

Rajiv Gandhi University of Health Sciences, Karnataka

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Regulations & Curriculum of DM Paediatric Cardiology





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RAJIV GANDHI UNIVERSITY OF HEALTH SCIENCES, KARNATAKA, BENGALURU
4th T Block, Jayanagar, Bengaluru - 560 041

RGU/AUTH/PG-Super specialty/DM-Paediatric Cardiology/181ST SYN/103(1) /2023-24

Date 27/10/2023

NOTIFICATION

Sub: - Curriculum for DM Paediatric Cardiology - reg

Ref: - 1) Minutes of the meeting of BOS in Super specialty held on 25/07/2023.
2) Minutes of the 181 Syndicate Meeting held on 11/09/2023.

In exercise of the powers conferred under Section 35(2) of RGUHS Act 1994, the Syndicate in its 181st meeting held on 11/09/2023 is pleased to notify the Curriculum for Super Specialty DM Paediatric Cardiology Course as per Annexure appended herewith.

The said Curriculum shall come into effect from the academic year 2020-21 onwards.


REGISTRAR

To

The Principals of all Affiliated Colleges conducting DM Paediatric Cardiology.

Copy to: -

1. The Secretary to Governor, Governors Secretariat, Raj Bhavan, Bengaluru-560 001.
2. The Secretary to Government, Health & Family Welfare Department (Medical Education) M.S. Building, Bengaluru - 560 001.
3. The Director, Department of Medical Education, Ananda Rao Circle, Bengaluru-560 009.
4. PA to Hon'ble Vice-Chancellor/Registrar/Registrar (Evaluation)/Finance Officer
5. Director, Curriculum Development Cell.
6. Deputy Registrar, Admission/Affiliation
7. The Homepage of RGUHS Website
8. Guard File/Office copy

CHAPTER I REGULATIONS

1. Eligibility for admission

D.M.: Candidate seeking admission for D.M Pediatric Cardiology must possess recognized degree of MD Paediatrics (or its equivalent recognized degree)

2 . Obtaining Eligibility Certificate by the University before making Admission

No candidate shall be admitted for any Super Speciality course unless the candidate has obtained and produced the eligibility certificate issued by the University. The candidate has to make an application to the University with the following documents along with the prescribed fee :

1. MBBS and MD pass / degree certificate issued by the University.
2. Marks cards of all the university examinations passed MBBS course.
3. Attempt Certificate issued by the Principal.
4. Certificate regarding the recognition of the medical college by the Medical Council of India.
5. Completion of internship certificate.
6. In case internship was done in a non-teaching hospital, a certificate from the Medical Council of India that the hospital has been recognized for internship.
7. Registration by any State Medical Council and
8. Proof of SC/ ST or Category I, as the case may be.

Candidates should obtain the Eligibility Certificate before the last date for admission as notified by the University.

A candidate who has been admitted to postgraduate course should register his / her name in the University within a month of admission after paying the registration fee.

3. Intake of Students: The intake of students to each course shall be in accordance with the ordinance in this behalf.

4. Duration of Study The course of study shall be for a period of 3 years

consisting of 6 terms.

5. Method of training

The training of postgraduate for DM course shall be residency pattern with graded responsibilities in the management and treatment of patients entrusted to his/her care. The participation of the students in all facets of educational process is essential. Every candidate should take part in seminars, group discussions, grand rounds, case monstration, clinics, journal review meetings, CPC and clinical meetings. Every candidate should be required to participate in the teaching and training programme of Post graduate students. Students should be posted to basic medical sciences and allied specialty departments or institutions if necessary

6. Attendance, Progress and Conduct

A candidate pursuing DM course should work in the concerned department of the institution for the full period as a full time student. No candidate is permitted to run a clinic/laboratory/nursing, home while studying Super Speciality course.

Each year shall be taken as a unit for the purpose of calculating attendance.

Every student shall attend symposia, seminars, conferences, journal review meetings, grand rounds, CPC, case presentation, clinics and lectures during each year as prescribed by the department and not absent himself / herself from work without valid reasons.

