DM Cardiology

Program details

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RECOMMENDATIONS BY BOARD OF STUDIES FOR CARDIOLOGY DM PROGRAMME

Aims and objectives

The DM Cardiology programme in SCTIMST is a 3-year course which involves training of students already having a postgraduate degree (MD/DNB) in Medicine or Pediatrics, in theoretical, clinical and practical aspects of Cardiology. Based on the training, after the 3-year period, the specialist - cardiologist - is expected to have an in-depth, comprehensive knowledge of all facets of cardiovascular diseases and their management, have skills to effectively deliver curative and preventive care, and have attitudes and behavior consistent with highest professional standards. Candidates meeting the following criteria are eligible to apply for admission to the course

1. Indian citizen
2. Must have completed MD/DNB degree from Indian Medical Council recognized universities.
3. Age below 35 years on the date of application

Should not have more than 2 attempts to pass any examinations, and the total number of attempts overall should not be more than 2

The aim of the curriculum is to provide a basic framework for the course of DM cardiology. The candidate is expected to learn to deliver "state of the art" clinical care in a scientific, cost effective, ethical and compassionate manner to an individual and patient, and also develop an attitude of committed learning, teaching, and research for the welfare of the society.

To achieve these objectives, 3-years' residency programme in accredited centers is currently employed. The training includes both theoretical and practical aspects of core knowledge and skills, and will be imparted in a manner that is conducive to learning. It will be supervised and objectively evaluated. The curriculum will be periodically revised and updated every 3 to 5 years.

Guiding Principles

The five guiding principles of the programme are:

A. Medical Knowledge

1. Acquire medical knowledge and critically evaluate them

2. Understand and incorporate evidence-based decision-making

B. Patient Care

1. Medical interview and physical examination

2. Patient education of disease and treatment

C. Interpersonal and Communication Skills

1. Communicate effectively with other professionals

2. Maintain comprehensive medical records

D. Professionalism

1. Demonstrate self-awareness and limits

2. Demonstrate high standards of ethical and moral behaviour and responsibility

4. Demonstrate respect for patient's dignity

5. Participate in team work for giving better patient care and for gathering knowledge

E. Systems-Based Practice

1. Promote patient safety within the system

2. Provide value added and cost-effective care for patients

3. Promote health and prevention of disease and injury

Syllabus

Theoretical knowledge to be acquired at 18 months training (Part I theory examination) and at 36 months training (Part II Examination)

Serial numbers 1-9 to be completed by 18 months for part I examination

Serial numbers 10-11 to be completed at 36 months for part II examinations

Part I

1. Cardiac anatomy: applied anatomy of cardiovascular system, normal variations, embryology, and alterations in disease states.

2. Cardiac physiology: normal cardiovascular physiology including electrical activity, cardiac cycle, cardiac metabolism, and physiology of circulation. Range of normal responses, and alterations in health and disease states.

3. Cardiac pharmacology: Basic understanding of pharmacokinetics of drugs and pharmacodynamics of drugs used in cardiology. Their mechanism of action, metabolism, adverse effects, drug interactions, drug development, and practice of prescription utilizing best scientific evidence.

4. Cardiac pathology: structural alterations- structural alterations - macroscopic and microscopic, due to various diseases primarily and secondarily involving the heart and the vascular system.

5. Cardiac investigations: A thorough knowledge of basic principles, indications, technique, results, strength and limitations of various diagnostic tests is essential. Proficiency in independently ordering, performing and interpreting some of these investigations is essential, and accrue from a large number of tests performed under supervision and independently as subsequently suggested. These include invasive and non-invasive investigations.

Non-invasive investigations: ECG, Echocardiogram, Chest X-ray, Cardiac CT and CT angiography, Cardiac MRI and MR angiography, Nuclear cardiac imaging, exercise stress testing and Holter monitoring.

Invasive investigations: Cardiac hemodynamics (pressure waveforms, oximetry, cardiac output, vascular resistance, shunts, valve area), normal and abnormal angiographic anatomy of heart and blood vessels, safety precautions, complications of cardiac catheterizations and their management.

Invasive electrophysiological studies – basic understanding of electrical signals, interpretations, physics of radiofrequency and pacemaker.

6. Epidemiology and preventive cardiology: principles of epidemiology in relation to cardiac diseases. Concepts of risk factors, population approaches, prevention of diseases and health promotion.

7. Genetics and molecular cardiology;

8. Basics of statistical methods; Research methodology:

9. Biomedical engineering: Basic understanding of physical principles of various biomedical instruments and devices used in cardiac diagnosis and therapeutics with a view to optimally utilize them.

Part II

10. Core cardiology: The epidemiology, etiopathogenesis, clinical presentation, diagnosis, differential diagnosis, treatment, complications, prognosis and preventive aspects (wherever applicable) of the following heart diseases

    - Atherosclerotic heart disease - acute and chronic coronary artery diseases.

