Needs: Local : Pink, National : Orange, Regional: light blue, International : green

Colour Coding
Global GREEN
Regional BLUE
National ORANGE
Local (State) PINK

GUIDELINES FOR COMPETENCY BASED POSTGRADUATE TRAINING PROGRAMME POST DOCTORAL ADVANCE FELLOWSHIP (PDAF) IN CARDIOVASCULAR AND THORACIC ANAESTHESIAPROGRAM OUTCOME

India is at the epicentre of rising cardiovascular and thoracic diseases including coronary artery disease (CAD), congestive heart failure,rheumatic heart disease,congenital heart diseases, respiratory diseases like carcinoma lung and vascular diseases like varicose vein, thrombosis etc..The Post Doctoral Advance fellowship (PDAF) in Cardiovascular and Thoracic Anaesthesia is aimed to train a physician in the specialized field of Cardiovascular and Thoracic Anaesthesia.

1. The trainee shall acquire skills in various aspects of theoretical, clinical and practical realms of Cardiovascular and Thoracic diseasesand enable them to offer skill-based surgical and postoperative intensive care of the highest professional standards.

2. The knowledge and attitudes imparted during the program shall enable the student to work as an independent clinician, teacher and researcher who is well versed with diagnostic and therapeutic acumen and research methodologies pertaining to Cardiovascular and Thoracic diseases.

3. Such an extensive training shall cater to the health care needs of patients of different heart diseases at the **local, regional** and **national levels and help deliver quality care of international standards to our population.**

A post graduate student pursuing PDAFcourse will acquire **adequate knowledgerelated to**

(a) Basic Sciences as applied to Cardiovascular and Thoracic diseasesso that the student is at par with national and international counterpartsto help acquire focused and knowledge based understanding about the common and rare clinical diseases related to different aspects of Cardiovascular and Thoracic diseases.

(b) Clinical, experimental, investigative and management issues applied to non-surgical and surgical aspects of Cardiovascular and Thoracic diseaseto gain comprehensive proficiency related to etio-pathogenesis, anatomy, physiology, and the diverse clinical spectrum of these diseases. Thefamiliarity with local prevalent disease trends and management practices shall help Cardiovascular and Thoracic anaesthesiatrainees **serve their region, state, and country** in a need-based and cost-effective manner.

(c) Awareness about recent advances in fieldof Cardiovascular and Thoracic Anaesthesiawith up to dated skill and knowledge to apply skill based intellectual decision based management algorithms to benefit **the region, state, and country.**

(d) Contribute to the field of Cardiovascular and Thoracic Anaesthesiaby imparting training to colleagues, teaching future students, and getting involved in research.

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Global GREEN
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EligibilityRequirements

StudentswhohavecompletedMD/DNBinAnaesthesiologyareeligibleforPost Doctoral Super-Specialty Course in Cardiovascular and Thoracic Anaesthesia.

SUBJECTSPECIFICLEARNINGOBJECTIVES

d

During the Post Doctoral Advance Fellowship (PDAF) In Cardiovascular And Thoracic Anaesthesia , a student willacquire:

a. Clinical,diagnostic, analytical, self-directed motivational learning with procedural and therapeutic skills required in perioperative care of patients with the full spectrum of cardiovascular -thoracic diseases**prevalent in the region, state, and country.**
b. Have comprehensive knowledge and skills in the areas of basic, clinical, and translational in Cardiovascular and Thoracicdisease burden, epidemiology, patho-physiology, and key determinants of these disease in the **region, state, and country.**
c. Develop mentorship, leadership, and networking skills to help teach, train, and impart clinical and research skills to future cardio-thoracic vascular anesthesiologistin the state and country.
d. Acquire skills to establish an effective communication network with the patients, patients' relatives, health administration, policy makers, common public, community leaders, peers of medical fraternity and academicians in the field ofCardiovascular and Thoracic Anaesthesiaand allied fields.
e. **Along with clinical knowledge, they should have skills in** formulating research questions, planning, initiating, and conducting translational, clinical and epidemiologic research that **prioritizes thrust areas of Cardiovascular and Thoracic Anaesthesiaat** institutional, state, national and international levels.
f. Should network to set up collaborative workforces at various levels to enhance the **research milieu of the country with special focus on** easing access to therapy, lowering the cost of treatment modalities, novel indigenous modes of treatment and prevention aspects of different cardiac diseases.
g. Demonstrate compassion for patients and their families and have anethical and holistic approach to them to help deliver evidence-based, respectful ethical care to the patients.

The student is expected to gain knowledge in the following FOUR key areas:

A. TheoreticalKnowledge:

1. The student will acquire knowledge in all aspects pertaining to the surgery of Cardiovascular and Thoracic surgical cases and their postoperative carewith particular focus on their critical carein **the region, state, and country.** This shall involve teaching and training to enable theCardiovascular and Thoracic Anaesthesiastudent to provide specialist care to the citizens of the country. In addition to clinical **training,** research **skills shall also be prioritized so that the Cardiovascular and Thoracic**

Anaesthesiatrainee gets the skills to set up collaborative networking at institutional, state, national and global levels to add to the research milieu of the country.

2. ThePDAF trainee shall acquire up-to-date knowledge, skills, and attitudes in clinical Cardiovascular and Thoracic Anaesthesiato understand the disease burden, epidemiology, patho-physiology and key determinants of cardiovascular and thoracic disease in the **region, state and country.**
3. Shall be able to make patient-centric decisions based on the latest scientific advances in Cardiovascular and Thoracic Anaesthesiaafter rationally examining available data and apply these ethically in a **cost-effective manner tailored to the needs of the patients of the region, state, and country.**
4. Shall be well versed not only with **diagnostic and therapeutic modalities related to pharmacological and non-pharmacological management, interventions, cutting edge research and their application to** diverse aspects of Cardiovascular and Thoracic diseasesbut shall also be trained in disease patterns and preoperative evaluation and preparation of such patients.

B. Teaching skill

1. The student will beabletoteach diverse aspectsofCardio-vascular and thoracic diseasestoother residentdoctors,junior colleagues, nursing, and para-medical staff to enhance **the skills of the work force at local level.**
2. Shall develop mentorship and leadership qualities to help teach, train and impart clinical and research skills to future cardiologists in the **state and country.**

C. Research methodology

1. To seek solutions to such areas of unmet clinical need, should be conversant with principles of research as applied to contemporary Cardio-vascular and thoracic diseases spectrum **prevailing in the local community, state, or country.**
2. Shall be trained to formulate, write, and conduct research proposals using appropriate methodologies related to Cardiovascular and Thoracic Anaesthesiain accordance with ethical guidelines.
3. Shall have the skills to promote inter-institutional research and help train and guide those who wish to undertake pursue research.

4. Group approach

1. During the academic training, students will be part of multi-disciplinary meetings with specialists in Cardiology, Cardiothoracic surgery, Radiology, Nuclear Medicine departments and allied clinical disciplines.

