
# Curriculum For DM Cardiology (3-year course)

# All India Institute of Medical Sciences Nagpur

# CURRICULUM FOR DM (CARDIOLOGY) (3-YEARS PROGRAM)

## 1. GOAL

The program aims at training a Physician in the specialty of cardiology encompassing the related knowledge, skills, research methodology and attitudes which will enable him/her to function as an independent clinician/consultant, a teacher, or a research scientist.

The goal of the program is to produce a competent cardiologist who:

a. Has acquired the competence pertaining to cardiology that is required to be practiced in the community and at all levels of health care system.

b. Has acquired the skills to manage the patient effectively pertaining to cardiology.

c. Has acquired skill in effectively communicating with patient and his attendants.

d. Has the desired skills to independently manage emergency cases.

e. Is aware of the latest developments in the field of cardiology oriented to principles of research methodology.

f. Has acquired skills in educating medical and paramedical professionals.

## 2. PROGRAM OUTCOMES

On successful completion of the DM Cardiology training, the trainee will have the following subject specific competencies:-

| 1) Cognitive Domain | |
|---|---|
| Sl.No. | |
| 1.1 | Understand the normal cardiac anatomy and physiology from fetal life to adult. |
| 1.2 | Understand the basic principles involved in pathology of heart diseases and their assessment as applicable to cardiology practice. |
| 1.3 | Be conversant with the etiology, pathophysiology, diagnosis, and management of common heart diseases in an out -patient, inpatient and emergency settings. |
| 1.4 | Recognize the importance of inter-disciplinary approach in the management of various heart diseases and obtain relevant specialist / ancillary services' consultation where appropriate. |
| 1.5 | Possess knowledge of the commonly used radio-imaging techniques like Plain X-ray, Echo, CT and MRI, various contrast radiographies and nuclear imaging techniques. |
| 1.6 | Acquire and demonstrate the knowledge about various forms of cardiac investigations like ECG, Treadmill test, holter monitoring, ambulatory blood pressure monitoring. |
| 1.7 | Possess knowledge about various cardiac procedures/surgeries including angiography, angioplasty, pericardiocentesis. |
| 1.8 | Acquire and demonstrate knowledge about temporary and permanent pacemaker insertion, AICD, Paediatric procedures etc. |

| 2) Psychomotor domain | |
|---|---|
| Sl.No. | |
| 2.1 | Understand the presentation (history and clinical examination), evaluation and management of congenital and acquired cardiac disorders in neonates, infants, children, and adult. |
| 2.2 | Order relevant investigations and competently interpret the results of laboratory studies including ECG and the results of general and specific cardiac imaging procedures performed in patient with cardiac disorders. |
| 2.3 | Formulate and implement treatment plans, and monitor the effectiveness of their interventions for various cardiac diseases including management of acute MI, chronic cardiac disease, heart failure and patient who underwent various procedures like angioplasty, PPI, CRT etc. |
| 2.4 | Perform competently all medical and invasive procedures including but not limited to (a) performing echo and Pericardiocentesis, (b) Temporary pacemaker insertion (c) Perform angiography (d) Permanent pacemaker insertion (e) AICD insertion. |
| 2.5 | Acquire proficiency in prescribed minor and major procedures related to cardiology, echo, angiography and angioplasty initially with assistance and later independently. |
| 2.6 | Should be able to prescribe, formulate and implement the various procedure /therapies in cardiology including, but not limited to, coronary artery diseases like angiography and angioplasty, pacemakers etc. |
| 2.7 | Formulate and carry out pre procedural evaluation |
| 2.8 | Acquire skills to manage post procedure patients of angioplasty, pacemakers, AICD. |
| 2.9 | Provide Basic and Advanced Life Support services in emergencies |