Every candidate is required to attend a minimum of 80% of the training during each academic year of the Super Speciality course. Provided further, leave of any kind shall not be counted as part of academic term without prejudice to minimum 80% attendance of training period every year.

Any student who fails to complete the course in the manner stated above shall not be permitted to appear for the University Examinations

7 . Monitoring Progress of Studies

7.1 Work diary /Log Book - --Every candidate shall maintain a work diary and record of his/her participation in the training programmes conducted by the department such as journal reviews, seminars, etc. (please see Chapter IV for model checklists and logbook specimen copy). Special mention may be made of the presentations- by the candidate as well as details of clinical or laboratory procedures, if any conducted by the candidate. The work diary shall be scrutinised and certified by the Head of the Department and Head of the Institution and presented in the university practical/clinical examination.

7.2 Periodic tests:

In case of courses of three years duration (DM, MCh.), the concerned departments may conduct three tests, two of them be annual tests, one at the end of first year and the other in the second year. The third test may be held three months before the final examination. The tests may include written papers, practicals / clinicals and viva voce. Records and marks obtained in such tests will be maintained by the Head of the Department and sent to the University, when called for.

7.3 Records: Records and marks obtained in tests will be maintained by the Head of the Department and will be made available to the University or MCI.

8. Schedule of Examination

The examination for D M courses shall be held at the end of three years. The university shall conduct two examinations in a year at an interval of four to six months between the two examination. Not more than two examinations shall be conducted in an academic year

9. Scheme of Examination: D M:

The examination shall consist of theory, clinical/practical and viva voce examination.

9.1 (Theory) (Written Examination): The theory examination shall consist of four question papers, each of three hours duration. Each paper shall carry 100 marks. Out of the four papers, the first paper will be on basic medical sciences. Recent advances may be asked in any or all the papers.

9.2 Practical / Clinical Examination:

In case of practical examination, it should be aimed at assessing competence, skills of techniques and procedures as well as testing student's ability to make relevant and valid observations, interpretation and experimental work relevant to his / her subject.

9.3 In case of clinical examination, it should aim at examining clinical skills and competence of candidates for undertaking independent work as a specialist. Each candidate should examine at least one long case and two short cases.

The maximum marks for Practical I Clinical shall be 200.

10 Viva Voce: Viva Voce examination shall aim at assessing thoroughly depth of knowledge, logical reasoning, confidence and oral communication skills. The maximum marks shall be 100.

10.1 Examiners: There shall be at least four examiners in each subject. Out of them, two shall be external examiners and two shall be internal examiners. The qualification and teaching experience for appointment as an examiner shall be as laid down by the Medical Council of India.

10.2 Criteria for declaring as pass in University Examination: A candidate shall secure not less than 50% marks in each head of passing which shall include (1) Theory, (2) Practical including clinical and viva voce examination.

A candidate securing less than 50% of marks as described above shall be declared to have failed in the examination. Failed candidate may appear in any subsequent examination upon payment of fresh fee to the Registrar (Evaluation).

10.3 Number of Candidates per day D M Course: The maximum number of candidates for practical/clinical and viva-voce examination shall be maximum of 3 per day

CHAPTER II

GOALS AND GENERAL OBJECTIVES OF POSTGRADUATE MEDICAL EDUCATION PROGRAM

GOAL

The goal of Super Speciality medical education shall be to produce competent specialist and /or Medical teacher:

- (i) who shall recognise the health needs of the community, and carry out professional obligations ethically and in keeping with the objectives of the national health policy;
- (ii) who shall have mastered most of the competencies, pertaining to the specialty, that are required to be practiced at the secondary and the tertiary levels of the health care delivery system;
- (iii) who shall be aware of the contemporary advances and developments in the discipline concerned;
- (iv) who shall have acquired a spirit of scientific inquiry and is oriented to the principles of research methodology and epidemiology; and
- (v) who shall have acquired the basic skills in teaching of the medical and paramedical professionals.