2. This will help them to understand the concept of the Heart-Lung -team approach that seeks a multi-disciplinary approach in patient care. Inputs and insights gained during such interactions shall help in knowledge and skill building and are likely to improve patient outcomes of the **region, state, and country.**

SUBJECTSPECIFICCOMPETENCIES

At the end of the course, the PDAF student will acquire the following competencies under the following three domains:

(A) Cognitive domain (Knowledge domain)

By the end of the course, the PDAF student should:

1. Have the ability to have a complete understanding about the etiopathogenesis, diagnostic techniques, management issues, perioperative and intensive care aspectsof different Cardio-vascular and thoracic diseases of children and adults with special focus on prevalent clinical problems in the **region, state and country**. These include surgeries like **coronary by-pass grafting, valve replacements, correction of cyanotic and acyanotic cardiac diseases, embolectomies, various lung reduction surgeries. Medical management of Congestive heart failure, Myocardial infraction, constrictive pericarditis, tamponade, and various pulmonary and vascular problems**
2. Have a comprehensive awareness of normal processes that govern cardiac-pulmonary physiology and how they get impaired in disease states.
3. Demonstrate knowledge and expertise in relation to clinical course, adverse effects, short-term and long-term complications processes involved in different diseases of the cardiovascular systemto identify these in an early and timely manner.
4. Have the skills to plan and order suitable investigations that are applicable for diagnosis and management in a cost-effectivemannersuitable to the **needs of the people of the region, state, and country.**
5. Ability to correctly analyze and interprettheresultsofvariousroutineandother specialized investigations and cardiac-pulmonary functions tests so that appropriate therapeutic strategies can be applied for proper management of the patients with cardiac diseases and respiratory diseases.
6. Be aware of different guidelines of various national and international associations and their applications tailor-made to suit the local needs of patients.
7. Should be conversant with the recent advances inscience related to diagnostic and therapeutic techniques, novel drugs, otherkey research areas and their application toclinical and interventional and non-interventional Cardiovascular and Thoracic proceduresthat may continuously change and evolve over time.
8. Have the ability to rationally analyze scientific data and apply it to needs of the **local populace of the state and country.**
9. Have a working understanding of biostatistics to enable balanced evaluation and analysis of literature.
10. Demonstrate competence in basic concepts of research design, methodology, clinical epidemiologyand preventive issues of various Cardio-vascular and thoracic diseases.
11. Should have the skills to conceptualize, write and conduct research proposal keeping in mind all ethical principlesespecially with context to Indian beliefs and customs,related to disease of the cardiovascular system focusing on indigenous needs of **local, regional, and national health priority.**

12. Should be able to identify, prioritize and manage **cardiac, vascular, and thoracic emergencies**, common as well as rare, that are **prevalent in the region** or **state** and take judicious decisions regarding urgent hospitalization to expedite care and/or other super-specialty referral, as required.
13. Haveabasicunderstanding of digital applications in Cardiovascular and Thoracic Anaesthesiaand use of Artificial intelligence and machine learning.

(B) Affective domain (Attitudes including Communication and Professionalism)

1. Demonstrate kindness, empathy and compassion towards all patients and their families.
2. Treat all patients in a holistic manner.
3. Respect the patients' right to information and second opinion.
4. Communicate well with patients and make all efforts to explain the rationale of diagnostic and treatment approach to patients and their caregivers in their own language for ease of understanding and do proper detailed preanesthetic checkups.
5. Spend time with patients explaining to them with thoughtfulness and empathy the pros and cons of all options and further course of action.
6. Have the skills to participate in seminars, Continued Medical Education programs, panel discussions, lectures to discuss and review recent scientific data to **further the cause of Cardiovascular and Thoracic Anaesthesiain the country and increase visibility on national and global platforms.**
7. Should actively cultivate skills to work in a team, with mutual respect, basic human courtesy and a supportive attitude towards othersincluding other clinicians, para-clinical staff, policy makers and health administrators to improve Cardiovascular and Thoracic Anaesthesiaservices **at a regional, state, and national level.**
8. Communicate openly and honestly with all patients and their caregivers, hospital administrators, regulatory authorities, peers and researchers of the Cardiovascular and Thoracic Anaesthesiafraternity and other allied members of the public and community leaders.
9. Develop a habit of maintaininghonest, detailed and comprehensive medical records.
10. Maintain principles of etiquette and abide with the country's laws, always adopting ethical practices.
11. Be aware of ethical principles of clinical research as guided by institutional ethical committees.
12. Should demonstrate principles of equality when dealing with individuals of special groups.
13. Should be able to accept feedback and criticisms with an open mind.
14. As a skilled professional, be aware of the value of maintaining punctuality in clinical work.

(C) Psychomotor domain

At the end of the course, the student should have acquired following skills:

1. Skills to appropriately investigate and correctly and ethically manage all types of Cardio-vascular and thoracic surgical cases and its post operative care.
2. Plan and order the required investigations for patients in a cost-effective manner tailored to the individual surgical needs of the patients.

3. Be able to correctly analyze the results of all frequently used as well as specialized investigations necessary in Cardiovascular and Thoracic operative cases,including routine biochemistry, biomarkers, serological tests and ECG.
4. After having performed under supervision during PDAF training, should be able to demonstrate requisite skills and confidence in independently using imaging modalities like:
    I. basic and advanced echocardiography including transesophageal.
    II. Advance hemodynamic monitoring skills
    III. Conduct coronary and non-coronary angiography and other interventional procedures in the cath labs.
    IV. interpret CT scans, nuclear cardiac scans, cardiac CT, cardiac MRI ..
    V. interpret thromboelastograms.

5. Have basic understanding about functioning of different monitoring equipment's in routine use in the non-invasive and invasive Cardiovascular monitors and how to reduce their maintenance cost for the institution.
6. Have knowledge about Cardiovascular and Thoracic Anaesthesiaand its digital applications and fundamentals of use of artificial intelligence and machine learning.

Syllabus

Coursecontents:

I. Cognitivedomain

A. BasicSciencesasappliedtoCardiovascular and Thoracic Anaesthesia

1. Demonstrate understanding of the basic sciences relevant to Cardiothoracic and Vascular Anaesthesia
2. Reveal comprehension of the anaesthetic management of common and uncommon surgical conditions related to cardiac, thoracic, and vascular diseases, in patientsbelonging to all age groups, with a thorough knowledge of the etiology, pathophysiology and surgical treatment of the disease state.
3. Describe theory of the underlying etiology, mechanism and management of critical conditions requiring cardio-pulmonary-cerebral resuscitation.
4. Demonstrate understanding of principles, pathophysiology, components, conduct, andcomplications of cardiopulmonary bypass and cardiac assist devices.
5. Show understanding of the principles, pathophysiology, and complications of majorvascular surgery.
6. Assimilate and practice principles of critical care in postoperative cardiac, thoracic, andvascular surgical intensive care units and cardiology care units.
7. Recognize the disease conditions beyond the area of his/ her competence and followappropriate referral mechanism prior to subjecting the patients to anaesthesia.
8. Advice regarding the anesthetic management of cardiac, thoracic, and vascularsurgical cases and conduct this management effectively.
9. Update himself/ herself regularly by self-study, and by attending CMEs, workshops,conferences, and seminars relevant to the specialty.
10. Teach and guide his team colleagues, students, and paramedical staff.
11. Reveal understanding of medicolegal aspects of cardiothoracic and vascularanaesthesia.
12. Demonstrate knowledge of administrative aspects of Cardiothoracic and vascularoperation suite complex.
13. Undertake audit, use information technology media, and conduct research, both clinicaland biomedical, with publishing the work and presenting at various scientific events
14. A basic science include anatomy, physiology, pharmacology, physics, biochemistry, coagulation, CPB pharmacokinetics during CPB, monitoring, diagnostic techniques involve cardiology diagnostic and therapeutic therapy.
15. Cardiopulmonary bypass and extra corporeal circulation -drugs related to anaesthesia of CPB.
16. Pulmonary life-support — advanced cardiac life support
17. Applications of Pharmacokinetics and Pharmacodynamics
18. Anatomy cardiac: embryology, development of heart, pulmonary and vascular organs adult anatomy of lungs, thorax, diaphragm, vascular, and coronary artery