- Valvular heart disease including rheumatic heart diseases
- Congenital heart disease in infants, children and adults
- Heart failure- acute and chronic heart failure
- Systemic hypertension – primary and secondary
- Cardiac arrhythmias
- Sudden cardiac death, syncope
- Heart muscle disease – myocarditis and cardiomyopathy
- Pericardial disease- acute and chronic Pericarditis,
- Constrictive Pericarditis, pericardial effusion
- Infective endocarditis – diagnosis, treatment and prevention
- Lungs and heart diseases including pulmonary hypertension
- Diabetes mellitus and heart disease
- Pregnancy and heart disease
- Stroke and heart disease
- Cardiac involvement in other systemic diseases
- Diseases of aorta including aneurysms, aortitis, aortic dissection
- Peripheral vascular diseases, venous system diseases including thromboembolism
- Anaesthesia and non-cardiac surgery and heart
- Cardiac trauma
- Cardiac neoplasms

11. Recent advances and future of Cardiology

Reference books and Journals

Textbooks – General

1. Harrisons's – Principles of Internal Medicine
2. Braunwald's – Heart Disease
3. Hurst – The Heart
4. Otto – Valvular Heart disease – A companion to Braunwald's Heart disease
5. Opie – Drugs for the Heart (handbook) – most recent edition (currently 8th)
6. Alpert – Valvular Heart disease
7. ESC Textbook of Cardiovascular Medicine
8. Murphy and Lloyd - Mayo Clinic Cardiology

Interventional Cardiology

1. Grossman – Cardiac Catheterization, Angiography and Intervention
2. Topol's – Textbook of Interventional Cardiology
3. Kern – Cardiac catheterization handbook
4. Mullin's – Cardiac catheterization and hemodynamics
5. Percutaneous Mitral Valvotomy, edited by Dr Harikrishnan S
6. Kern - Hemodynamic rounds

Echocardiography and ECG

1. Feigenbaum – Echocardiography
2. Snidder – Echocardiography in pediatric heart disease
3. Schamroth – An introduction to ECG
4. Marriott – Practical Electrocardiography
5. Chau – Electrocardiography in Clinical practice
6. Lang RM - ASE's Comprehensive Echocardiography
7. Lancelotti - The EACVI Textbook of Echocardiography

8. Otto - The Practice of Clinical Echocardiography
9. Wyman – Echo in Pediatric and Congenital Heart Diseases

Pediatric Cardiology

1. Rudolph – Congenital disease of the heart
2. Joseph K. Perloff – The clinical recognition of congenital heart disease
3. Moss and Adam's – Heart disease in infants, children and adolescents
4. Myung K Park – Pediatric cardiology for practitioners
5. Anderson – Paediatric Cardiology
6. Freedom – The Natural and Modified History of Congenital Heart Disease
7. Gatzoulis – Adult congenital heart diseases
8. IAP Speciality on Pediatric Cardiology - 2E (2013)
9. Yagel Fetal Cardiology 2nd Ed

Electrophysiology

1. Ellenbogen – Clinical cardiac pacing, defibrillation and resynchronization therapy
2. Ellenbogen – Cardiac pacing and ICDs
3. Josephson – Clinical cardiac Electrophysiology
4. Zipes/Miller – Cell to Bedside

Journals

1. New England Journal of Medicine
2. Journal of American College of College
3. Circulation
4. Heart
5. American Heart Journal
6. American Journal of Cardiology

7. International Journal of Cardiology
8. Catheterization and cardiovascular interventions
9. Pediatric Cardiology
10. Pacing and cardiovascular electrophysiology
11. European Heart Journal
12. JACC Intervention
13. Journal of Invasive cardiac Electrophysiology
14. Lancet
15. Indian heart Journal
16. Cardiology in the Young
17. Cardiology Clinics
18. Cardiac EP Clinics
19. Annals of Pediatric cardiology
20. Canadian Journal of Cadiology
21. Cardiology in review
22. JAMA cardiology
23. Progresss in cardiovascular diseases
24. Eurointerventions
25. Current problem in cardiology
26. Mayo clinic proceedings
27. Journal of American society of echocardiography
28. Progress in paediatric cardiology

29. Congenital heart diseases

30. Echocardiography

31. Annals of thoracic surgery

32. Journal of thoracic and cardiovascular surgery

33. European Journal of Cardio-Thoracic surgery

Academic Program Committee

Academic Program Committee will oversee the implementation of the curriculum including the academic activities including research projects of the Senior Residents and the continuous evaluation process of the Senior Residents over the three years.

The committee will consist of

1. Chairman of Academic Program (Head of Department)
2. Program-in-Charge (Senior Faculty from the department)
3. Program Coordinator (Associate / Assistant Professor)

Head of the Department:

1. Overall supervision of the conduct of academic programs and evaluation.

2. Assess the quality and adequacy of content of academic program.

3. Evaluate the progress of each student.

4. Member of the appraisal committee and will assess the remedial measures taken to enhance performance of the resident/student.

