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PROGRAM
DM CARDIOLOGY

(Revised with effect from 2016-2017 onwards)

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GOAL

The goal of postgraduate education for the award of the postdoctoral degree in cardiology (DM – Doctor of Medicine) is to bring out competent cardiologists who shall recognize the health needs of the society, provide quality health care and carry out professional obligations ethically to fulfill the objectives of national health policy. During the training period they shall master the competencies in cardiology and basic medicine that are required for cardiology practice from the primary to tertiary level of health care system. In addition they should also acquire basic skills in teaching the medical and paramedical professionals, research skills, organizational competency and social health care capabilities. Thus the major components of the curriculum shall cover theoretical knowledge, practical and clinical skills, attitude skills and training in research methodology and social care.

Training programme

All the candidates joining the postgraduate course in DM Cardiology shall work as fulltime residents during the whole 3 year period of training. They shall be given fulltime responsibility and assignments and their participation in all facets of the educational programme is assured. A structured training schedule shall be set up by an academic cell or curriculum committee constituted as follows:

Principal (chairman)

Head of department (convener)

2 senior faculty in cardiology (adult & pediatric) and 2 senior faculty from related departments (eg. cardiac surgery , nuclear medicine etc.) as members

The committee shall meet at least once in a year and make necessary modifications in the training schedule based on the latest developments in the field of medicine and health care needs of the society. The committee shall also monitor the implementation and running of the training programme.

Program Outcomes

- PO1 Offer to the community, the current quality of 'standard of care' in Cardiology diagnosis as well as therapeutics.
- PO2 Utilize the knowledge and skills acquired in allied specialties such as Anatomy, Physiology, Biochemistry, Pharmacology, Pathology , Microbiology and General Medicine.
- PO3 Competency in diagnosis and management processes
- PO4 Keeping abreast of all recent developments and emerging trends in the field of Cardiology
- PO5 Evaluate own professional activities, educational needs and select appropriate learning resources periodically.
- PO6 Contribute as an individual/ or in a group or institution towards the fulfillment of national objectives concerning diseases.
- PO7 Effectively communicate with patients or relatives so as to educate them sufficiently and give them the full benefit of informed consent to treatment and ensure compliance.
- PO8 Effectively communicate with colleagues.

Program Specific Outcomes

- PSO1 Ability to manage common emergencies at primary level.
- PSO2 Perform out patient services including patient screening and disease determination.
- PSO3 Participate in community out reach activities like camps, school screening and public education.
- PSO4 Prescribe medications for various ailments and follow up patients to understand outcomes.
- PSO5 Present academic papers in State/National conference.
- PSO6 To participate in department research activities and clinical audit.

1. Teaching schedule

The residency training programme shall include formal lectures in the subject and subspecialties, symposia, clinical discussions, training in diagnostic and therapeutic modalities, research, journal clubs / clinical clubs and teaching rounds. It shall also incorporate guest lectures, orientation classes, in-house quiz , training in computer / internet applications etc.

Formal lectures by faculty – senior and junior – on various subjects will be an integral part of the schedule. However the number of such lectures shall be minimized to encourage self learning. Instead lecture topics shall be assigned as home work also.

Symposia shall be much more frequent than formal lectures. Maximum involvement of students and faculty shall be ensured.

Clinical discussion is the core of postgraduate programmes like DM Cardiology. On an average there shall be two case discussions per week – one long case and one short case . The discussion should cover all the aspects from basics to the latest advances. Active involvement of the faculty shall be encouraged to maintain a high standard of training. Discussions on hemodynamics, other diagnostic modalities and newer trends in cardiology shall be done at least once in a week. This is of great importance in view of the fast advances occurring in the field of cardiology.

Journal club is an integral part of a postgraduate training programme. This helps the students and faculty to update their knowledge in the latest developments in the field of medicine. It not only imparts new information but also trains the candidates to objectively assess and criticize the various articles and studies which will be useful in ensuring practice of evidence based medicine.

Teaching rounds shall be strengthened. A detailed teaching round at least once in a week improves the patient care in addition to enhancement of the clinical skills of the students as well as the faculty.