anatomy

19. Principlesof biostatistics
20. Physiology cardiac: cellular physiology, hemodynamics, autonomic nervous system, cardiac functions
21. Physiology cardiac: cellular physiology, hemodynamics, autonomic nervous system, cardiac functions, blood
22. Pulmonary: open & closed chest ventilation. Ventilation/perfusion mismatch. Pulmonary airway mechanics, one lung ventilation.
23. Thoracotomy and pulmonary physiology. Renal, hepatic, CNS, endocrinal system, others, metabolic effects of surgery. Endocrines response to anaesthesia and surgery
24. Pathophysiology heart failure, congenital defects, cardiopulmonary reserves, acquired cardiac & pulmonary diseases. Vascular pathology. Immunological response metabolic response during CPB
25. Pharmacology: total circulatory arrest, pharmaco kinetics & pharmacodynamics of anesthetic and vasoactivedrug's biochemical reaction, applied concepts drugs related to anaesthesia practice cardiovascular drugs. Current antibiotics for ICU use bronchodilator. Antiarrhythmic drugs, nitric oxide.
26. Physics: basic concepts, analyzing, measuring & monitoring devices, electronics, computing of patient'sdata. laser in cardiac surgery, robotic technique
27. Equipment: computer application, maintenance monitoring techniques, equipment in OT equipment for transport of patients, ICU equipment

B. ClinicalCardiovascular and Thoracic Anaesthesia

1. Anaesthesia for cardio- thoracic & vascular surgery: - or diagnostics/interventional procedures in adults &pediatric age groups. Vascular surgery: aortic surgery, carotid artery surgery.
2. Pediatric: basic hemodynamics, palliative procedures, pre —op. preparation & special care in monitoring, fluid balance & airway management
3. Anaesthesia for neonatal complex cardiac surgery
4. Anaesthesia management for redo- surgery
5. Anaesthesia for robotic, minimally invasive surgery.
6. Anaesthesiafor ischemic heart disease, valvular heart disease, vascular disease, adult congenital heart surgery
7. Electrophysiological & arrhythmia surgery. Heart transplant, heart lung transplant, ventilator assets
8. Anaesthetic techniques for pulmonary surgery diagnostic & elective. Emergency procedures for lung surgery. one —lung anaesthesia, ventilation, physiotherapy (gas exchange & airway dynamics)
9. Anaesthesia during emergency cardiac surgery, and direct emerging from Cath lab after CATH lab complication
10. Anaesthesia in patients for diagnostic & palliative procedures in cardiology, radiology CATH lab
11. (Outside operative rooms), Invasive cardiology procedure
12. Anaesthesia management of redo- surgery
13. Management for post op. ventilation care, prolonged ventilation, weaning, control of acute pain — its techniques & agents used, Postoperative pain management,

invasive tracheal procedures for ventilator care.

14. Intra op. monitoring, PAC based, and non-PAC based and minimally invasive, cardiac output, POC coagulation monitoring

15. Pediatric diagnostics procedures in CATH lab & echocardiography
16. Invasive therapeutic techniques like ASD devices, stent in major vessels, coil embolization
17. Pregnancy and heart disease
18. Perfusion technology, principles, equipment, oxygenators, haemofiltration, MUF, PUF andECMO
19. Hypothermia, techniques & protocols
20. Myocardial protection
21. Haemodilution
22. Anticoagulation, pharmacology, monitoring methods
23. Side-effects, complication & management
24. Subsystem care — cerebral, renal hepatic protection
25. Cerebral protection, cerebral monitoring
26. Total circulatory arrest left heart bypass.
27. Anaesthesia management during CPB
28. Pharmacokinetics& pharmacodynamics of drugs during CPB
29. Management for post op. ventilation care, prolonged ventilation, weaning, control of acute pain — its techniques & agents used, Postoperative pain management, invasive tracheal procedures for ventilator care.
30. Intra op. monitoring, PAC based, and non-PAC based and minimally invasive, cardiac output, POC coagulation monitoring
31. Protocols for sub —system care, cerebral, renal, hepatic & others
32. Ventilatory care, weaning of ventilator support. Parenteral nutrition, control of infection
33. End stage renal failure, bedside dialysis techniques
34. Postoperative management of single ventricular repair
35. Hepatic failure
36. ICU monitoring technique in postoperative pain management
37. ICU management, especially after neonatal surgery — ventilator support in neonates, ECMO program for neonates and children
38. Intensive coronary care
39. Bronchoscopy and anaesthesia for bronchoscopic procedures
40. Cerebral function monitoring
41. Diseases of aorta including aneurysms, aortitis, aortic dissection
42. Peripheral vascular diseases and venous system diseases
43. Anaesthesia and non-cardiac surgery and heart
44. Cardiac Arrest and Sudden Cardiac Death
45. Endemic and Pandemic Viral Illnesses and Cardiovascular Disease
46. Endocrine Disorders and Cardiovascular Disease
47. Cardiovascular surgery and its applications in adult and congenital heart diseases
48. Neuromuscular Disorders and Cardiovascular Disease
49. Interplay between Renal Disease and Cardiovascular Illness

C. **Laboratory testing: outlining use of Diagnostic and monitoring Modalities in the Diagnosis and Perioperative Management**

1. PrinciplesofElectrocardiography
2. Nuclearmedicine and applications in Cardiology
3. Exercise Physiology and Exercise Testing in Coronary Artery Disease
4. Transesophageal echocardiography with emphasis on transthoracic echocardiography also
5. Physical principles of echocardiography including:

- How to image, store and retrieve echo images
- Doppler principle, color flow doppler, spectral Doppler, calculation and hemodynamics
- Lett ventricle chamber and walls systolic and diastolic functions
- Cardiomyopathy dilated, hypertrophic and restricted.
- Ischemic heart disease
- Aortic stenosis
- Aortic regurgitation
- Mitral stenosis
- Mitral regurgitation
- Tricuspid and pulmonary valves
- Right ventricle evaluation
- Prosthetic valves
- Endocarditis
- Aortic disease
- Pericardial disease
- Cardiac tumors and masses
- Imaging artifacts
- Congenital heart disease
- 3d echocardiography: image acquisition, data analysis, cropping, measurements,
- Speckle tracking
- Ultrasound for vascular access and lungs
- Transthoracic echocardiography and its interpretation
- Ultrasound for nerve blocks

6. Clinical applications of Cardiac MRI, CT and PET imaging
7. Principles of coronary angiography and functional coronary imaging
8. Principlesofqualitycontrolandqualityassurance
9. Anyotherrelatedareas.
10. Invasive & non-invasive hemodynamic monitoring techniques for pre-peri& post operative periods in cardiothoracic OR S, ICU and cardiology suits. Understanding of basic concepts of monitoring
11. Indication, cost effectiveness, complications
12. Equipment usage & knowledge of accessories
13. Knowledge of the following monitoring-

14. Cardiac functions: ECG, ABP, vent. Pressures, calculation of cardiac output,resistance, flow echo, dopplers, cardiac CT, PET
15. Pulmonary function PFT blood gases, acid —base, pulm-airway mechanics.
16. Coagulation profile temp. renal, b. sugar, enzymes. ACT, heparin &protamine regulation, thromboelastography.
17. Neuromuscular blockade: and other recent advances in monitoring, Cerebral Oximetry, evoked potential monitoring, BIS monitoring during CPB