GENERAL OBJECTIVES

At the end of the Super Speciality training in the discipline concerned the student shall be able to:

- (i) Recognise the importance of the concerned specialty in the context of the health need of the community and the national priorities in the health sector.
- (ii) Practice the specialty concerned ethically and in step with the principles of primary health care.
- (iii) Demonstrate enough understanding of the basic sciences relevant to the concerned specialty.
- (iv) Identify social, economic, environmental, biological and emotional determinants of health in each case, and take them into account while planning therapeutic, rehabilitative, preventive and promotive measures/strategies.
- (v) Diagnose and manage majority of the conditions in the specialty concerned based on clinical assessment, and appropriately selected and conducted investigations.
- (vi) Plan and advise measures for the prevention and rehabilitation of patients suffering from disease and disability related to the specialty.

- (vii) Demonstrate skills in documentation of individual case details as well as morbidity and mortality data relevant to the assigned situation.
- (viii) Demonstrate empty and humane approach towards patients and their families and exhibit interpersonal behaviour in accordance with the societal norms and expectations,
- (ix) Play the assigned role in the implementation of national health programmes, effectively and responsibly.
- (x) Organise and supervise the chosen/assigned health care services demonstrating adequate managerial skills in the clinic/hospital or the field situation.
- (xi) Develop skills as a self-directed learner, recognise continuing educational needs; select and use appropriate learning resources.
- (xii) Demonstrate competence in basic concepts of research methodology, epidemiology, and be able to critically analyse relevant published research literature.
- (xiii) Develop skills in using educational methods and techniques as applicable to the teaching of medical/nursing students, general physicians and paramedical health workers.
- (xiv) Function as an effective leader of a health team engaged in health care, research or training.

STATEMENT OF THE COMPETENCIES

Keeping in view the general objectives of Super Speciality training, each discipline shall aim at development of specific competencies, which shall be defined and spelt out in clear terms. Each department shall produce a statement and bring it to the notice of the trainees in the beginning of the programme so that he or she can direct the efforts towards the attainment of these competencies.

COMPONENTS OF THE PG CURRICULUM

The major components of the PG curriculum shall be:

- i) Theoretical knowledge
- ii) Practical/clinical Skills
- iii) Attitudes, including communication.
- iv) Training in research methodology.

Source: Medical Council of India, Regulations on postgraduate medical education, 2000.

Annexure to University Notification No: No.UVORD-06/1999-2000, dated, 01.01.2000

DM Pediatric Cardiology- Curriculum

I. Topics and Sub-topics to be covered focusing on Basic, Clinical & Allied Sciences including Recent Advances.

Syllabus

Part I Applied Basic Sciences

Part II General Cardiology

Part III Pediatric Cardiology

Part I

Applied Basic Sciences

A. Applied Anatomy

1. Embryologic development of cardiovascular system
2. Molecular and genetic determinants of cardiac development
3. Anatomy of the cardiovascular system
4. Embryologic basis of congenital heart malformations: Current concepts

B. Applied Physiology

1. Study of cardiac contractility, blood flow and oxygen delivery
2. Basic concepts in hemodynamics: Flows, pressures and resistances, measurement and calculations
3. Basic concepts in cardiac electrophysiology

C. Applied Biochemistry

1. The cardiac metabolism in health and disease status

D. Applied Pathology

Examination of cardiac specimens and correlate clinical and echo/ cath data with cardiac morphology.

E. Applied Pharmacology

1. Principles of clinical pharmacology in connection with cardiovascular drugs
2. Drug management in Intensive Care Unit

F. Pediatrics

1. Impact of cardiovascular pathology on growth and development of the child
2. Nutrition in children with heart disease
3. Pathophysiology of exercise in children with cardiovascular disease
4. Psychological development of a child with heart disease.

G. Epidemiology

1. Epidemiology of Rheumatic fever and RHD
2. Global burden of congenital heart diseases and natural history
3. Screening for RHD and congenital heart disease: Strengths and limitations of available tests
4. Childhood obesity, hypertension, impact of changing lifestyles and development of adult cardiovascular disease.