Guest lectures shall be arranged as frequently as possible. Senior faculty from other departments, faculty from other institutions in the state and visiting national and international faculty shall be invited for guest lectures or clinical discussions and

demonstrations. The topics shall cover not only medical subjects but also other aspects like communication skills, social problems etc.

An example of teaching format is given below:

8 AM – 9AM (5 days a week)

- Seminar
- Journal club
- Short case discussion
- Hemodynamic discussion
- Noninvasive cardiology

Afternoon session (once in a week)

- 2 hours – long case discussion

Conferences and continuing medical education programmes

All postgraduate students shall be encouraged to attend and actively participate in conferences and CMEs. They should be trained to present as many papers as possible (at least one paper each in national and regional conferences-- grace marks shall be provided for the same in the internal assessment). During the three year training each candidate should attend at least two national conferences, two regional conferences and 15 hours of CME.

Research

Thesis - As per the common regulations

Log book

Each candidate shall maintain a systematic log book in which the academic, clinical and research work shall be neatly entered. Senior faculty may be entrusted to periodically evaluate the log book and assign scoring for the same. The log book shall be submitted

after certification by the Head of Department in the final year practical examination for scrutiny by the examiners.

Involvement in teaching

Postgraduate students in cardiology shall be assigned the job of teaching medical undergraduate and postgraduate students and also students of paramedical courses.

Training in diagnostic modalities

In addition to acquiring skills in basic modalities of cardiac investigations like electrocardiogram and radiology, they should be given adequate training in various aspects of echocardiography (including transesophageal echo) and stress testing. Interventional cardiology is advancing at a fast pace and hence they should have enough exposure to invasive cardiology including interventional techniques (on-hand training shall be provided) such that at the end of the course they should have confidence in performing cardiac interventions. They should also have adequate exposure to other areas like nuclear cardiology, CT imaging, MRI etc.

Social activities

By concentrating on the advanced aspects of clinical medicine, the present generation doctors are moving away from the basic aspect of medical care ie. social health. Hence the young doctors should be encouraged to get involved in social activities like participation in medical camps, relief works, rural care etc.

Periodic internal assessment

To improve the standards of the postgraduate training a periodic internal objective assessment is needed. A few such methods are

- a) assessing grading score for the log book every 6 months
- b) theory and practical examination periodically

SYLLABUS

Theory

Students should acquire adequate theoretical knowledge in the following fields

1. Applied anatomy - embryology and development, anatomy of heart and great vessels, pulmonary system , renal system and other organs.
2. Applied physiology – cardiac cycle, cardiac contraction, ionic basis, receptor concepts, hemodynamics, coronary blood flow, pulmonary circulation, electrophysiology, acid base balance, physiology of extracorporeal circulation.
3. Genetics and molecular biology
4. Applied pathology – rheumatic fever, valvular lesions, myocarditis, pericarditis, endocarditis, cardiomyopathies, cardiac tumors, immunological disorders, endomyocardial biopsy.
5. Pharmacology related to cardiovascular therapy and related disorders
6. Microbiology relevant to cardiovascular and related infections
7. Clinical cardiology – congenital heart diseases, valvular lesions, rheumatic fever, endocarditis, coronary artery disease, pericardial disease, cardiomyopathy, cardiac failure, arrhythmias, dyslipidemia, cardiac tumors, autonomic neuropathy, systemic hypertension, pulmonary hypertension, pulmonary embolism, cor pulmonale, cardiac involvement in systemic illnesses, specific situations like pregnancy, anesthesia, noncardiac surgery and malignancies, cardiovascular surgery, aortic and peripheral vascular disease, immunological disorders and new entities
8. Investigations & instrumentation – basic investigations like biochemistry , clinical pathology and microbiology , electrocardiography, radiology, stress testing, echocardiography, intravascular ultrasound, angiography, cardiac catheterization and angiography, radionuclide studies, cardiac CT, MRI, PET, electrical & radiation safety norms and any new modalities.
9. Cardiovascular therapy – pharmacotherapy, pacemakers, cardioverter defibrillator, cardiac resynchronisation therapy, ablation procedures, interventions

(coronary, other vascular, valvular, congenital heart diseases etc.), cardiovascular surgery including cardiac transplantation, stem cell therapy, gene therapy and new developments.