D. Allied sciences

1. Cardiac surgery: surgical techniques, curative surgery, palliative procedures, risk evaluation, prognosis.
2. Cardiology and cardiac nuclear medicine: pre- op. evaluation, patho- physiology, electrophysiology, diagnostic radiology procedures-ECG,X-ray angiography, cardiac catheterization.
3. Doppler's. echocardiography, nuclear studies & their interpretation & their treatment of disease special procedures : pacing, cardioversion, PTCA, etc. automated cardioverters, invasive procedures for arrythmia i.e. ablation of abnormal pathway.
4. Molecular medicine and genetics: basic training in research method in the areas of inflammation and epigenetics
5. Statistics: statistical techniques

E. RecentAdvances

1. Knowledge of recent development in field of cardio thoracic & vascular surgery
2. Cardiology- PTCA, balloon embolectomy, other percutaneous procedure etc.
3. Heart- lung transplant — physiology, pharmacology (anaesthetic consideration) — donor — recipient selection
4. Immunosuppression etc.
5. Cardiac assisting devices — artificial heart, IABP,LHAD
6. Advances pulmonary Hypertension, ECMO, Heart Failure, ventilation
7. Blood substitutes
8. Current advances and concepts in drugs, equipment, and monitoring methods
9. They need to be changed as new recent advances are inducted in practice of cardiothoracic and vascular surgery and anaesthesia. The latest guidelines, changes and modifications of the guidelines and the latest landmark scientific papers that have change the clinical practice are to be included in the recent advances apart from the new techniques in clinical care, research and data management.
10. Anyotherrelatedareas.

II. Psychomotordomain

1. Evaluate patients scheduled for cardiac, thoracic, and vascular surgery in thepreoperative period by taking relevant history, examining the patient, ordering relevant.investigations, and interpreting them to obtain additional information about surgicalcondition and or the associate medical condition, which necessitates modifications ofthe proposed anaesthetic management.
2. Administer appropriate anaesthesia to the cardiac, thoracic and vascular surgicalprocedures independently.
3. Perform invasive procedures necessary for optimal patient care during the perioperativeperiod.
4. Provide basic and advanced cardiac life support.
5. Demonstrate intensive care skills necessary for management of patients in postoperativecardiac, thoracic, and vascular surgical intensive care units and cardiology care units.
6. Shoulder responsibility of patient monitoring in perioperative period.
7. Attitude, communication abilities, human values, and ethical practice
8. Adapt ethical principles, professional honesty, and integrity in all aspects ofcardiothoracic and vascular anaesthesia practice.
9. Deliver anaesthesia care in all need of the specialty, irrespective of the social status,caste, creed or religion of the patient.
10. Develop communication abilities in explaining the various options available in theanaesthetic management, critical care, pain management, and to obtain true informedconsent from patient.
11. Provide leadership in the operating suite and get best out of the teamwork in a congenialworking atmosphere.
12. Apply high moral and ethical standards while carrying out human and animal research.
13. Be humble and accept the limitations in his knowledge and skill and to ask for help fromcolleagues when needed.
14. Respect patient's rights and privileges including right to information and right to seek a second opinion.

Besides the above, post graduate students inPDAF should be involved in patient care and management of cardiac emergencies apart from the designated bedside, didactic and self-learning schedules assigned to them.

Addition done in syllabus of the Post Doctoral Super-Specialty Course in Cardiovascular and Thoracic Anaesthesiaprogram after revision and approval by Board of Studies

1. Training of residents in anaesthesiafor Diagnostic and therapeutic bronchoscopic procedures
2. Training of residents in anaesthesia for transcutaneous aortic valve implantation
3. Advances in cardiovascular pharmacology of cardiovascular disease
4. Anaesthesia for robotic cardiac and pulmonary surgery.
5. Cardio-pulmonary rehabilitation

Needs: Local : Pink, National : Orange, Regional: light blue, International : green

The Objectives of the 2 year training program is to **train the medical postgraduate as a best skilled "Cardiovascular and Thoracic Anesthesiologist"**in different aspects of theoretical, clinical and practical spheres of Post Doctoral Advance Fellowship in Cardiovascular and Thoracic Anaesthesiaand enable them to offer skill based diagnostic, curative and preventive care with the highest professional standards. This training will help to accomplish the local, regional, and national health care needs for quality care commensurate with international standards.

Local level	**Our state has a high burden of cardiovascular and thoracic diseases, including ischemic heart disease and rheumatic valvular diseases. These trends highlight the need for effective prevention and management strategies to address the growing burden of heart disease in the state. Course curricula are hence designed to be tailor made to this specific disease and there surgical subsets:** 1. **CABG**– for on pump, off pump , minimally invasive and robotic coronary bypass grafting and Percutaneous coronary procedures. 2. **Congestive heart failure:** Ventricular assist devices and cardiac transplant. 3. **Rheumatic heart disease** (commonest cause of heart failure and valvular heart disease in young children and adults)- valve replacement with focus on minimally invasive surgeries. 4. **Thoracic disease-** fungal diseases, lobectomies, Lung volume reduction surgery. 5. **Vascular diseases-** embolectomies. 6. **Congenital heart disease-** surgical and postoperative ASD, VSD, PDA and complex diseases 7.
National level	1. **CABG** - (India has exponentially rising trends of coronary heart disease with mortality and morbidity rates higher than prevalent global trends, accounting for nearly 25% of the world's coronary heart disease (CHD) burden) so the numbers of patients requiring coronary artery bypass surgeries. 2. **Congestive Heart failure** (at present India is home to about 40% of the world's patients with Heart failure) so this the requirement of ventricular assist devices and cardiac transplant. 3. **Rheumatic heart disease** (epidemic proportions in India with an estimated prevalence of 1.5-2 per 1000 individuals): a preventable cause of young and adult-onset heart failure due to valvular heart disease 4. **Congenital heart disease:** It is one of the three most common causes of neonatal mortality, the majority occurring within first year of life.
Regional level	Mechanisms including pathophysiology, genetics, novel risk factors, epidemiology and surgical and postoperative management of coronary and ischemic heart disease, rheumatic heart disease and pulmonary surgeries,and their specific aspects related to the sub-continent.
Global level	All the diseases covered in the courses of the are contextual and pertinent to global health issues. Moreover, India being home to appx 17% of the global population, health care decisions and policies based on Indian data are likely to create a global impact

TEACHINGANDLEARNINGMETHODS

General principles

The course is designed to train candidates in principles and practice of cardio vascular and thoracic anaesthesia to enable them to conduct, perioperative care, anaesthesia and intensive care to cardiac, thoracic and vascular patients independently.The basic aim of postgraduate medical training and education is to produce specialists who understand the needs of community health of the state and country and enhance the quality of health care as well as provide an impetus to research, education, and training of the medical community. The postgraduate doctor after completion of the skill-based competency training program should be able to successfully address the medical requirements of the community. Learning during the programme is not only goal-oriented and didacticbut also essentiallyself-directedand emanates from clinical and academic work. The designated academic sessions are meant to supplement the student's core efforts.

TeachingMethodology

The post graduate student shall be given the responsibility of managing and caring for patients in a gradual and phased manner under supervision, after the student demonstrates skill and efficiency at each step.Teaching sessions shall be an overall judicious amalgamation of case presentations, journal clubs, seminars, group discussion related to non-invasive and invasive lab data, cardiac cath meetings, bed-side teaching, focused brief topic presentations as allotted from time to time, case-based learning, integrated and interdepartmental meetings including any other collaborative activity with allied departments, as deemednecessary. Suggested modalities of teaching-learning methods are summarized below but shall not be limited to these.The frequency of the mentioned teaching and learning methods may vary based on perceived requirements, candidates' competencies, work load and overall working schedule.