5. The relative importance of pediatric heart disease in the context of other pediatric health priorities
6. Cost effective resource utilization

H. Applied physics and foundation of ECG, Echo, MRI, Cardiac Cath, Nuclear Cardiology

I. Research Activity

1. Principles of research ethics
2. Designing a research study
3. Use appropriate statistical methods
4. Write a scientific paper and present scientific data
5. Understand systematic critical review of scientific literature
6. Develop protocols and methods for research
7. Use of database and analyze data

J. Core principles of Cardiac Surgery:

1. Definitions and common terminology
2. Core principles of cardiopulmonary bypass
3. Myocardial preservation
4. Components of the CPB circuit
5. Common adverse effects of CPB

Part II

General Cardiology

1. Rheumatic Heart Disease
2. Coronary artery disease, atherosclerosis, pediatric origins
3. Electrophysiology and pacemakers
4. Congestive heart failure
5. Diseases of Aorta, Pericardium
6. Neoplasms of heart
7. Kawasaki Disease
8. Cardiovascular involvement in systemic illnesses

Clinical Evaluation

1. History and physical examination
2. Radiology
3. Electrocardiography
4. Two dimensional echocardiography with Doppler study
5. Nuclear Cardiology
6. Computerized Tomography, magnetic Resonance Imaging
7. Diagnostic Cardiac Catheterization including Electrophysiology study
8. Stress testing
9. Newer cardiac imaging
10. Relative merits of cardiovascular diagnostic techniques

Part III

Pediatric Cardiology

By the end of the education program the trainee is expected to know and manage the following clinical problems completely

1. Cardiovascular collapse in infancy

- Distinguish cardiac and noncardiac causes of cardiovascular collapse
- Natural history, anatomy, physiology and clinical features of cardiac disorders that cause collapse in infancy
- Physiology of duct dependent systematic circulation-management with prostaglandin E whenever needed
- ECG, CXR and echocardiographic findings in the congenital heart disease that present with collapse.
- Indications and risks of invasive and noninvasive investigations in this situation
- Indications and risks of catheter intervention and surgery in collapsed state
- Impact of cardiovascular collapse on other organs.

2. Cardiac failure in infants and children

- Understanding the physiology of cardiac failure caused by pressure overload, volume overload, restriction to inflow, reduced contractility
- Physiology of pulmonary edema
- Clinical features of cardiac failure at different ages
- Natural history, anatomy, physiology and clinical presentation of disorders that cause cardiac failures.
- ECG, CXR and echocardiography findings in cardiac disorder which present with cardiac failure
- Indications, contraindications, actions and side of drug treatment effect
- Indications and risks of catheter intervention and surgery in congenital heart disease, which present with cardiac failure.

3. Cyanosis in the newborn period

- Understand the physiology of cyanosis caused by right heart obstruction with right to left shunting, parallel circulation, common mixing lesions and duct dependent pulmonary circulation
- Distinguish cardiac and non-cardiac causes of cyanosis in newborn
- Natural history, anatomy, physiology and clinical features of congenital heart disease causing cyanosis in newborn
- ECG, CXR and echocardiography findings in cyanotic heart disease in new born
- Indications, limitations and risk of invasive and noninvasive investigations in newborn with cyanotic congenital heart disease

- Indications and risks of catheter intervention and surgery in cyanotic congenital heart disease in newborn.

7. Cyanosis beyond the new born period

- Distinguish cardiac and non-cardiac causes of cyanosis beyond newborn period
- Natural history, anatomy, physiology and clinical features of congenital heart disease causing cyanosis beyond newborn period
- ECG, CXR and echocardiography findings in cyanotic heart disease after newborn period
- Indications, limitations and risk of invasive and noninvasive investigations in child with cyanotic congenital heart disease
- Indications and risks of catheter intervention and surgery in cyanotic congenital heart disease after newborn period.\

8. Evaluation of the child with a cardiac murmur

- Physical signs on examination of cardiovascular system and their interpretation
- Characteristic features of innocent murmurs

9. Evaluation of children and adolescents with chest pain, palpitations, presyncope or syncope

- Clinical features that distinguish between arrhythmias, vasovagal syncope and seizures in patients with altered consciousness
- Causes of chest pain in childhood
- Types of structural heart disease which present with chest pain, palpitation and syncope
- Indications for exercise test, ambulatory ECG, cardiac event recorder and tilt table test in the investigations of these conditions.
- Treatment for arrhythmias, vasovagal syncope.