10. Sports medicine
11. Preventive cardiology and cardiac rehabilitation
12. Update on advances in cardiology
13. Research methodology
14. Economics in cardiovascular management
15. Communicative skills, social medicine

II Practical syllabus

Ward and outpatient care	6 months
Emergency care, support to other depts.,	3 months
Training in coronary care unit	6 months
Noninvasive and invasive lab training	12 months
Cardiac surgery training	1 month
Pediatric cardiology training	3 months
Outstation training	1 month
Research and statistics (first year)	1 month
Nuclear medicine	1 month
Rural care / hospital administration	1 month
Examination	last month

Courses

Course I Basic Sciences (Code: DMCR1)

CO1: Knowledge of applied anatomy relevant in the practice of Cardiology in the community: Applied anatomy - embryology and development, anatomy of heart and great vessels, pulmonary system , renal system and other organs.

CO2: Knowledge of applied physiology relevant in the practice of Cardiology in the community: Applied physiology – cardiac cycle, cardiac contraction, ionic basis, receptor concepts, hemodynamics, coronary blood flow, pulmonary circulation, electrophysiology, acid base balance, physiology of extracorporeal circulation.

CO3: Knowledge of Genetics and molecular biology relevant in the practice of Cardiology in the community.

CO4: Knowledge of applied Pathology of diseases relevant to the practice of Cardiology in the community: rheumatic fever, valvular lesions, myocarditis, pericarditis, endocarditis, cardiomyopathies, cardiac tumors, immunological disorders, endomyocardial biopsy.

CO5: Knowledge of Pharmacology related to cardiovascular therapy and related disorders.

CO6: Knowledge of Microbiology relevant to cardiovascular and related infections

Applied anatomy pertaining to clinically significant parts- embryology and development, anatomy of heart and great vessels, pulmonary system , renal system and other organs.

Applied physiology including cardiac cycle, cardiac contraction, ionic basis, receptor concepts, hemodynamics, coronary blood flow, pulmonary circulation, electrophysiology, acid base balance, physiology of extracorporeal circulation.

Genetics and molecular biology

Applied pathology of common disorders rheumatic fever, valvular lesions, myocarditis, pericarditis, endocarditis, cardiomyopathies, cardiac tumors, immunological disorders, endomyocardial biopsy.

Pharmacology pertaining to cardiovascular therapy and related disorders

Microbiology relevant to cardiovascular related infections and its identification

Course II Clinical Cardiology (Code: DMCR2)

CO1: Detailed knowledge of the diseases relevant in the practice of the speciality of cardiology in the community.

CO2: Knowledge and skill in the clinical diagnosis of diseases.

CO3: Knowledge about congenital heart diseases, valvular lesions, rheumatic fever & endocarditis.

CO4: Knowledge about coronary artery disease, pericardial disease, cardiomyopathy, cardiac failure, arrhythmias, dyslipidemia & cardiac tumors.

CO5: Knowledge about autonomic neuropathy, systemic hypertension, pulmonary hypertension, pulmonary embolism, cor pulmonale, cardiac involvement in systemic illnesses, specific situations like pregnancy, anesthesia, noncardiac surgery and malignancies, cardiovascular surgery, aortic and peripheral vascular disease, immunological disorders and new entities

Clinical cardiology includes detailed knowledge about pathophysiology , features and treatment of conditions such as congenital heart diseases, valvular lesions, rheumatic fever, endocarditis, coronary artery disease, pericardial disease, cardiomyopathy including dilated cardiomyopathy, hypertrophic cardiomyopathy and restrictive cardiomyopathy, myomas of the heart, cardiac failure, arrhythmias, dyslipidemia, cardiac tumors, autonomic neuropathy, systemic hypertension, pulmonary hypertension, pulmonary embolism, cor pulmonale, cardiac involvement in systemic illnesses, specific situations like pregnancy, anesthesia, noncardiac surgery and malignancies, cardiovascular surgery, aortic and peripheral vascular disease, immunological disorders.