Formalteachingsessions

These includeregularbedsidecasepresentationsanddemonstrations,didacticlectures, journal clubs, seminars, discussions related to non-invasive and invasive lab data, bed-side teaching, case-based learning, interdepartmental meetings and collaborative meetings with allied departments
Thiswillcompriseofthefollowing:

Minimumsessions

• Clinicalcasediscussion	-onceaweek
• Journalclub	-oncea month
• Seminar	-oncein 4 weeks
• Bedsiderounds	-Every day
• Surgical discussions	-Every day
• Pre-AnaesthesiaClinic	-Every day
• Mortalitymeeting	-onceamonth
• Combined Grand rounds	-onceamonth.

AllabovemayrefertosessionsconductedingivenDepartmentandnotforeachtrainee.

DidacticLectures

In addition, 6 lectures per year covering recent advances in all aspects of cardiac diseases would be taken by faculty members.All post graduate students are required to attend these lectures. Short term basic and clinical courses on:

- Each student is expected to attendaccreditedscientificmeetings(CME,symposia, conferences, seminars) at least once or twice a year.

Logbook: The candidates have to build up a logbook according to the set norm of the unit in which all the clinical work, research project and teaching activities have to be entered periodically. This book must be signed by the Anaesthesiology consultants on a regular basis. During the training period, the Post Doctoral Super-Specialty Course in Cardiovascular and Thoracic Anaesthesiastudent shall maintain a detailed and comprehensive Logbook indicating the duration of the postings and work done inCardiovascular and Thoracic operative rooms,ICU and CATH labs. Data should include the procedures assisted and performed, and teaching sessions attended. The purpose of the Logbook is to:

a) Maintainarecordoftheworkprofile duringtraining,
b) EnableConsultantstoaccess informationaboutthework of the student.
c) Keep an eye on the progress and intervenewhennecessary.
d) Toassessfrom time to time, theexperiencegained,and quality of work performed by the trainee.

The Log Book shall also serve as a source to help in the internal evaluation of the trainee. The Log book shallbecross-checked and assessedperiodicallybythe facultymemberswho are involved in impartingthetraining. It shall be signed by the Head of the Department and a proficiency certificate from the Head of Department regarding the student's clinical competence, overall skillful performance of procedures and general approach towards patients will be necessary before the student is allowed to appear in the final examination.

Clinicalpostings:Recommendedschedulefortwoyearstraining

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	16 months
CARDIOLOGY	2 months
CARDIAC-SURGICAL ICU	4 months
ALLIED POSTINGS	2 months

Research

The trainee shall be required to undertake research and write papers under the guidance of faculty (the cardiac anaesthesia professors will be the lead guides with faculty from allied specialties can work as co guides). The candidate will have to submit a proposal / topic for the

project work within three months of the joining of the course. The work period for the project will be one year. It is desired that paper from the project should be accepted for publication in at least an Indian journal. Another article (that can also be a interesting case report, review article, proc-con debate) as first author should also be submitted for publication in a journal before the candidate appears in the final exit exam examination.

FINAL EXIT EXAMINATION

Candidates will be allowed to appear within two years of training.

Board Of Examiners

Cardia anesthesiologists with minimum 10 years of teaching experience and active involvement in the clinical care and specialty of CVTA,
Internal examiners will be only from core faculty.

Theory Papers

There shall be three theory papers with the following titles.

- Basic science as related to Cardiac Anaesthesia
- Clinical aspects as related to cardiac anaesthesia
- Recent advances in cardiac anaesthesia

Clinical Practical and Viva Voice

One long case and two short cases will be given to the candidates and the discussion there on would last 30-40 min in each case. The candidates are also given ECG, X-ray, echo, Angio reports to be interpreted. Various equipment, used in OR, intensive care unit, drugs, fluids, catheter for invasive monitoring are also required to be interpreted and discussed on table viva. One examination could be held every year after completion of two years of each batch.

RecommendedReading:

Books(latest editions)

Atrainee is expected to gain academic knowledge through standardtextbooks related to the specialties of Cardiothoracic Vascular anaesthesia,Echocardiography, Critical care, Cardiothoracic & Vascular surgery, and Cardiology.

1. Braunwald`s Heart Disease, 12th Edition, 2021
2. Kaplan's Cardiac Anaesthesia7th Edition, 201
3. Moss and Adam`S Heart Disease In Infants, Children and Adolescents: Including The Fetus and Young Adults, 10th Edition,2021
4. Frederick A. Hensley , Glenn P. Gravlee MD , Donald E. Martin A Practical Approach To Cardiac Anaesthesia 5th edition ,2012
5. Textbook Of Interventional Cardiology, 8th Edition, 2019
6. Fuster and Hurst`s: The Heart, 15th Edition, 2022
7. Miller's Anaesthesia, 9th edition, 2019,

8. Complications in Anaesthesia, 3rd edition, 2017
9. David Sidebotham Cardiothoracic Critical care, 2007
10. Glenn P. Gravlee Cardiopulmonary Bypass and Mechanical Support: Principles and Practice 4th edition,2015
11. David L. Brown , Cardiac Intensive Care,3 rd edition, 2019.
12. Albert C. Perrino,A Practical Approach to Transesophageal Echocardiography,2019
13. Morton Kern, Hemodynamic Rounds, 2018, 4th Edition
14. Feigenbaum's Echocardiography, 2018, 8th Edition
15. Leo Schamroth An Introduction To Electrocardiography, 2018, 8th Edition
16. Practical Perioperative Transoesophageal Echocardiography (Oxford Clinical Imaging Guides),2018
17. David Sidebotham Marriott's Practical Electrocardiography, 2021, 13th Edition
18. KaanKırali , Joseph S. Coselli Cardiopulmonary Bypass: Advances in Extracorporeal Life Support , 2022
19. Fabio Sangalli ECMO-Extracorporeal Life Support in Adults, 2016
20. Atilio BarbeitoThoracic Anaesthesia McGraw-Hill Medical 16 July 2012

Journals:

A trainee is expected to upgrade his/her academic knowledge through publishedarticles of various journals related to Cardiothoracic Vascular anaesthesia,Echocardiography, Critical care, Cardiothoracic & Vascular surgery and Cardiology.

1. Annals of Cardiac Anaesthesia (https://journals.lww.com/aoca/pages/default.aspx)
2. Journal of cardiothoracic and vascular anaesthesia (https://www.jcvaonline.com/)
3. British Journal of Anaesthesia (https://www.bjanaesthesia.org/)
4. Anesthesiology(https://pubs.asahq.org/anesthesiology)
5. Anaesthesia and Analgesia, (https://journals.lww.com/anaesthesia-analgesia/pages/default.aspx)
6. Canadian Journal of Anaesthesia,(https://www.cas.ca/en/practice-resources/canadian-journal-of-anaesthesia)
7. Journal of Anaesthesia, (https://www.springer.com/journal/540)
8. New England Journal of Medicine, (https://www.nejm.org/)
9. Journal of the American College of Cardiology,(https://www.jacc.org/toc/jacc/69/9)
10. Circulation, (https://www.ahajournals.org/journal/circ)
11. Heart,(https://heart.bmj.com/)
12. Lancet,(https://www.thelancet.com/)
13. European Heart Journal,(https://academic.oup.com/eurheartj)
14. Heart rhythm(https://www.heartrhythmjournal.com/)
15. American Heart Journal(https://www.sciencedirect.com/journal/american-heart-journal)
16. American Journal of Cardiology, (https://www.ajconline.org/)
17. Catheterizationand cardiovascular interventions, (https://onlinelibrary.wiley.com/page/journal/1522726x/homepage/forauthors.html)
18. Pediatric Cardiology, (https://www.springer.com/journal/246)
19. Pacing and cardiovascular electrophysiology(https://onlinelibrary.wiley.com/journal/15408159)
20. JACC Interventions(https://www.jacc.org/journal/interventions)
21. Journal of Invasive cardiac Electrophysiology,(https://www.springer.com/journal/10840)
22. Indian heart Journal,(https://indianheartjournal.com/)
23. Annals of Pediatric cardiology,(https://journals.lww.com/AOPC/pages/default.aspx)