5. Conduct of the external examination and supervision of conduct of internal examinations.

Program In-Charge (PIC)

The Program In-Charge is accountable to the Head of the Department, the Board of studies and the Academic council.

The Program In-Charge will ensure that the program is organized, relevant, and continually updated. The Program In-Charge acts as a liaison between the residents and faculty, frequently in the role of resident advocate.

Duties of the Program In-Charge, assisted by the residency training committee include:

1. Will be responsible for ensuring the implementation of academic programs as envisaged by the BOS.

2. Assign equal number of academic programs for each resident for each year and ensure it is conducted

3. Supervise the conduct of evaluation of academic programs by PC

4. Supervise the internal evaluation process

5. Organize external and internal examinations

6. Verify and validate entry of marks in the e-portfolio after it has been verified and validated by PC.

7. Report to BOS/academic council, deficiencies, suggestions and feedback on the upgraded curriculum and evaluation.

Programme Co-Ordinator (PC):

The Programme coordinator will function as a personal educational supervisor for the residents and will be accountable to the program In-Charge.

Duties of the programme coordinator include:

1. Circulate monthly academic roster of department and send a copy to the academic division

2. Maintain dossier for each student till the end of the course

3. Circulate and collect evaluation forms after each academic program

4. Maintain register of attendance in academic programs of both students and faculty.

5. Enter and validate entry of information and marks for each student for each program at the end of each month in the e-portfolio.

6. Monitor log book entries

7. Collect student feedback

8. Organize internal examination

2.4 Research guide mentor:

Each student should have a mentor in the department. A research mentor will be assigned for the thesis and research projects. The Research mentor is the primary liaison between residents and faculty for research and works to ensure that the research requirements of the department are met.

Specific duties include:

1. The mentor could be the thesis guide for post-doctoral courses or any other faculty member nominated by the APC.

2. Can guide the student in the selection of appropriate thesis topic, process of submission to TAC and IEC.

3. Ensure participation and presentation in a national conference

4. Guidance for publication of research paper

5. Review abstract submitted for conference and ensure that abstract is sent to e-portfolio

6. Participate in appraisal meeting conducted by departmental academic

7. Committee and assist in planning remedial actions for candidates' progress

8. Guide and counsel students in managing work and stress

9. Guidance students in planning their careers

Practical / Clinical / Laboratory experience to be imparted

To achieve the stated objectives, the candidate will have following minimum exposure in various disciplines of cardiology training. The duration of posting in each areas has been decided based on the relevance of each areas and minimum duration required in these areas to develop basic skills in patient management.

In-patients wards	6 months
Review Clinics and consultation	6 months + 1 month
OPD	6 months
CCU	3 months
Cardiac Cath lab	6 months
Echocardiography	4 months
Non-invasive cardiology lab	
Exercise lab/cardiac radiology	1 month
EP including Holter and pacemaker clinic	2 months
Cardiac surgery	1 month

Interdisciplinary exposure

Cohesive interdepartmental and interdisciplinary interaction has been identified as a key component for optimal clinical, academic and research excellence of the students. To facilitate this at personal and departmental levels, the residents will have:

- Posting in Cardiac surgery and Cardiac surgical theatres
- Biomedical technology orientation posting,

- Short-term training in biostatistics & research methodology, and cardiac pathology,
- Participation in Interdepartmental academic meetings involving departments of cardiac surgery and radiology.
- Short-term training in cardiac CT and MRI

Clinical skills: Include the ability to take discerning history, perform relevant clinical examination, decide the appropriate investigations and derive the management plan.

Technical skills: The candidate should be able to perform and interpret relevant cardiac investigations independently, and should have a firm grasp on many others. To assure this, a minimum numbers are mandatory as given below.

Non-invasive

ECG interpretations	2000
Holter analysis and interpretation	50
Treadmill stress test: conducting and interpretation	100
Implanted Devices Clinic: Interpretation and trouble-shooting	50
Transthoracic echocardiography (including segmental views and basic foetal echocardiography)	500
Transesophageal echocardiography	25
CT interpretations	20
MRI interpretations	20

Invasive: The training in invasive procedures is designed to provide maximum possible experience to the residents. These procedures should be under the supervision of a faculty member

without affecting the safety of the patients at any cost. The goal of fixing the minimum number of cases to be performed is to make the resident well-versed and confident in performing the common procedures independently and other procedures under limited supervision at the end of 3years. The minimum number of each procedure to be undertaken by the resident is given below, and the number as the primary operator under supervision is given in brackets:

Right heart catheterizations	30 (10)
Electrophysiological studies	30 (5)
Coronary angiography,	200 (30)
IVUS, OCT, FFR	10 (5)
Therapeutic procedures	
Pericardiocentesis	10 (5)
Temporary pacemaker implantations	20 (10)
Intra-aortic balloon pump	3 (1)
Permanent pacemaker and ICD	20 (5)
Valvuloplasty	50 (5)
PTCA	50 (5)
Septal puncture (BMV/ EP studies)	30 (5)

Communication skills: The candidate is expected to develop into an effective communicator to the patients, their family, colleagues and students.