| 3) Affective Domain | |
|---|---|
| Sl.No. | |
| 3.1 | Demonstrate respect, compassion, and integrity; a responsiveness to the needs of patients and society; and a commitment to excellence. |
| 3.2 | Demonstration of skill in listening to patients and families and the ability to effectively educate and counsel patients and their families on diagnostic and treatment decisions including angiography, angioplasty and prognosis. |
| 3.3 | Develop the skills to interact with professional colleagues for the care of the cardiac patient. |
| 3.4 | Demonstrate the ability to lead the consult service through interactions with referring and primary doctor. |
| 3.5 | Effectively work with other members of the health care team, including referring physicians from other specialties, nurses, social workers and technicians, and to implement a treatment plan. |
| 3.6 | Effectively teach cardiology care to medical students, junior post graduate students, nurses and technician. |
| 3.7 | Adopt ethical principles in all aspects of cardiology practice/ research. (Professional honesty and integrity, humility, informed consent, counselling and recognize patients' rights and privileges). |
| 3.8 | Develop desired skills to independently manage emergency situations related to cardiac disease and complications associated procedures /surgeries as mentioned above. |
| 3.9 | Communicate effectively and demonstrate caring and respectful behavior when interacting with patients with cardiac problems and their families. |
| 3.10 | Be conversant with counselling techniques for the family / primary care takers. |
| 3.11 | Work with faculty and colleagues to provide patient-focused care. |
| 3.12 | Perform necessary patient care documentation in an accurate and timely manner. |
| 3.13 | Adhere to ethical standards and maintain professionalism while using social media platform for teaching, learning, and communicating. |

## 3. ELIGIBILTY CRITERIA

MD/DNB (Medicine) from INI/NMC recognized institute shall be the minimum qualification.

## 4. SELECTION OF THE CANDIDATE

Through entrance test conducted by the competent authority.

## 5. DURATION OF THE COURSE

The training will be of 3 years full time residency pattern. During these years, the candidate shall be a senior resident who will perform clinical, teaching and research activities as prescribed in the curriculum. The candidate will be given additional administrative responsibilities during these years as per his/her competency.

## 6. SYLLABUS

a. Basic Subjects

Teaching and attaining proficiency in applied Anatomy (including developmental anatomy), Physiology and Pathology related to the cardiovascular system.

b. Clinical Cardiology

Etiopathology, hemodynamics, clinical evaluation, noninvasive and invasive evaluation, and management strategies for the following disorder

- Coronary artery disease
- Rheumatic heart disease
- Congenital heart disease and other pediatric cardiac disorders
- Pericardial diseases
- Cardiac arrhythmias
- Heart failure
- Peripheral vascular disorders
- Pulmonary thromboembolism and pulmonary hypertension
- Systemic hypertension
- Systemic diseases involving heart
- Heart muscle diseases
- Traumatic heart disease
- Tumors of heart
- Genetics, molecular biology and immunology related to cardiology
- Geriatric heart disease
- General anesthesia and non-cardiac surgery in patients with heart disease

- Pregnancy and heart disease
- Epidemiology and preventive cardiology

c. Practical
   i. Non-invasive Technique: To perform and interpret various noninvasive techniques including:
      - Electrocardiography
      - Radiography – routine and specialized areas like CT and MRI
      - Stress testing – tread mill test, stress related and other nuclear techniques
      - Holter monitoring for arrhythmias and ischemic disorders
      - Echocardiography – M-mode, Two dimensional, Doppler, color flow imaging, transesophageal echocardiography, tissue doppler imaging (TDI), Speckle track Echocardiography and echo directed hemodynamic studies .
   ii. Invasive Cardiology
      - Experience in cardiac catheterization to calculate and interpret varioushemodynamic parameters
      - Right and left heart cath and coronary angiography procedures in adults andchildren
      - To perform temporary pacemaker insertion.
      - To assist in various interventions including valvuloplasty, coronary andcongenital interventions.
      - Electrophysiology: To interpret electrophysiological data and assist in electrophysiology procedures, permanent pacemaker implantation.

**TEACHING PROGRAMME**

The teaching schedule will be as follows: -

d. Daily ward rounds with bedside case discussions, file rounds (documentation of case history and examination, progress notes, round discussions, investigations, and management plan), interesting and difficultcase discussions
e. Weekly teaching programme: -
   Bedside clinical case
   Seminar / Journal club
   Cath conference
f. Monthly teaching programme: -
   Session on ECGs/Holter/X-rays/Echocardiogram
g. DM residents would present interesting cases, seminars and take part in clinico-pathological cases in central hospital teaching events.
h. Thesis review once in six months

## 7. ACADEMIC AND CLINICAL WORK REQUIREMENTS

Journal club readings – minimum of 4 reviews and 6 journal readings

| Procedures | Minimum number to be done |
|---|---|
| 2D Echocardiography | 500 |
| TMT | 100 |
| Temporary Pacemaker Insertion | 10 |
| Holter Analysed | 50 |
| Permanent Pacemaker assisted /done | 5 |
| Cath procedures/interventions assisted /done | 500 |