24. JAMA cardiology,(https://jamanetwork.com/journals/jamacardiology)

E learning resources

1. Clinical Key which gives access to various Post Doctoral Super-Specialty Course in Cardiovascular and Thoracic Anaesthesiajournals
2. https://www.clinicalkey.com/#!/browse/book/3-s2.0-C20191011278
3. https://www.clinicalkey.com/#!/browse/book/3-s2.0-C20120064599
4. https://scai.org/
5. https://www.clinicalkey.com/#!/browse/book/3-s2.0-C20150009698
6. https://www.escardio.org/Education/Online-Learning
7. https://www.clinicalkey.com/#!/browse/book/3-s2.0-C20140013160
8. https://www.acc.org/
9. https://www.clinicalkey.com/#!/browse/book/3-s2.0-C20120021461
10. www.tct.md.com
11. https://www.medscape.com/cardiology
12. www.pcr.online.com

Program outcome for Post Doctoral Advance fellowship (PDAF) in Cardiovascular and Thoracic Anaesthesia

Outcomes of the 'PDAF- Cardiothoracic and vascular program', are outlined below and summarize the broad skill sets that the candidate is expected to acquire after the successful completion of two years training program:

1. To assess and evaluate preoperative patients with various acquired and congenital cardiological conditions in a step wise manner.
2. Apply necessary monitoring techniques and arrive at logical management decisions for all surgical patients with common/uncommon, simple/complicated conditions of the cardiovascular and thoracic diseases prevalent in the **community, region, and country.**
3. Have sufficient and up-to-date knowledge and skills in the perioperative and intensive care related cardiovascular and thoracic diseases also to understand the disease burden, epidemiology, patho-physiology, and key determinants of cardiac disease in the **region, state and country.**
4. Make continuous efforts to acquire latest medical knowledge related to diagnostic, investigative, medical and surgical management of cardiovascular and thoracic diseases and rationally analyse it.
5. Evaluate clinical and scientific data in an analytical manner and choose how and what to use in patient care commensurate to the **requirements of the residents of the region, state, and** country.
6. Keep abreast of latest advances in there subject and critically examine available scientific evidence to decide their place and application in patient management.
7. Make evidence-based decision-making part of the learning process and apply it logically in **cost-effective country-centric manner tailored to the needs of the patients.**
8. Apart from clinical work, prioritize thrust research areas at **institutional, state, national and international levels,** and network to set up collaborative networking and workforces at these levels to enhance the **research milieu of the country.**
9. Acquire skills to become an effective communicator with
    a. the patients and their caregivers
    b. hospital and public health administrators
    c. policy makers and regulatory authorities
    d. peers and researchers of one's own medical fraternity and other allied streams.
    e. members of the public and community leaders
10. Develop mentorship, leadership and networking qualities to help teach, train and impart clinical and research skills to future cardiologists in the **state and country**

Course outcome for PDAF Cardiothoracic vascular anaesthesia

At the end of the course, the PDAF student should acquire the following competencies under the three domains:

(A) Cognitive domain (Knowledge domain)

By the end of the course, the PDAF student should:

1. Have the ability to have a complete understanding about the etio-pathogeneis, diagnostic techniques, management issues, epidemiological and preventive aspects of different Cardio-vascular and thoracic diseases of children and adults with special focus on prevalent clinical problems in the **region, state, and country**. These include **Coronary artery disease, the** prevalence of which in our state has nearly doubled in last three decades, with rising trends in young people, **Hypertension** (single most common risk

factor for cardiovascular deaths, with current prevalence rates of 10-12%), **Congestive heart failure** (most cases in the region related to underlying Coronary artery disease, Hypertension and rheumatic heart disease), **Rheumatic heart disease** (commonest cause of heart failure and valvular heart disease in young children and adults), Congenital and acquired pulmonary and vascular diseases.

2. Have a comprehensive awareness of normal processes that govern cardiac-pulmonary physiology and how they get impaired in disease states.
3. Demonstrate knowledge and expertise in relation to clinical course, adverse effects, short-term and long-term complications processes involved in different diseases of the cardiovascular system to identify these in an early and timely manner.
4. Have the skills to plan and order suitable investigations that are applicable for diagnosis and pre and post operative management in a cost-effective manner suitable to the needs of the **people of the region, state, and country.**
5. Ability to correctly analyze and interpret the results of various routine and other specialized investigations and cardiac-pulmonary functions tests so that appropriate therapeutic strategies can be applied for proper management of the patients with cardiac diseases and respiratory diseases.
6. The PDAF Cardiovascular and Thoracic Anesthesia trainee should be able to prioritize the investigations and treatment modalities sensibly and logically for resource-limited situations commensurate with the requirements of **the state or country so as to provide best possible treatment in all situations.**
7. Be aware of different guidelines of various national and international associations and their applications tailor-made to suit the local needs of patients.
8. Should be conversant with the recent advances in science related to diagnostic and therapeutic techniques, novel drugs, other key research areas and their application to clinical and interventional and non-interventional Cardiovascular and Thoracic procedures that may continuously change and evolve over time.
9. Have the ability to rationally analyze scientific data and apply it to needs of the **local populace of the state and country.**
10. Have a working understanding of biostatistics to enable balanced evaluation and analysis of literature.
11. Demonstrate competence in basic concepts of research design, methodology, clinical epidemiology and preventive issues of various Cardio-vascular and thoracic diseases.
12. Should have the skills to conceptualize, write and conduct research proposal keeping in mind all ethical principles especially with context to Indian beliefs and customs, related to disease of the cardiovascular system focusing on indigenous needs of **local, regional, and national health priority.**
13. Should have the ability to establish a research laboratory, if required, even in remote areas of the region.
14. Should be able to identify, prioritize and manage **cardiac, vascular, and thoracic emergencies**, common as well as rare, that are **prevalent in the region or state** and take judicious decisions regarding urgent hospitalization to expedite care and/or other super-specialty referral, as required.
15. Have a basic understanding of digital applications in Cardiovascular and Thoracic Anesthesia and use of Artificial intelligence and machine learning.

(B) Affective domain (Attitudes including Communication and Professionalism)

1. Demonstrate kindness, empathy and compassion towards all patients and their families.
2. Treat all patients in a holistic manner.
3. Respect the patients' right to information and second opinion.
4. Communicate well with patients and make all efforts to explain the rationale of diagnostic and treatment approach to patients and their caregivers in their own

language for ease of understanding.