PORTFOLIO

A portfolio is a collection of information that demonstrates development or evidences learning outcomes, skills or competencies.

Benefits of portfolio to the trainee:

provide a structure to guide the resident through the learning process, enabling them to set and review personal goals, targets and objectives.

Work-based assessments by the supervisors may demonstrate whether the trainee has attained practical skills appropriate to the specialty.

Portfolios can maintain record of procedures and allow learning points to be noted alongside. This can be powerful as the learning from successes and failures is reviewed by the trainee and supervisor.

Benefits of portfolio for the program In-Charge and supervisors:

This evaluates a candidate's ability to reflect on practice and learn from experience. Portfolios record all educational and clinical supervision meetings, personal development plans, and a plan of development, along with skills and a record of work-based assessments. This provides supervisors and program directors with a transparent longitudinal record ensuring that a trainee's progress can be reviewed as he/she rotates from post to post.

The record of experience - the log book

Trainees will be expected to maintain a Log book of the clinical activities and academic experiences. The log book is part of the portfolio, which should be maintained in the form of a printed copy and an electronic version.

Functions of the log book:

It provides trainees with a personal record of all procedural and other training experiences, which are requirements for satisfactory completion of the training program. It will be used by the Educational mentor to monitor the trainee's experience to ensure that it is appropriate.

Procedure of completing the logbook:

The trainee residents should enter the data regarding their clinical and academic experiences in a format of weekly data entry chart. All residents are expected to complete the weekly data entry charts at the end of the same week. Instructions for completing the charts will be available with the format logbook.

The weekly data entry charts must be attested by the concerned consultants every week. All charts must be preserved and produced for verification to the Program In-Charge at the time of final preparation of logbook.

Submission of Thesis:

Submission of at least one thesis project is compulsory for the trainee DM residents, who should design the project under guidance of the research mentor. It will be recommended for the trainees to submit the thesis proposals within 3 months after joining the program and necessary permissions and findings should be sought within 6 months of joining the programme.

The project must be approved by the institute technical advisory committee (TAC) and the institute ethics committee (IEC).

Guidelines for preparation and submission for the TAC and IEC are available in the institute web site

Submission of thesis for publication should be done at 30 months and will be evaluated by external examiners/experts.

Academic schedule of the department for curriculum implementation:

	Academic session	**Day**	**Time**
1	Hemodynamics, Angiography , Interventions: discussions	Tues – Saturday	8:00-9:00 am
2	Journal club	Monday	7:30 -8:15 am
3	Problem oriented medical discussion	Monday	8: 15 - 9:00 am
4	Surgical case discussion (interdisciplinary meeting)	Wednesday & Saturday	2:00 - 3:00 pm 2:00 - 3:00 pm
5	Electrophysiology/interventional rounds Coronary intervention forum Pediatric Echo/MR/CT/intervention forum	Wednesday Friday Thursday	4:00 – 5:00 pm
6	Short topic review	Thursday	7:30 – 8:00 am
7	Non-invasive imaging rounds / Hemodynamic rounds/ fellows meeting	Saturday	9:00 –10: 00 am
8	Clinical case / bedside discussion	Saturday	10:30- 12:00 pm
9	Seminar	Saturday	3:00 - 3:45 pm

Minimum 75% attendance and participation mandatory for course completion

Research and other academic activities

The candidate will be involved in one research project, which preferably should be a prospective study. The mentor or the guide of the project will be identified by the Head of department in consultation with the faculty members in the initial 6 months. The areas of project work should be decided in discussion with these mentors, and the research project should be presented in the departmental research meeting at the end of 6 months of joining the training period. The project should be modified as per the suggestions from the department, and presented for approval from institute ethical committee, if indicated. The regular progress of research work should be presented at 3-monthly research meetings in the department. The completed research work should be presented at completion of 30 months of residency. The research projects should have been published or publishable in peer reviewed journals at this point of training period.

The residents should have at least one clinical paper submitted in a peer-reviewed journal indexed in prior to appearing for the final examination. At least one abstract presentation should be made at national level scientific meeting. The senior resident has to present certificate of participation to PC and submit abstract of presentation to the PC and also ensure entry in e-portfolio

Categories of research projects:

Clinical research:

Residents can gain research experience either by joining departmental clinical projects or collaborative studies with other departments. The project design may be prospective or retrospective. Conducting retrospective analysis of large case series may also be considered as clinical research.

All clinical research projects must be submitted to the Institute technical advisory committee and institute ethics committee for approval.

Biomedical technology research:

One of the objectives of Institute is to enable the indigenous growth of biomedical technology. All trainee residents must complete the introductory course in biomedical technology wing of the institute. **(BMT wing posting for senior residents is mandatory)**.