## 8. SCHEDULE OF POSTING

a. Internal Rotation (Departmental posting): -

| | |
|---|---|
| Ward/CCU | 12 months |
| Cardiology OPD /Emergency | 6 months |
| Cath Lab | 9 months |
| EPS/CRD Clinic | 1 month |
| Echocardiography | 5 months |
| TMT/Holter | 1 month |

b. External Rotation (Inter departmental Postings)

| | |
|---|---|
| Cardiac Surgery | 1 month |
| Nuclear Cardiology | 1 month |

The external rotation will be done during the V/VI semester

Cardiac surgery posting (1 month)
The resident during the cardiac surgery rotation will be able to understand the principles of preoperative preparation and the post-operative recovery of cardiac surgery patients.

Nuclear Cardiology posting (1 month)
The resident during the Nuclear cardiology rotation will be able to understand the principles and be able to advise and interpret the myocardial perfusion imaging (Stress-SPECT , Rest-SPECT , PET Scan ).

## 9. LOGBOOK

The student will maintain logbook containing details of his training and procedures done in non-invasive diagnostic lab and cath lab. The records of the following procedures conducted by self or assisted as 1st and 2nd assistant will be maintained:
Pericardial Tap, Hemodynamic Monitoring, Echocardiography – transthoracic & Transesophageal, TMT, Holter Monitoring, Tilt Table Test,Coronary Angiography, PTCA, Balloon Valvuloplasty, Temporary Pacemaker, Permanent Pacemaker, AICD, Biventricular Pacemaker, IABP Insertion and miscellaneous procedures.The log book will be put up to HoD by the 7th of each month

## 10. DISSERTATION

Every student registered as postgraduate shall carry out research project under the guidance of a recognized post graduate teacher, the result of which shall be written up and submitted in the form of a dissertation. Work for writing the dissertation is aimed at contributing to the development of a spirit of enquiry, besides exposing the student to the techniques of research, critical analysis, acquaintance with the latest advanced in medical science and the manner of identifying and consulting available literature. Dissertation will be done in accordance with institutional protocol.

Process to be completed within six months of admission to DM Cardiology course.

| **Activity** | **July admission** | **January Admission** |
|---|---|---|
| Selection of topic in consultation with PG Guide | September/October | March/April |
| Institute Scientific/Ethics Committee approval | November/December | May/June |
| Final Approval letter by Academics Section | 31$^{st}$ December | 30$^{th}$ June |

Submission of Dissertation: The Dissertation will be submitted at least six months prior to the scheduled examination, i.e. by 31st December for June examination and by 30th June for December examination.

The student will (i) identify a relevant research question; (ii) conduct a critical review of literature; (iii) formulate a hypothesis; (iv) determine the most suitable study design; (v) state the objectives of the study; (vi) prepare a study protocol; (vii) undertake a study. according to the protocol, (viii) analyze and interpret research data, and draw conclusions; (ix) write a research paper for Presentation / Publication.

## 11. ASSESSMENT

### a. Six monthly Progress Report:

The progress of the DM student will be monitored with the help of a six-monthly structured report. The report will contain details pertaining to attendance, teaching-learning activities, clinical duties, teaching assignments, practical work, marks obtained at intermediate examinations, papers / posters presented, research publications and progress of dissertation work.

### b. Timing for Six monthly evaluations:

| Report | July Session | | January Session | |
|---|---|---|---|---|
| | Period | Submitted by | Period | Submitted by |
| I | July to December | 7th January | January to June | 7th July |
| II | January to June | 7th July | July to December | 7th January |
| III | July to December | 7th January | January to June | 7th July |
| IV | January to June | 7th July | July to December | 7th January |
| V | July to December | 7th January | January to June | 7th July |
| VI | January to June | 10th June | July to December | 10th December |

### c. Internal Assessment (Formative Assessment )

(600 Theory + 600 Practical = Total 1200 Marks)

Theory (600 Marks)

| Schedule | Marks | Pattern and Marks Distribution |
|---|---|---|
| At end of First year | 100 (1 Paper) | 10 Short Questions x 10 Marks each (Total Duration 3 hrs.) |
| At end of Second year | 100 (1 Paper) | 10 Short Questions x 10 Marks each (Total Duration 3 hrs.) |
| Preprofessional | 400 (4 Papers of 100 marks) | As per Final Professional Examination |
| Total | 600 Marks | |