5. Spend time with patients explaining to them with thoughtfulness and empathy the pros and cons of all options and further course of action.
6. Have the skills to participate in seminars, Continued Medical Education programs, panel discussions, lectures to discuss and review recent scientific data to **further the cause of Cardiovascular and Thoracic Anesthesia in the country and increase visibility on national and global platforms**.
7. Should actively cultivate skills to work in a team, with mutual respect, basic human courtesy and a supportive attitude towards others including other clinicians, para-clinical staff, policy makers and health administrators to improve Cardiovascular and Thoracic Anesthesia services **at a regional, state, and national level**.
8. Communicate openly and honestly with all patients and their caregivers, hospital administrators, regulatory authorities, peers and researchers of the Cardiovascular and Thoracic Anesthesia fraternity and other allied members of the public and community leaders.
9. Develop a habit of maintaining honest, detailed, and comprehensive medical records.
10. Maintain principles of etiquette and abide with the country's laws, always adopting ethical practices.
11. Be aware of ethical principles of clinical research as guided by institutional ethical committees.
12. Should demonstrate principles of equality when dealing with individuals of special groups.
13. Should be able to accept feedback and criticisms with an open mind.
14. As a skilled professional, be aware of the value of maintaining punctuality in clinical work.

(C) Psychomotor domain

At the end of the course, the student should have acquired following skills:

1. Skills to appropriately investigate and correctly and ethically manage all types of Cardio-vascular and thoracic surgical cases and its post operative care.
2. Plan and order the required investigations for patients in a cost-effective manner tailored to the individual needs of the patients.
3. Be able to correctly analyze the results of all frequently used as well as specialized investigations necessary in Cardiovascular and Thoracic operative cases, including routine biochemistry, biomarkers, serological tests and ECG.
4. After having performed under supervision during PDAF training, should be able to demonstrate requisite skills and confidence in independently using imaging modalities like:
    a. basic and advanced echocardiography including transesophageal.
    b. Conduct coronary and non-coronary angiography and other interventional procedures.
    c. interpret CT scans, nuclear cardiac scans, cardiac CT, cardiac MRI ..
    d. interpret thromboelastograms.
5. Have basic understanding about functioning of different monitoring equipment's in routine use in the non-invasive and invasive Cardiovascular monitors and how to reduce their maintenance cost for the institution.
6. Have knowledge about Cardiovascular and Thoracic Anesthesia and its digital applications and fundamentals of use of artificial intelligence and machine learning.

department like operation theatre, postoperative icu, intensive coronary care unit, cath. Lab, echo room. He or she will be learning the invasive cardiology diagnostic procedure and therapeutic procedure done in cath lab and emergency services. Besides, this a programme for invasive monitoring demonstration, seminars, workshops, journal club will also be organized.

- **Teaching Programme**

The following teaching programme is prescribed for the course :

Operation room and ICU teaching	five days in a week
Seminars/ journal club	four per month
clinical audits	once per month
echo rounds	once per month
faculty echo lectures	once per month
wet lab porcine heart dissection	once a year

courses offered via institute 01 programme and students have to collect mandatory scores
Saturday institute grand rounds teaching
Teaching of junior residents pursuing MD anaesthesia, technicians by these residents in their second year period, is part of the training.

Surgical / Post Op Intensive Care Unit

In the operation room the candidates have to be present at around 8:30 AM and be a pert of the team for the conduct of Anaesthetics in Cardiac, thoracic and vascular patients according to the posted lists. The routine lists include all the adult, paediatric, robotic assisted, cardiac, vascular and thoracic cases and all the congenital diseases. One at a time will be responsible for the emergency cases after routine hours. They will use electronic charting and keep audit records. They will be tutored in real tim the TEE/ TTE use in operation room and ICU. They will shift the patients to the cardiac surgical icu and be a part of the team to manage patients actively in the ICU.

During their posting the candidates is required to be attending the ICU rounds and learn all the intricacies of the critical care , ventilatory care , haemodynamics , pain control , nutrition and outcome and various procedures associated with them. They will build up a data base in relation to above areas to understand the patient management in a better way.

Cardiac Postings

During their posting in cardiology, trainees are required to participate in the rounds and cath lab procedures in adults and paediatrc patients, understand intricacies of catheterization techniques, all the percutaneous procedures and their anaesthetic management, echo room training for transthoracic echocardiography, and also cardiac radiology

Period Of Posting In Various Units

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

Cardiaothoracic and vascular anaesthesia	18 months
cardiology	2 months
cardiac nuclear medicine	one week included in 18 months

- **ASSESSMENT**

At the end of one year of training there will be an internal assessment comprising off both single theory paper and clinical viva for each candidates. Internal assessment will also be made in day to day work of the trainee, which involves patient care, teaching, anesthesia management in the operation room, emergency service, bed side presentation and research. The candidates will be counseled on their performance regularly so that optimum level can be reached.

- **Log Book**

The candidates has to build up a log book according to the set norm of the unit in which all the clinical work, research project and teaching activities have to be entered periodically. This book has to be signed by the anaesthesiology consultants on a regular basis.

- **RESEARCH**

The trainee shall be required to undertake research and write papers under the guidance of faculty (the cardiac anaesthesia professors will be the lead guides with faculty from allied specialties can work as co guides). The candidate will have to submit a proposal / topic for the project work within three months of the joining of the course. The work period for the project will be one year. It is desired that paper from the project should be submitted/accepted for publication in at least an indexed Indian journal. Another article (that can also be a interesting case report, review article, proc-con debate) as first author should also be submitted for publication in a journal before the candidate appears in the final exit exam examination

- **FINAL EXIT EXAMINATION**

Eligibility

Candidate will be allowed to appear with in two years of training.

Board Of Examiners

Cardia canesthesiologists with minimum 10 years of teaching experience and active involvement in the clinical care and specialty of CVTA.

Internal examiners will be only from core faculty (as mentioned above) professor grade

Theory Papers

There shall be two theory papers with the following titles

- Basic science and clinical aspects as related to cardiac anesthesia
- recent advances in cardiac anesthesia

Clinical Practical And Viva Voice

One long case and two short cases will be given to the candidates and the discussion there on would last 30-40 min in each case. The candidates are also given ECG, X-ray, echo, angio reports to be interpreted. Various equipment, used in OR, intensive care unit, drugs, fluids, catheter for invasive monitoring are also required to be **interpreted** and discussed on table viva. Two examinations could be held every year in the months of may and December.

Cardiac and Vascular Anaesthesiology Curriculum

The training programme shall be updated as and when required.

A basic science include anatomy, physiology, pharmacology, physics, biochemistry, coagulation, cpb-pharmacokinetics during cpb, monitoring, diagnostic techniques involve cardiology diagnostic and therapeutic therapy.

Special consideration –cardio pulmonary bypass and extra corporeal circulation
-drugs related to anaesthesia of cpb
Pulmonary life-support – advanced cardiac life support

Operative observations and training

Preoperative evaluation
Operative direct care and conduct of anaesthesia (routine and emergency)
Post- operative intensive care and pain relief (routine and emergency)
Research projects
Examinations – basic sciences
(theory and practical) clinical practice of anaesthesia & allied Sciences
Recent advances.

Detailed Syllabus

General

History of anaesthesia for thoracic & cardiovascular surgery
Natural history of cardiac & pulmonary diseases demography
Diagnosis, pre-op. evaluation & preparation for surgery

1. Basic sciences

1. Anatomy cardiac : embryology, development of heart, pulmonary and vascular organs adult anatomy of lungs, thorax, diaphragm, vascular, and coronary artery anatomy .
2. physiology cardiac : cellular physiology, haemodynamics, autonomic nervous system, cardiac functions,blood physiology, coagulation action potential, cardiac arrhythmia
3. Pulmonary : open & closed chest ventilation. Ventilation/perfusion mismatch. Pulmonary airway mechanics, one lung ventilation.
4. Thoracotomy and pulmonary physiology. Renal, hepatic, cns, endocrinal system, others,metabolic effects of surgery. Endocrines response to anesthesia and surgery
5. Pathophysiology : heart failure, congenital defects , coad, cardiopulmonary reserves, acquired cardiac & pulmonary diseases. Vascular pathology. Immunological response metabolic response during cpb
6. Pharmacology : total circulatory arrest, pharmaco kinetics & pharmacodynamics of anaesthetic and vasoactive drugs biochemical reaction, applied concepts drugs related to anaesthesia

practice cardiovascular drugs. Current antibiotics for icu use bronchodilator. Antiarrhythmic drugs, nitric oxide.