Biomedical technology research may be conducted under the guidance of research mentor in collaboration with the scientist-engineers in the biomedical technology wing.

Credit-based Evaluation

This includes three essential components: the documentation of the academic activities in a structured format, a credit-based evaluation of the academic performance, and periodic review and appraisal of the resident based on the evaluation.

Comprehensive documentation by E-portfolio, logbook etc.

The residents are expected to document their academic activities in a personal log book (clinical dossier) under the corresponding subheadings. This should be countersigned by the Head of the department or the supervising consultant after the procedure. This document will be the basis of credit-based evaluation, the third key component of the curriculum development.

This Dossier will serve as the platform to prepare the 'E-portfolio' for the residents at the end of their tenure in the institute. The E-portfolio would reflect academic, clinical and research experience of the concerned resident in the department.

Credit-based evaluation

The internal evaluation of the senior residents will be based on grading. The grading will be based on the performance in each module with specified maximum credits against them.

The respective modules, with the maximum credits allotted against them, are given below.

SI No.	Module	Credits
1	Patient evaluation and management	25
2	Noninvasive laboratory evaluation, analysis and interpretation	25
3	Academic presentation	40
4	Invasive and interventional lab	30
5	Project work / Thesis, including conference presentation and publication	30
6	Skill enhancement postings	20
7	Theory and practical evaluation (Internal examinations)	24

8	Any outstanding activities	6
		200

Module I: Patient evaluation and management (25 Credits)

I. Ward posting (6 credits)

The evaluation tools will be as follows,

1. Completion of admission and discharge summaries & at discharge patient education and prescription.
2. Evaluation of his understanding of the clinical problem of all inpatients under his charge and recognition using clinical laboratory parameters of pt's progress, deterioration or complications.
3. Identification of all clinical issues setting targets to be achieved at discharge.
4. Patient education and counseling especially with respect to post discharge life style, diet, exercise, behavior modification & drugs and drug interactions.
5. .Clinical appreciation of bedside signs and symptoms
6. Interpretation of all laboratory and invasive and noninvasive test5 results
7. .Discharge Summary quality and completeness
8. Bedside procedures including pleural and ascitic tap, and central venous cannula placement.

2. Assessment of Outpatient training (12 credits).

(i) New outpatient Clinic (4 credits).

1. Number of clinical cases seen and discussed with Consultant.
2. Completeness of case history writing and the plan of management along with patient education and quality of prescription given to patient.
3. Interpretation of all routine investigation including ECG, Chest X ray and Doppler echocardiography & Laboratory reports.
4. Total evaluation / plan management strategy of patient on completed routine investigations.
5. Evaluation by senior consultant in outpatient clinic.

(ii) **Review Outpatient clinic and consultations (8 credits)**

1. Number of Review patients seen and consultant's opinion sought with relevant investigation & plan of management- Consultant's evaluation of SR on his understanding of the clinical problem, judgment in patient management and knowledge of the clinical / management issues involved.
2. Number of the patients identified with new problem / worsening of existing clinical issues requiring change of management plan and management discussed with consultant and also presented to the Medical/Surgery Dept meetings charting out plan of management, with all relevant investigations.
3. Identification of critically ill patients and channeling their acute management.
4. Inter-departmental consultations

3. ICU and Emergency room management (7 Credits)

A) This includes evaluation of patient management in the ICCU (newly admitted. transferred from wards, transferred after intervention procedure, etc) and charting out plan of management and carrying out the same.

B) All emergency room visits of patients outside office hours / their evaluation /charting out plan of management including ICU admissions and preparation for primary PCI /emergency intervention/ surgery as indicated.

ICU training will include all emergency procedures including temporary pacing, acute rhythm management, DC cardioversion, transcutaneous pacing, arrhythmia monitoring and documentation, pericardial tapping, pleural tapping, central venous cannulation, endo-tracheal intubation, ventilator management and blood gases interpretation, CPR, CPR protocol.

Module II: Noninvasive Cardiac Lab Training (25 credits)

1. Evaluation of ECG: Reporting and Analysis (5 credits)

Reporting at least 500 ECGs

1. To have a collection of 60 ECGs with all known abnormalities collected in a log book. (At least 60 ECGs of various arrhythmias, waveform abnormalities, device ECGs and utility of nonconventional ECG leads).
2. The evaluation will be based on the quality of the log book submitted

2. Evaluation of 2D-Echo Doppler Exposure (8 credits)

1. Both Performances and Interpretation of echo Doppler studies.
2. To have soft copy of 2D / M-mode / PW Doppler /CW Doppler tracings of various cardiac abnormalities detected with this technique.
3. At least 50 still frames of M mode, 50 still frames of Doppler studies and 200 cine loops of various cardiac malformation (2D, color flow) and advanced studies including TEE, 3D echo and Tissue Doppler.