Course III Investigations & Cardiovascular Therapy (Code: DMCR3)

CO1: Skill in investigations & instrumentation – basic investigations like biochemistry , clinical pathology and microbiology , electrocardiography, radiology, stress testing, echocardiography, intravascular ultrasound, angiography, cardiac catheterization and

angiography, radionuclide studies, cardiac CT, MRI, PET, electrical & radiation safety norms and any new modalities.

CO2: Knowledge and skill in pharmacotherapy, pacemakers, cardioverter defibrillator, cardiac resynchronisation therapy, ablation procedures and interventions (coronary, other vascular, valvular, congenital heart diseases etc.)

CO3: Knowledge and skill in cardiovascular surgery including cardiac transplantation, stem cell therapy, gene therapy and new developments.

CO4: Knowledge and skill in practicing sports medicine in the community.

CO5: Competency in preventive cardiology and cardiac rehabilitation.

Skill in the usage of basic investigations like, electrocardiography, radiology, stress testing, echocardiography, intravascular ultrasound, angioscopy, cardiac catheterization and angiography, radionuclide studies, cardiac CT, MRI, PET, electrical & radiation safety norms and any new modalities.

Competency to manage ST elevation Myocardial Infarction(STEMI)

Competency in performing Holter and TMT and interpret the result

Detailed knowledge on pharmacotherapy, pacemakers, cardioverter defibrillator, cardiac resynchronisation therapy, ablation procedures, interventions (coronary, other vascular, valvular, congenital heart diseases etc.), cardiovascular surgery including cardiac transplantation, stem cell therapy, gene therapy and new developments.

Judicial use of antibiotics in a post cardiac transplant patient

Course IV Recent Advances (DMCR4)

CO1: Updated knowledge of technologies and instrumentations used in Cardiology.

CO2: Updated knowledge on the drugs used in the practice of cardiology.

CO3: Knowledge about the recent published research papers in cardiology

Includes latest update on treatment modalities and use of newer technology in an international level as well as knowledge about latest published research papers in cardiology

Soft Skills (DMCR5) – Elective Course

CO1: Competency to conduct a clinical research.

CO2: Acquisition of pedagogical skills for students (MBBS, Specialties)

CO3: Ability to work as a member of a healthcare team.

CO4: Communication skills with patients, caregivers and colleagues including non medical staff and an understanding of economics in cardiovascular management.

CO5: Attitude to be a lifelong learner.

Examination

As per the common regulations

4 papers of 3 hours duration with maximum marks of 100 each

Paper I – Basic sciences

Paper II –Clinical cardiology

Paper III – Cardiac investigations and cardiovascular therapy

Paper IV – Recent advances

MODEL QUESTION

DM CARDIOLOGY – PAPER I

Basic sciences

Time 3 hours

Max.marks 100

(all questions carry equal marks)

Discuss briefly the following

1. development of aortic arch and its clinical applications
2. applied anatomy of coronary circulation
3. microbiology of prosthetic valve endocarditis
4. endothelin receptor antagonists
5. myocardial proteins
6. genetics of cardiomyopathy
7. physiology of pulmonary circulation
8. ionic basis of cardiac arrhythmias
9. pathology of cardiac tumors
10. nitric oxide synthase

MODEL QUESTION

DM CARDIOLOGY

Paper II – clinical cardiology

Time 3 hours

Max.marks 100

(all questions carry equal marks)

1. Constrictive pericarditis vs restrictive cardiomyopathy – compare and contrast
2. Changing trends in rheumatic fever
3. Heart failure with normal ejection fraction – discuss
4. AVRT vs AVNRT – approach to ECG differentiation
5. Discuss the pathogenesis of viral myocarditis
6. Outline the localization of accessory pathway by surface ECG
7. Cardiac events during sleep – discuss
8. Critically analyse the pathophysiology of pulmonary embolism
9. Outline the approach to cardiac malpositions
10. A 50year old diabetic female with history of effort angina for six months and an episode of acute coronary syndrome two weeks ago is now diagnosed to have carcinoma breast. You are called for a preoperative clearance . How will you proceed?