10. Congenital heart disease: all conditions should be individually studied under the following heads

- Incidence
- Embryology and genetics
- Anatomy
- Physiology and hemodynamics
- Natural History
- Diagnosis: Clinical findings, ECG, Chest X-ray, Echo, other imaging studies, Angiography
- Management
- Indications and timing of surgical and non-surgical interventions
- Clinical presentation
- Surgical and catheter intervention treatment options for each lesion, relative advantages and disadvantages of each approach
- Modified natural history: Survival, specific long-term post operative concerns

11. Pulmonary hypertension

- Recognize the clinical signs of pulmonary artery hypertension
- Understand the physiology of pulmonary artery hypertension –primary and secondary
- Recognize ECG, CXR, echocardiography evidence of PAH
- Assessment of pulmonary vascular resistance on cardiac catheterization
- Knowledge of classification, pathology, natural history, complications and management of pulmonary vascular disease
- Treatment of pulmonary artery hypertension and pulmonary hypertensive crisis after cardiac surgery

12. Fontan circulation

- Understand the physiology of Fontan circulation
- Indications
- Core requirements
- Preoperative evaluation (imaging, hemodynamic assessment)
- Knowledge of various surgical procedures used to create Fontan circulation
- Management of Fontan circulation in the postoperative period
- Complications of Fontan repair: Short term and long term

11. Inflammatory cardiovascular disease

- Knowledge of physiology, pathology, natural history, clinical features of rheumatic fever, Kawasaki disease and collagen vascular disease affecting cardiovascular system
- Cardiac and non-cardiac manifestations of these disorders
- Echocardiographic feature of these disorders
- Current recommendations for investigations and treatment
- Perform coronary angiography in children if needed

12. Cardiomyopathy and myocarditis

- Knowledge of physiology, pathology, natural history, clinical presentations and prognosis of myocarditis and dilated hypertrophic and restrictive cardiomyopathy
- Knowledge of genetics of cardiomyopathy
- Carry out echocardiographic evaluation of a child with myocarditis or cardiomyopathy
- Indications for medical and surgical treatment in cardiomyopathy
- Knowledge of available forms of circulatory supports
- Role of cardiac transplantation

13. Prevention and management of infective endocarditis

- Knowledge of epidemiology, pathophysiology, clinical manifestations, anatomical features, course and prognosis of infective endocarditis
- Identify cardiac and noncardiac manifestations of endocarditis
- Role of blood cultures, inflammatory markers, transthoracic and transoesophageal echocardiography in diagnosing infective endocarditis

- Integrate clinical and laboratory findings to plan appropriate management
- Current recommendation of antibiotic regimens for endocarditis treatment and prophylaxis in children
- Surgical management in patients with infective endocarditis

14. Cardiovascular abnormalities in neonatal intensive care

- Understanding the physiology of transitional circulation
- Differentiate PPHN from congenital heart disease with pulmonary artery hypertension
- Knowledge of pathophysiology, clinical manifestations, echocardiographic features and treatment of persistent pulmonary hypertension in newborn
- Knowledge of duct dependent lesions
- Indications and contradictions for medical and surgical treatment of PDA in preterm child

15. Cardiovascular evaluation of children with genetic disorders and syndromes

- Cardiac abnormalities found in common genetic disorders and syndromes
- Perform echocardiography to accurately diagnose cardiac abnormalities in these syndromes
- Knowledge of prognosis of genetic syndromes and their associated cardiac abnormalities.

