal of the FAT is to collect information which can be used to improve the student learning process.

Formative assessment is essentially positive in intent, directed towards promoting learning; it is therefore part of teaching. Validity and usefulness are paramount in formative assessment and should take precedence over concerns for reliability. The assessment scheme consists of Three Parts which has to be essentially completed by the candidates.

The scheme includes:-

Part I:- Conduction of theory examination

Part-II :- Feedback session on the theory performance

Part-III :- Work place based clinical assessment

Scheme of Formative assessment

PART – I	CONDUCT OF THEORY EXAMINATION	Candidate has to appear for Theory Exam and it will be held for One day.
PART – II	FEEDBACK SESSION ON THE THEORY PERFORMANCE	Candidate has to appear for his/her Theory Exam Assessment Workshop.
PART – III	WORK PLACE BASED CLINICAL ASSESSMENT	After Theory Examination, Candidate has to appear for Clinical Assessment.

The performance of the resident during the training period should be monitored throughout the course and duly recorded in the log books as evidence of the ability and daily work of the student

1. Personal attributes:

- **Behavior and Emotional Stability:** Dependable, disciplined, dedicated, stable in emergency situations, shows positive approach.
- **Motivation and Initiative:** Takes on responsibility, innovative, enterprising, does not shirk duties or leave any work pending.

- **Honesty and Integrity:** Truthful, admits mistakes, does not cook up information, has ethical conduct, exhibits good moral values, loyal to the institution.
- **Interpersonal Skills and Leadership Quality:** Has compassionate attitude towards patients and attendants, gets on well with colleagues and paramedical staff, is respectful to seniors, has good communication skills.

2. Clinical Work:

- **Availability:** Punctual, available continuously on duty, responds promptly on calls and takes proper permission for leave.
- **Diligence:** Dedicated, hardworking, does not shirk duties, leaves no work pending, does not sit idle, competent in clinical case work up and management.
- **Academic ability:** Intelligent, shows sound knowledge and skills, participates adequately in academic activities, and performs well in oral presentation and departmental tests.
- **Clinical Performance:** Proficient in clinical presentations and case discussion during rounds and OPD work up. Preparing Documents of the case history/examination and progress notes in the file (daily notes, round discussion, investigations and management) Skill of performing bed side procedures and handling emergencies.

3. Academic Activity: Performance during presentation at Journal club/ Seminar/ Case discussion/Stat meeting and other academic sessions. Proficiency in skills as mentioned in job responsibilities.

FINAL EXAMINATION

The summative assessment of competence will be done in the form of DNB Final Examination leading to the award of the degree of Diplomate of National Board in Cardiac Anaesthesia. The DNB final is a two-stage examination comprising the theory and practical part. An eligible candidate who has qualified the theory exam is permitted to appear in the practical examination.

Theory Examination

1. The theory examination comprises of **Three/ Four** papers, maximum marks 100 each.
2. There are 10 short notes of 10 marks each, in each of the papers. The number of short notes and their respective marks weightage may vary in some subjects/some papers.
3. Maximum time permitted is 3 hours.
4. Candidate must score at least 50% in the aggregate of **Three/ Four** papers to qualify the theory examination.

5. Candidates who have qualified the theory examination are permitted to take up the practical examination.

a) Practical Examination:

1. Maximum Marks: 300.
2. Comprises of Clinical Examination and Viva.
3. Candidate must obtain a minimum of 50% marks in the Clinical Examination (including Viva) to qualify for the Practical Examination.
4. There are a maximum of three attempts that can be availed by a candidate for Practical Examination.
5. First attempt is the practical examination following immediately after the declaration of theory results.
6. Second and Third attempt in practical examination shall be permitted out of the next three sessions of practical examinations placed alongwith the next three successive theory examination sessions; after payment of full examination fees as may be prescribed by NBE.
7. Absentation from Practical Examination is counted as an attempt.
8. Appearance in first practical examination is compulsory;
9. Requests for Change in center of examination are not entertained, as the same is not permissible.
10. Candidates are required not to canvass with NBE for above.

Declaration of DNB Final Results

1. DNB final is a qualifying examination.
2. Results of DNB final examinations (theory & practical) are declared as PASS/FAIL.
3. DNB degree is awarded to a DNB trainee in the convocation of NBE.

RECOMMENDED TEXT BOOKS AND JOURNALS

A. List of Books

- 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.
- Kaplan's Cardiac Anesthesia- 7th edition- Elsevier
- Oxford Textbook of Cardiothoracic Anaesthesia- R Peter Alston; Paul
- Textbook of Critical care – Dr. Yatin Mehta, Jaypee Brothers
- Paediatric Cardiac Anaesthesia- Dr Carol Lake
- Comprehensive Textbook of Perioperative Transesophageal Echocardiography- Dr. Robert M.Savage
- Anesthetic Management of Cardiac Surgery Maintenance.../C _Scheeren.
- Essentials of Cardiac Anesthesia- by Joel A. Kaplan,M.D.
- Review of Cardiac Anesthesia with 2100 MCQs...Poonam Malhotra Kapoor
- Cardiac Anaesthesia Principles and clinical practice by Fawzy G and Entafanous.
- Cardiac Anaesthesia : A Practical Handbook: Nian Chih Hwang
- Manual of Cardiac Anaesthesia –Jan L. Kramer
- Cardiac and Vascular Anesthesia: The Requisites (Requisites in Anesthesia) hardcover-28 May 2004 by Jacqueline Leung (Author)

B. List of Journals

- Journal of Cardiothoracic and Vascular Anesthesia
- Cardiothoracic Anesthesia
- Annals of Cardiac Anesthesia
- Seminars in Cardiothoracic and Vascular Anesthesia

- The Egyptian Journal of Cardiothoracic Anesthesia
- Indian Heart Journal
- Indian Journal of Cardiac Surgery