MODEL QUESTION

DM CARDIOLOGY

Paper III – Investigations & cardiovascular therapy

Time 3 hours

Max.marks 100

(all questions carry equal marks)

1. Drug eluting vs bare metal stent – choice ?
2. Cardiac resynchronisation therapy – critical evaluation of the clinical trials
3. Fontane surgery - ? ideal candidate
4. Non surgical management of mitral regurgitation
5. 25 year old primigravida has mitral stenosis- outline the management strategy
6. IVUS – current applications
7. 57 year old dyslipidemic male who had CABG 3 years ago has developed crescendo effort angina of 6 months duration; now in class III. How will you manage ?
8. Discuss the applications of cardiac MRI.
9. ARB / ACEI / combination – comments.
10. 3 D echo evaluation of mitral regurgitation

MODEL QUESTION
DM CARDIOLOGY
Paper IV – Recent advances

Time 3 hours

Max.marks 100

(all questions carry equal marks)

1. Discuss the diagnostic modalities to assess vulnerability of plaque
2. Critically analyse the data on the role of statins in aortic stenosis
3. Short QT syndrome – discuss
4. Write briefly on the current status of endovascular repair
5. Changing trends in infective endocarditis prophylaxis – discuss
6. Pulmonary vascular resistance VS pulmonary capacitance – overview
7. Critically comment the COURAGE trial
8. What is the role of external counterpulsation in current day practice
9. Sauna therapy – discuss
10. Oral GP IIb / IIIa receptor blockers

Reading – recommended books and journals

Books

Must read

1. Heart Disease – a text book of cardiovascular medicine ; Zipes DP , E. Braunwald, Philadelphia, Elsevier Saunders
2. The Heart – Fuster V , Mc Graw Hill Co.
3. Echocardiography , Feigebaum . h , William & Wilkins , Baltimore
4. Cardiac catheterization, angiogram and interventions- William Grossman, Philadelphia. Lea & Febiger
5. Heart disease in infants, children and adolescence – Moss , Adams: Baltimore, Williams & Wilkins
6. Clinical recognition of congenital heart disease – Perloff .JK, Philadelphia, WB Saunders
7. Text book of interventional cardiology – Topol ; Philadelphia ‘ Saunders
8. Cardiac electrophysiology – Zipes ; Philadelphia, Elsevier
9. Clinical electrocardiography – Goldberger ; St.louis, Mosby/Elsevier
10. Stress testing – Principles and practice ; Ellestad MH ; New York , Oxford University
11. Cardiac electrophysiology ;- Josephson etal

Must refer

1. Text book of cardiovascular medicine – Topol ; Philadelphia ; Lippincott Williams & Wilkins
2. Text book of medical physiology – Guyton AC ; Philadelphia; Elsevier Saunders
3. Atlas of nuclear cardiology – Dilsizian V , Narula, Braunwald ; Philadelphia ; current medicine
4. Cardiovascular magnetic resonance – Manning WJ ; Philadelphia ; Churchill Livingstone

5. Heart failure : a companion to Braunwald's Heart Disease ; Philadelphia ; Saunders
6. Cardiac surgery – Kirklin JW , Barret Boyes ; New York , Churchill Livingston
7. Congenital Heart Disease in adults – Perloff JK , Philadelphia , WB Saunders
8. Medical clinics of North America
9. Cardiology clinics

Journals

Indian

1. Indian Heart Journal
2. Journal of Indian Medical Association
3. Journal of Association of Physicians of India

Foreign

1. Circulation
2. Journal of American College of Cardiology
3. American Heart Journal
4. European Heart Journal
5. British Heart Journal
6. Circulation Research
7. Progress in cardiovascular disease
8. Heart
9. Pediatric cardiology
10. New England Journal of Medicine
11. Lancet
12. Journal of American Medical Association

13. J American Society of Echocardiography
14. Eur. J of Echocardiography
15. Hypertension
16. Hypertension research
17. J. Interventional cardiology
18. J. Cardiovascular Electrophysiology
19. J. Nuclear cardiology
20. Radiology
21. Chest
22. J. Thoracic and cardiovascular surgery