7. Physics : basic concepts, analyzing, measuring & monitoring devices, electronics, computing of patients data .laser in cardiac surgery, robotic technique
8. Equipment: computer application , maintenance monitoring techniques, equipment in ot , equipment for transport of patients, icu equipment

2. clinical sciences

1. Anaesthesia for cardio- thoracic & vascular surgery:- or diagnostics procedures in adults & paediatric age groups. Vascular surgery: aortic surgery , carotid artery surgery.
2. Paediatric : basic haemodynamics, palliative procedures, pre –op . preparation & special care in monitoring, fluid balance & airway management
3. Anesthesia for neonatal complex cardiac surgery
4. Anaesthesia management for redo- surgery
5. Paediatric diagnostics procedures in cath lab & echocardiography
6. Invasive therapeutic techniques like asd devices, stent in major vessels, coil embolization

Detailed:

1. anaesthesia a for ischemic heart disease, valvular heart disease, vascular disease, adult congenital heart surgery, Paediatric surgery
2. Electrophysiological & arrhythmia surgery. Heart transplant, heart lung transplant, ventilator assets
3. Anaesthetic techniques for pulmonary surgery diagnostic & elective. Emergency procedures for lung surgery . one –lung anaesthesia, ventilation, physiotherapy (gas exchange & airway dynamics)
4. Anaesthesia during emergency, surgery and direct emerging from cath lab after cath lab complication
5. Anaesthesia in patients for diagnostic & palliative procedures in cardiology, radiology cath lab (outside operative rooms). Invasive cardiology procedure
6. Anaesthesia management of redo- surgery
7. Management for post op. ventilation care, prolonged ventilation, weaning , control of acute pain – its techniques & agents , used. Postoperative pain management, invasive tracheal procedures for ventilator care.
8. Intra op. monitoring, PAC based and non PAC based and minimally invasive, cardiac output, POC coagulation monitoring

Cardiopulmonary bypass

1. Perfusion technology, principles, equipment, oxygenators, haemofiltration, MUF, PUF and ECMO
2. Hypothermia, techniques & protocols
3. Myocardial protection

4. Haemodilution
5. Anticoagulation, pharmacology, monitoring methods
6. Side-effects , complication & management
7. Subsystem care – cerebral , renal hepatic protection
8. Cerebral protection, cerebral monitoring
9. Total circulatory arrest, left heart bypass
10. Anaesthesia management during CPB
11. Pharmacokinetics& pharmacodynamics of drugs during CPB

Intensive care management

1. Protocols for sub –system care, cerebral, renal, hepatic & others
2. Ventilatory care, weaning of ventilator support. Parenteral nutrition, control of infection
3. End stage renal failure, bedside dialysis techniques
4. Postoperative management of single ventricular repair
5. Hepatic failure
6. ICU monitoring technique in postoperative pain management
7. ICU management, especially after neonatal surgery – ventilator support in neonates, ECMO programme for neonates and children
8. Intensive coronary care, ECMO care and other LV support devices
9. Cerebral function monitoring

Tranoseophageal echocardiography with emphasis on transthoracic echocardiography also

1. Physical principles of echocardiography
2. How to image, store and retrieve echo images
3. Doppler principle, cfd, spectral Doppler, calculation and haemodynamics
4. Left ventricle chamber and walls systolic and diastolic functions
5. Cardiomyopathy dilated, hypertrophic and restricted
6. Ischaemic heart disease
7. Aortic stenosis
8. Aortic regurgitation
9. Mitral stenosis
10. Mitral regurgitation
11. Tricuspid and pulmonary valves
12. Right ventricle evaluation
13. Prosthetic valves
14. Endocarditis
15. Aortic disease
16. Pericardial disease
17. Cardiac tumors and masses
18. Imaging artifacts
19. Congenital heart disease

20. 3d echocardiography : image acquisition, data analysis, cropping, measurements,
21. Speckle tracking
22. Ultrasound for vascular access and lungs
23. Transthoracic echocardiography and its interpretation
24. Ultrasound for nerve blocks

3. Allied sciences

1. Cardiac surgery : surgical techniques, curative surgery, palliative procedures, risk evaluation, prognosis.
2. Cardiology and cardiac nuclear medicine: pre- op. evaluation, patho- physiology, electrophysiology, diagnostic radiology procedures-ecg , x-ray angiography, cardiac cath, Doppler's. echocardiography, nuclear studies & their interpretation & their treatment of disease special procedures : pacing, cardioversion, ptca, etc. automated cardioverters, invasive procedures for arrthmia i.e. ablation of abnormal pathway.
3. Statistics : statistical techniques (01 courses)

Monitoring in anaesthesia

1. Invasive & non-invasive haemodynamic monitoring techniques for pre-peri& post-operative periods in cardiothoracic ors, icu and cardiology suits
2. Understanding of basic concepts of monitoring
3. Indication, cost effectiveness, complications
4. Equipment usage & knowledge of accessories
5. Knowledge of the following monitoring-
6. Cardiac functions : ecg, abp, vent.pressures, calculation of cardiac output , resistance, flow, echo, dopplers, cardiac CT, PET
7. Pulmonary function : pft, blood gases, acid –base pulm . airway mechanics.
8. Coagulation profil temp. renal, b. sugar, enzymes.act heparin & protomine regulation, thromboelastography.
9. Neuromuscular blockade : and other recent advances in monitoring, Cerebral Oximetry, evoked potential monitoring, BIS monitoring during CPB.

Recent advances

1. Knowledge of recent development in field of cardio thoracic & vascular surgery
2. Cardiology- ptca, ballon embolectomy, other percutaneous procedure etc.
3. Heart- lung transplant – physiology, pharmacology (anaesthetic consideration) –donor – recipient selection
4. Immunosupression etc.
5. Cardiac assisting devicesv – artificial heart, iabp,lhad
6. Advances in pulmonary Hypertension, ECMO, Heart Failure, ventilation, Heart and Heart lung transplant

7. Blood substitutes
8. Current advances and concepts in drugs, equipment, and monitoring methods
9. They need to be changed as new recent advances are inducted in practice of cardiothoracic and vascular surgery and anaesthesia. The latest guidelines, changes and modifications of the guidelines and the latest landmark scientific papers that have change the clinical practice are to be included in the recent advances apart from the new techniques in clinical care, research and data management.

Thoracic Anaesthesia

1. Mediastinal masses and surgery
2. Lung diseases and masses and surgery
3. Lung reduction surgery
4. Preoperative functional evaluation of patients for lobectomy and pneumonectomy
5. Airway management with art and science of lung separation with the use of double lumen tubes and bronchial blockers
6. Minimally invasive Thoracic surgery
7. Robotically assisted mini thoracic surgery
8. Pain control in the postoperative care with special emphasis on various nerve and regional nerve blocks:
    a. Thoracic Epidural block
    b. Paravertebral Block
    c. Intrathecal subarachnoid bocks
    d. Intercostal nerve blocks
    e. PEC 1 and 2 blocks
    f. SAP block
    g. Erector spinae block