16. Cardiac evaluation of the child with stridor

- Knowledge of embryology, anatomy, natural history and clinical presentations of vascular rings and their association with lung pathology
- Echocardiographic identification of presence of vascular rings
- Selection of patients who merit further investigations like bronchoscopy or MRI and their interpretation
- Perform angiography to define aortic and pulmonary anatomy
- Surgical options for vascular rings

17. Detection and management of fetal cardiac abnormalities

- Perform fetal echocardiography at various gestational ages
- Assessment of fetal heart and cardiac abnormalities
- Detection of fetal tachyarrhythmias and their management
- Significance of fetal karyotype results and genetic analysis
- Management of fetus with congenital heart disease
- Knowledge of causes of fetal hydrops and its natural history

18. Adolescent and adult congenital heart disease

- Knowledge of natural history of congenital heart disease in adolescents and adult
- Problems associated with unoperated congenital heart disease in adults
- Long term sequelae of surgery for congenital heart disease

- Perform transthoracic and transesophageal echocardiography and diagnostic cardiac catheterization in adults with congenital heart diseases
- Implications of operated and unoperated congenital heart disease for pregnancy and contraception
- Knowledge of rhythm disturbance
- Counsel adults with cardiac disease for employment and exercise

19. Arrhythmias

- Knowledge of various types of arrhythmias found in fetal life, infancy, childhood, adolescent and adults.
- Natural history, presentation and clinical features of arrhythmias in all ages
- Knowledge of structural heart disease and types of cardiac surgery associated with cardiac arrhythmias
- Genetic disorders associated with arrhythmias
- Indications for exercise testing, ambulatory monitoring, cardiac event recorders, invasive electrophysiology, radiofrequency ablations and implantable cardioverter defibrillator
- Classification, mechanism, interaction, side effects, contraindications and clinical use of antiarrhythmic drugs
- Temporary and permanent pacemaker implantation in children

20. Pediatric Cardiac transplantation

- Indications and contraindications for cardiac transplantation
- Principles of recipient evaluation, immunology and immunosuppression involved in cardiac transplantation
- Problems of rejection

21. Nutrition and growth in congenital heart disease

- Know the impact of nutritional status and its assessment
- Effect of malnutrition and clinical outcome
- Principles and rules of nutritional support
- Knowledge of growth and failure in congenital heart disease
- Management of fluids and calorie intake and monitor feeding regimes
- Management of fluid balance after cardiac surgery

22. Assessment of children prior to cardiac surgery

- Knowledge of principles of cardiopulmonary bypass and risks involved

23. Care of children following cardiac surgery

- Knowledge of postoperative problems caused by cardiopulmonary bypass
- Management of fluid and electrolyte balance, coagulation abnormalities, rhythm abnormalities, inotropic support, infections in postoperative period
- Management of pulmonary hypertensive crisis in postoperative period
- Use of echocardiography in immediate postoperative period

24. Assessment of children with cardiac disease prior to non-cardiac surgery

- Knowledge of cardiac disorders associated with higher risks for general anesthesia

25. Management of critically ill children with cardiovascular compromise

- Recognition of clinical signs of low cardiac output and shock
- Knowledge of common causes of hemodynamic instability during childhood and its differential diagnosis
- Intensive care support for children with hemodynamic instability

26. Prevention of cardiovascular disease in adulthood

- Lifestyle alterations in urban Indian children
- Childhood Obesity: Epidemiology, long-term consequences, prevention, monitoring the impact of lifestyle changes
- Detection and management of lipid disorders in children

II. PROCEDURES TO BE LOGGED

Procedure	Supervised	Independent
Transthoracic echocardiograms with Doppler studies	200	1000
Transesophageal echocardiograms	25	25
Fetal echocardiograms	25	-
Trans-venous pacemaker insertion	10	10
Pericardiocentesis	10	25
Diagnostic cardiac catheterizations in congenital heart diseases	100	200
Therapeutic cardiac catheterizations	200	50
Electrophysiology study including insertion of permanent pacemakers	25	-
Stress testing	10	50
HUTT-Head up Tilt test	10	20
Holter interpretation	10	50
Pacemaker check up clinics	10	50

III. Academic Schedule:

Seminar and Journal clubs:

Seminars (attendance and presentations) and journal clubs at a frequency of one session very two weeks would be a basic requirement to keep the fellow abreast of current development in the specialty.