3. Holter: (2 Credits)

Analysis and reporting of at least 100 Holter tracings with copy of the final report and strips of interesting brady / tachyarrhythmias in hard copy (at least 25 rhythm abnormality tracing).

4. HUT Test: (2 credits)

To perform at least 10 HUT procedures and maintain a log book with procedure and interpretation all the 10 HUT rest results

5. Transesophageal Echo (2 credits)

To perform at least 5 TEE procedures and maintain a soft copy of 5 patients' cine-loop images for evaluation

6. Exercise ECG (4 credits)

To supervise /Analyze / interpret and report 100 Treadmill Exercise ECGs and keep a hard copy of 5 (abridged ECG copy of not more than 4 pages/case) patients with clinical history.

7. Pacemaker Clinic: (2 credits)

Pacemaker / device interrogation/ programming and trouble-shooting: To maintain a log of at least 5 device related malfunctions and trouble-shooting algorithms used.

Module III: Academic Presentation (40 credits)

1. Journal Review (3/year, Duration 30 min.) [4 credits]

Purpose of journal presentation it to instill qualities of enquiry and analysis of scientific medical articles and to evaluate its relevance and impact in understanding pathobiology of disease or in clinical management. The resident can select recent articles of clinical relevance, or consult the faculty to help select scientific articles with original research content for presentation. The presentation should reflect the resident's understanding of the problem under discussion and the outcome and analysis of the results with regard to various aspects of disease state and the clinical relevance.3-4 articles with brief exposition of the highlights of the study and its clinical relevance and the take home message. The senior resident should submit a short report of the articles presented in print with a copy for the dept. and one for the individual, .highlighting the aim, methodology, patient recruitment criteria, results, discussion and implications for clinical practice. The oral presentation and the write up will be equally weighted.

2. Short Topic Review (focused discussion) 3/year, 20 min each [6 credits]

Topics are selected which are very specific addressing a narrow field of cardiology and the purpose of this review is to have current understanding of the subject under discussion, with all relevant references up to date .The presentation is limited to 20 minutes and 10 minutes earmarked for discussion. The presenter has to submit in a short review format the topic under discussion limited to 1500-2000 words (adequate for short essay type questions). Presentation and the write up of the short review will be equally weighted, in evaluation.

3. Problem Oriented Case Discussion (2/year, 25 min each) [6 credits]

The purpose of this exercise is to identify daily clinical problems confronted during the routine hospitalization and management of patients, clinical problems significant enough to influence patient management (diagnosis/therapy). The literature review will be up to date, and will enable evidence based

approach to patient management in different clinical scenarios. The assessment will be based on the following parameters; review of the literature to chart out evidence based management plan and to write up a short report on the clinical problems and the current state of the art management and the level of evidence for such management option. The oral presentation and the write up are equally weighted for purpose of evaluation.

4. Seminar (3/year, 45 min each) [10 credits]

It is intended to encourage extensive literature review on the topic and present the highlights of the topic under review in a succinct manner with clear take home messages, but at the same time the extensive literature search elevates the presenter as an authority on the topic. The topic should be prepared as a review article with complete bibliography in a publishable format, along with the topic presentation. The presentation and the write up are equally weighted.

5. Mortality and Medical Audit (3/year, 15 min each)) 3 credits

1. Complete patient history of present and all past illness.
2. Admission diagnosis / differential diagnosis and evaluation and management with all the laboratory investigations
3. Final clinical diagnosis and the plan of management
4. Complication during the course of hospital stay attributed to disease or treatment /hospital acquired infection.
5. Progression of the disease .Natural or unnatural.
6. Cause of death*
7. Limitation/deficiency in evaluation/management.
8. Autopsy or any other clinical investigation, reports available after death*.
9. Lessons learned: Deficiency
10. Oversight : Errors.(acts of omission / commission)

11. Short report of the clinical summary including events leading to death* and cause of death*: to be submitted.

* only for mortality presentation

The oral presentation and the short write up will be equally weighted for the evaluation.

6. Bedside Clinical Presentation (2nd year:4/year, 3rd year: 6-8/year) {3 + 7 = 10 credits}

1. History taking, presentation and analysis of history.
2. Physical findings, presentation and discussion with differential diagnosis.
3. Investigation-ECG, echo Doppler, X ray, laboratory investigations.
4. Final Diagnosis: Physiological abnormalities/anatomical defects / etiology/ functional class / associated conditions/ complications
5. Further evaluation / Laboratory / Invasive investigations and plan of patient management including a prescription of non pharmacological advice and pharmacological treatment with plan for review.