Practical (600 Marks)

| Schedule | Marks | Pattern and Marks Distribution |
|---|---|---|
| At end of First year | 100 | 2 Cases x 25 Marks each (Total 50 marks),<br>25 marks for Procedures<br>25 marks for viva voce |
| At end of Second year | 100 | |
| Pre-professional | 400 | As per Final Professional Examination |
| Total | 600 Marks | |

### d. Eligibility for Professional/Summative assessment:

- Candidate should secure a minimum of 50% marks in Theory and Practical separately in formative assessments, to be eligible to appear for Professional Examination
- At least four out of six-monthly progress report should be satisfactory.
- Minimum 80% attendance in each year of training.
- Approval of Dissertation.
- Successful completion of Research Methodology program.
- Minimum one scientific paper/ poster presentation at an international/national/state/zonal/regional conference / scientific society meetings.
- Minimum one scientific research paper – for publication/ accepted for publication / sent for publication in a peer-reviewed indexed scientific journal.

### e. Summative assessment/Final professional assessment

At the end of the training the final professional assessment will be as follows:

i. Theory -4 Papers each of 100 marks each=400 marks
ii. Practical-Clinical cases +Procedures + Viva=400 marks

Theory (400 marks)

| Paper | Title | Marks | Marks Distribution |
|---|---|---|---|
| I | Basic sciences as related to Cardiology | 100 | Short Answer Question marks : 10 X 10 =100 |
| II | Clinical/ Cardiology | 100 | |
| III | Investigative Cardiology | 100 | |
| IV | Recent advances in Cardiology | 100 | |
| | Total Marks | 400 | |

Practical (400 marks)

| | Subjects | Content | Marks Distribution | Total Marks |
|---|---|---|---|---|
| A. | One long and Two short Clinical Cases from various sections of Cardiology | History taking, physical examination, interpretation of clinical findings, differential diagnosis, investigations, prognosis and management. | 100 x 1(Long Case)<br><br>75 x 2 (Short Cases) | 250 |
| B | Procedures | The candidate will be asked to perform echocardiography during the examination | 50 | 50 |
| C | Viva-voce examination | (a)The practical examination will include a final viva-voce on fundamentals and principles of cardiovascular diseases, their management, and recent advances in field of cardiology.<br><br>(b)It will also include five spotters on spotters on Electrocardiogram (coronary artery disease, arrhythmias, congenital heart disease, dyselectrolytemia etc.), Cardiac catheterization and hemodynamic data,Arterial blood gas analysis,Chest x-ray (congenital heart disease, valvular heart disease,cardiomyopathy, pericardial involvement etc.), coronary angiogram.<br><br>(c)Viva-voce on research and publication | (a)25<br><br>(b) 5 X 10=50<br><br>(c) 25 | 100 |
| | | Total Marks | | 400 |

Note: (a) Minimum 40% marks in each paper and aggregate of 50% marks to be declared pass in theory exam

(b) Minimum 50% marks required in Theory & Practical separately, to be declared successful in summative exam.

## 12. SUGGESTED BOOKS AND JOURNALS

a. Books

- Braunwald’s Heart Disease
- Hurst’s The Heart
- Grossman's Cardiac Catheterization, Angiography, andIntervention
- Stress Testing: Principles and Practice by Myrvin H.
- Drugs for the Heart by Lionel H. Opie
- The Cardiac Catheterization Handbook by Morton L. Kern
- Hemodynamic Rounds by Morton J. Kern
- Moss and Adams' Heart Disease in Infants, Children, and Adolescents
- Pediatric Cardiology for Practitioners by Myung K. Park
- Clinical recognition of congenital heart disease by Joseph Perloff
- Feigenbaum's Echocardiography
- Shamroth’s An Introduction to Electrocardiography
- Valvular Heart Disease by Alpert & Dalen
- Textbook of Interventional Cardiology by Eric J Topol & Paul S Teirstein

b. Journals

- New England Journal of Medicine
- The Lancet
- Journal of American College of Cardiology
- Circulation
- Heart
- Indian Heart Journal
- Hypertension
- American Journal of Cardiology
- Journal of Interventional Cardiology
- European Heart Journal