Journal club once a week	45min-60min
Seminar once a week	60min
Case discussion (Including interesting ECG/Echo cath)	Twice a week 60 min

Imaging meeting: Once a week (includes once a month fetal echo and MRI sessions)
Hemodynamics and angiograms: Once a week
Joint surgical meeting: Once weekly

III. Projects and Scientific presentation:

Fellows should design and execute at least one original project in Pediatric Cardiology for presentation at a national meeting or for publication in a peer-reviewed journal for the fellow as the lead author. These presentations should be evaluated at the time of viva-voce. Publication of case reports and case series should be encouraged throughout the training.

IV: Competency and Skills to be acquired at the end of 1st, 2nd & 3rd year year of training.

Competency at end of 1st year:

1. Competent clinical skills; capability of comprehensive evaluation in OP
2. Competence with ICU on-call duties; familiarity with common post-operative and medical emergencies.
3. Capability of comprehensive and reliable trans-thoracic echocardiography
4. Competent assistance for most invasive procedures
5. Capability of doing simple diagnostic catheterization
6. Capability to prepare and present the weekly surgical conference
7. Competent bedside interpretation of common bed-side arrhythmias

After 2 years:

All of the above plus:

1. Capability to perform balloon atrial septostomy with minimal supervision
2. Reasonable TEE interpretation; should be able to interpret images in the OR

3. Capability to perform basic interventions under supervision (PDA closures, balloon pulmonary valvotomy in older patients, simple ASD device closures)
4. Capable of independent decisions regarding surgery and catheter interventions
5. Capability interpreting MR and CT imaging data
6. Capability of advanced interpretation of angiographic data

After 3 years:

All of above two plus

1. Independent diagnostic catheterisation
2. Independent simple catheter interventions
3. First assistant to complex interventions
4. Independently solve most ICU problem
5. Stabilize a sick child in ICU independently

V. Log Book:

All trainees should maintain a log book that records all procedures and investigations performed and all clinical and educational sessions attended. The log book forms a running commentary of the trainee's day to day activity and documents the extent of experience gathered in various areas of the curriculum. The log book entries should be signed off by the educational supervisor, prior to each training assessment, to confirm satisfactory fulfillment of the required training experience.

Constitution of the logbook:

Non-invasive Studies:

Diagnostic trans-thoracic echocardiograms

Intraoperative echo studies

Fetal echocardiograms

TEE- studies

CT and MRI interpretations

Holter and Exercise tests

Cardiac Catheterization:

Diagnostic catheterization studies

Balloon atrial septostomy

Interventional procedures

Temporary pacemaker insertion

Electrophysiology studies

ICU:

Atrial wire ECG

Central and arterial line insertion

Atrial wire ECG

Emergency Care:

Acute arrhythmia management

Emergency and elective cardioversion

Temporary pacemaker insertion

Pericardiocentesis

Academic Activity:

Seminars

Journal Clubs

Research paper presentations in conferences

Full-length publications, papers in a form that is ready for submission (one such paper should be mandatory)

Weekly Pre-surgical presentations

Others (Mortality and Morbidity Meetings)

These should have been tabulated on a monthly basis and signatures of the head of the department should be obtained.

Published papers/Thesis

Case Reports

Reviews

VI. Details of Individual Rotations:

Out patient evaluation in the pediatric cardiology clinic: Fellows should evaluate and plan the care and follow-up of patients referred to the clinic for outpatient evaluation. The outpatient evaluation should serve the important purpose of acquisition of clinical skills under the guidance of a consultant cardiologist.

In-patient care: The fellow should provide care of patients admitted in the wards under the supervision of the consultant. This should also include care of convalescing postoperative patients. The consultant cardiologist should provide formal teaching and supervision of patient care.

Echocardiography: Advances in echocardiography, including the introduction of Doppler and color flow mapping, have provided prompt, detailed, and noninvasive diagnoses of cardiac disorders. Although performance of echocardiographic studies in adults is fairly straightforward, the nearly infinite variety of cardiovascular abnormalities in the infant and child make similar studies in infants and children much more difficult to perform and interpret. Training in echocardiography for prospective pediatric cardiologists will have to be carefully structured. The fellows should be introduced to cardiac ultrasound through hands-on experience guided by the consultant cardiologist and senior fellows. A comprehensive digital library and didactic sessions should be provided for the fellows. Carefully supervised hands-on training should eventually allow independent performance and accurate interpretation of echocardiograms in the vast majority of patients with congenital heart disease.