Module IV: Invasive and Interventional Lab (30 credits)

1. Hemodynamic presentations and interpretations (5 credits)
2. Angiographic interpretation (6 credits)
3. Cardiac cath. Lab hands on experience (15 credits)
    a. First operator
    b. First assistant
4. Cardiac electrophysiology , pacing, and devices (4credits)

Module V. Evaluation of Project (30 credits)

1. Mid-term evaluation of projects mandatory and will carry credits
2. Prospective / Retrospective Study
3. Ethical Committee clearance / Institute funding obtained
4. Contribution of candidate's experience in the study
5. Descriptive data collection / Quantitative data subjected to statistical analysis.
6. Midterm Review: At 18 months of DM course: Aims and objectives, review of literature, materials and methods (exclusion / inclusion criteria), data collection and presentation (% of target of the project) and preliminary data analysis**.(10 credits**)
7. Review at 30 months: Presentation of the full project as thesis and also in publishable form, complete with statistical analysis, discussion, study limitations, conclusion, and bibliography and acceptance of the work by external Expert **(15 credits**)
8. Overall impact of the project in adding to our knowledgebase, and patient management. Between 30-34 months, the project should be sent for publication to peer reviewed journals**. (5 Credits)**

Module VI (Skill enhancement postings) - 20 credits

1. Medical Statistics and research methodology (5 Credits)
2. Biomedical Technology posting (3 Credits)
3. Cardiac Surgical posting (2 credits)
4. Cardiac CT/MR imaging posting
5. Teaching assignments for DCLT, Nursing, CME programs
6. Patient education materials, patient information handouts, patient education programs
7. Community cardiology including outreach programs

Items 4-7: 10 credits

Module VII. Internal Examination: Theory (25 credits)

There will be 4 internal theory examinations, each having one theory paper of 100 marks during the 3-year course. These examination will have theory papers only, and the answer papers will be evaluated by the faculty members of the department. The results will be conveyed to the residents as a part of the regular appraisal.

No.	Schedule	Topics
1	At end of 6 months	Cardiac Anatomy, Cardiac Physiology, Genetics, Cardiac development, Cardiac Pathology, Pharmacology, Electrocardiography and Holter.
2	At end of 12 months	i)Noninvasive imaging in cardiology: Echo Doppler, MRI, Cardiac CT, Radionuclide studies ii) Cardiac hemodynamics, cardiac angiography, iii) Cardiac failure
3	At end of 24 months	Clinical Cardiology, Cardiac Electrophysiology and rhythm disorders, Cardiac therapeutics, Cardiac Epidemiology.
4	At end of 30 months	Recent advances (last 5-years) in Cardiology, Areas for future research in cardiology, Areas of advancement in cardiology**.**

Module VIII: Outstanding research/ academic achievements (Credits: 5)

1. Interdisciplinary research/ collaboration
2. Original research and publications
3. Outstanding achievements recognized by Institute
4. International conference presentation/ High impact factor publication

Personal Development plan/Periodic review and appraisal

Mid-term appraisal and appraisal report card will be introduced. The primary aim of this periodic (6-monthly) appraisal is to help the resident to identify his academic deficits if any, and to help the residents to improve on those aspects. A copy of the periodic appraisal card signed by the programme-in-charge and the resident will be handed over to the resident, and a copy of the same will be kept in the departmental clinical dossier. The department will also try to identify and facilitate the specific academic interest of the residents during these periodic appraisals. The residents will be encouraged to communicate their special interest to the head of the department and every possible step will be taken to facilitate/offer special training and research opportunity in those areas.

Internal Evaluation: Summary

Total marks for internal evaluation =200. This is derived from the marks scored in the academic activities . Each academic activity's mark will be based on the credit assigned to the activity. This will be finally converted to a score out of 200, which will be converted also to grade. Pass requirement 50% (C grade). Scoring Less than 40%, in the internal evaluation will require that the Senior Resident makes up the deficiency under supervision over the next 6 months before presenting himself for the Final Examination.

Sl No	Module	Credits	1st yr	2nd yr	3rd yr	Others	Total
1	Module 1 Patient care	25	8	8	9		
2	Module 2 Noninvasive	25	6	12	7		
3	Module 3 Academic presentations	40	12	16	12		
4	Module 4 Invasive Lab	30	8	12	10		
5	Module 5 Projects/Thesis	30		10	20		
6	Module 6 Skill enhancing postings	20				20	
7	Module 7 Internal Theory/Practical	25	12	6	7		
8	Module 8 Outstanding achievements	5				5	
Total		200	46	64	64	26	200

External Evaluation: Summary

Total marks for external evaluation 800 marks (Part 1 & Part II)

Part I: 200 marks for part I (theory 2 papers):50% required for pass

Part II : 600 marks

200 marks for part II (theory 2 papers). 50% required for pass

400 marks for Part II Clinical/ viva voce / practicals (50% required for pass)

Long case discussion: 100 marks, 3 short cases discussion: 150 marks

Viva Voce 75 marks

Practicals/ spotters/ specimens etc relevant for evaluation of the candidate: 75 marks

Final Results:

The minimum marks/grades required for the successful completion of the programme are

50% in Internal Evaluation /Grade C or more

50% in DM Part 1 Theory

Project/ Dissertation acceptance

50% in DM Part II Theory

50% in DM Part II Clinicals, Practicals and Viva Voce

Out-of-bounds before appearing for examinations:

A period of one week before the final theory examination of Part II will be “out of bounds” to senior residents. Attendance has to be marked on these days as usual. The residents will be free of all duties during this period.

Feedback from residents

In order to make improvements, the resident doctors are strongly encouraged to present their overall impressions about the program every 6 months. Re-appraisal meetings will be conducted at 6 monthly intervals, to evaluate the progress.

Competence expected at end of training

Clinical skills: Include the ability to take discerning history, perform relevant clinical examination, decide the appropriate investigations and derive the management plan.

Technical skills in noninvasive diagnostic techniques: The candidate is expected be able to perform and interpret relevant noninvasive cardiac investigations independently,

Interventional/Invasive skills: The training in invasive procedures is designed to provide maximum possible experience to the senior residents. These procedures will be under the supervision of a faculty member without affecting the safety of the patients at any cost. The goal of fixing the minimum number of cases to be performed is to make the resident well-versed and confident in performing the common procedures independently and other procedures under limited supervision at the end of 3years.

Annexures:

EVALUATION FORM FOR BEDSIDE CLINICAL PRESENTATION

Name of the student:

Name of the Faculty / Observer:

Date:

Sl. No.	Items of observation during Presentation	Poor 0	Below average 1	Average 2	Good 3	Very good 4
1	Completeness of history					
2	Accuracy of clinical signs					
3	Clarity of Presentation					
4	Assessment of problem and investigational plan					
5	Treatment plan					
6	Ability to defend diagnosis and plan					
7	Knowledge of the current and past literature					
	Grand Total					

NONINVASIVE LABORARTORY INVESTIGATIONS:

ANALYSIS AND INTERPRETATION

(ECG, TMT, Holter, echo-Doppler, HUT test, Pacemaker Clinic)

Name of the student:

Name of the Faculty / Observer:

Date:

Sl. No	Items of observation during presentation	Poor 0	Below average 1	Average 2	Good 3	Very good 4
1.	Understanding of clinical problem					
2.	Accuracy of Interpretations					
3.	Clarity of reporting					
4.	Assessment of problem and further management plan					
	Grand Total					

EVALUATION OF JOURNAL REVIEW PRESENTATIONS

Name of the Student:

Name of the Faculty / Observer:

Date:

Sl. No.	Items of observation during Presentation	Poor 0	Below average 1	Average 2	Good 3	Very good 4
1	Extent of understanding of scope & objectives of the paper presented					
2	To critically evaluate methods, analysis and interpretations of study					
3	Whether cross references have been consulted/ other relevant publications consulted					
4	Ability to respond to questions on the paper / subject					
5	Clarity of Presentation Audio – Visual aids used					
	Total					

EVALUATION OF SEMINAR/SHORT TOPIC / PROBLEM ORIENTED CASE DISCUSSION / MORTALITY PRESENTATIONS

Name of the student:

Name of the Faculty / Observer:

Date:

Sl. No.	Items of observation during Presentation	Poor 0	Below average 1	Average 2	Good 3	Very good 4
1	Whether all relevant publications were consulted					
2	Understanding of the subject, Completeness of the preparation, Current concepts coverage					
3	Content & Clarity of presentation, Appropriate use of Audio – Visual aids Time scheduling					
4	Ability to answer the questions					
	Total Score					

EVALUATION OF CLINICAL WORK IN WARD / OPD

Name of the student:

Name of the Faculty / Observer:

Date:

Sl. No.	Items of observation during presentation	Poor 0	Below average 1	Average 2	Good 3	Very good 4
1	Attendance and punctuality					
2	Presentations of cases during rounds/OPD					
3	Management/treatment plan, Maintenance of case records & its completeness					
4	Investigations work up for diagnosis/ treatment & interpretation					
5	Interaction with colleagues and supporting staff Bedside Manners Rapport with patients and family					
6	Discharge summary, Prescription & Counseling Patient and relatives					
	Total Score					

INVASIVE AND INTERVENTIONAL LAB

Name of the student:

Name of the Faculty / Observer:

Date:

Sl. No	Items of observation during presentation	Poor 0	Below average 1	Average 2	Good 3	Very good 4
1.	Understanding of clinical problem					
2.	Evaluation of pre-procedural data and pre procedure work up					
3.	Operative skill & Safety of performing					
4.	Accuracy of reporting & Ability to derive diagnosis and plan of management					
5.	Post procedure recognition / management of complications					
	Grand Total					

LOG BOOK

Table 1: Academic activities attended

Name: Admission Year:

Date	**Type of activity Seminar, Journal club, Presentation, teaching**	**Particulars/remarks**

LOG BOOK

Table 2: procedures performed in non-invasive lab

Name: Admission Year:

Date	Name	ID	procedure	Operator/assistant

LOG BOOK

Table 3: procedures performed in invasive lab

Name: Admission Year:

Date	Name	ID	procedure	Operator/assistant