Cardiac catheterization and interventions: Responsibilities of the fellow should include: preparation of the case and review of informed consent with the patient's family prior to the procedure, presentation of the case to the consultant, performance of the catheterization initially with a consultant and eventually independently, analysis and review of the data after the catheterization. The fellow should eventually learn to obtain a complete set of hemodynamic, saturation and angiographic data in a safe and expedient manner. Training in catheterization of the newborn infant and interventional procedures should begin early because of the relatively long learning curve involved.

Cardiac Intensive Care: The cardiology fellow should be directly responsible for the management of all non-surgical cardiac ICU patients. This requires thorough familiarization with principles of critical care monitoring, management and invasive procedures. Care of ventilated children should be provided in concert with the anesthesiologist on call. Additionally, the cardiology fellows should work cooperatively with the cardio-thoracic surgical residents and anesthesiologists to care for all postoperative cardiac surgery patients. The consultant cardiologist on the ICU staff and the cardiac surgeon should provide direct supervision and teaching during daily rounds.

Electrophysiology: In conjunction with a consultant, the fellow should oversee all inpatients and outpatients with arrhythmias. The fellow should be responsible for coordinating patient management, helping to plan and execute drug trials and esophageal electrophysiology studies, cardioversions and exercise studies, as well as review of all Holter studies. Later during the fellowship, the fellow should

actively participate in intracardiac electrophysiology studies, ablations and pacemaker and ICD implantations.

Research:

Research relating to specific problems relating to the Indian context should be strongly encouraged. During training the fellow should complete one prospective or retrospective study and publish it or present it in a form that is ready for publication. Regular Journal clubs allow critical appraisal of recent publications. The process of completion of one or more projects and writing the manuscript should be viewed as education in research methodology. Courses in research methodology, both in house and trainees should attend those conducted in other institutions. Publication of case reports / images or brief reports should be encouraged as it allows for improvement in writing skills and overall expression.

VII. List of Books and References

Name	Author
Drugs for the heart - Fifth Edition	Lionel H. Opie, Bernad J. Gersh
Text Book of paediatrics - 15th Edition	Behrman Kliegman
Cardiac arrhythmias children and adult with CHD	Edward .P Walsh
Pulmonary Arterial hypertension Related to CHD	Maurice Beghetti Robyn J
Rudolph - CHD:Clinico-Physiological considerations	
Congenital Heart Disease - Test of angiocardiology - Vol-I	Robert M. Freedom
Nadas Peadiatric Cardiology - Second edition (original)	John F.Keane, James E.Lock
Basic Peadiatric intensive care	Sunit Singhi
Cardiac surgery of the Neonate and infant	Castaneda Jonas Mayer Hanley
Cardiac Surgery - Third Edition volume 1	Kirklin/Barratt-Boys
Nadas peadiatric cardiology Second edition	John E .Keane / James E.Loke
Pathophysiology of Heart disease	Leonard .S Lilly
Echocardiography (A practical approach)	Savithri Shrivastava
Intravascular catheterization	Hentry A. Zimmeran
Paediatric Formulary - Seventh Edition	
Percutaneous interventions of CHD	Horst Sievert /Shakeel A.Qureshi
Manual of cardiovascular medicine	Steven .P.Marso
Manual of Neonatal care Fifth Edition	John .p cloherty
Moss and Adams Heart disease in infant and adolescennts 6th Edition	Hugh D. Allen /David .J Driscoll
Essentials of cardiac physical diagnosis	Jonathan Abrams
Text books of Fetal cardiology	Lindsey Allen /Lisa Hornberger
Congenital Heart Disease - Volume II	Robert M. Freedom
CHD Considerations	Abraham .M Rudolph
Heart disease, A text book of cardiovascular medicine Volume 1	Eugene Braunwald
Heart disease, A text book of cardiovascular medicine -Volume 2	
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