MD Phase B Curriculum
In
" Paediatric Cardiology"

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Overview of the Specialty

The specialty of Pediatric Cardiology developed as a sub-specialization of Pediatric and cardiology who are predominantly concerns with the care of patients with cardiovascular disorders. Paediatric cardiology deals with those children with congenital heart diseases and acquired heart diseases. It is concerned with prevention, investigation and therapy and research into diseases involving the cardiovascular system. Care of children with cardiovascular disorders embraces a wide range of clinical activities and pediatric cardiologists need a broad view of the cardiovascular needs of individual patients and the communities in which they live including an understanding of any prevailing healthcare inequalities. This requires knowledge of not only the diagnostic and therapeutic modalities available, but also an appreciation of the importance of the epidemiology and potential for prevention of cardiovascular disease.

Although Pediatric cardiology is generally stereotyped and highly practical skill based pediatric specialty, noninvasive and interventional skills as high-profile components of the workload, competence in other areas of practice such as cardiovascular clinical pharmacology and cardiovascular imaging are equally important. Indeed the expert clinical management of patients with heart failure of cardiomyopathy or atria! fibrillation is as rewarding as the quasi surgical skills demanded of the coronary or electrophysiological interventionist.

Pediatric cardiologists generally work as hospital based specialists and need to integrate their work with not only community based primary care colleagues but also other hospital based physicians. e.g. nephrologists, as well as working closely with cardiothoracic surgeons and anesthesiologists and the imaging specialties, e.g. radiology and nuclear medicine. Sub-specialization within Cardiology has become commonplace with individuals focusing the development of their expertise in areas such as cardio vascular imaging, coronary intervention, cardiac arrhythmia, congenital heart disease, heart failure and hypertension.

Aim of the course

1. To train and prepare adequate number of specialist doctors for providing service to the children all over the country with any cardiac problems.
2. To ensure better future for children with congenital heart disease.
3. To reduce infant and under five mortality contributed by congenital and acquired cardiac problems.

Objectives

To provide specialized and well organized, structured training program of paediatric cardiology to the students undertaking the course so that they would be able to-

1. Recognize congenital and acquired cardiac problems in neonates, infants and children.
2. Refer the patient to the Tertiary Referral Hospital as and when required.
3. Manage acute cardiac emergencies in children.
4. Manage any medical conditions related to heart disease.
5. Manage neonatal cardiac emergencies.
6. Achieve capability to teach the subject to future students.
7. Design protocol for carrying out research in this field.
8. Achieve leadership and communicative skill to handle any unwanted situation which may arise during managing any critical case.
9. To contribute for future enhancement of the subject.

A. General rules for the course (MD Phase B in Paediatric Cardiology)

► The Name of Course will be "**MD Phase –B in Paediatric Cardiology**".

Eligible candidate for MD Phase B in Paediatric Cardiology".**:**

a) Direct entry: Medical graduates with FCPS or MD or equivalent degree in Paediatrics recognized by **BMDC.**

B. Rules for Medical graduate with FCPS/MD in Paediatrics from BCPS/Dhaka University/BSMMU (recognized by BMDC)

A medical graduate who has already obtained MD/FCPS in Pediatrics or equivalent degree will have to go through the following sequential programs for obtaining MD in Paediatric Cardiology.

a. Three years residential training in the special field (Paediatric Cardiology).
This training will be structured and monitored. A logbook is to be maintained throughout this training period.

b. During this specialty period the candidate will have to prepare a thesis on a chosen topic of the relevant subject. The thesis must be accepted by the BSMMU and defended by the candidate.

c. Candidates completing the training and thesis will then appear in the MD examination in the specialty. Successful candidate will then be declared to have obtained the MDdegree in the specialty.

► 1. The rules for Medical graduates:

A medical graduate with BMDC registration will have to undergo the following sequential education, training and assessment. As per decision of the Paediatrics faculty of BSMMU this part will remain same for all "Specialty MD"

MD Phase -B (Speciality training in Paediatric Cardiology)

- This training in the SPECIALTY (Paediatric Cardiology) will continue for THREE YEARS and will be structured and supervised and will include management of both in and out patients, hand –on training on skill development, active participation in clinical meetings, case discussions, journal clubs, death reviews, management of emergencies etc. During training the trainer will periodically monitor the logbook. The strength and weaknesses of the trainee will be identified and duly addressed. During this period the students will have to complete a logbook prepared for this particular course.

- During this 3 year training period the candidates will have to carry out a research work in this particular field. This research will be done under supervision of a senior Professor of the subject. After completion of the work the candidate will have to write a thesis based on the research and submit to the University for defense. During thesis defense at least two external examiners will examine and the supervisor will remain present as observer.

- Candidates completing the training and on successful defense of the thesis will then appear in the Phase B MD examination. Successful candidates will obtain the "MD in Paediatric Cardiology".

► Institutional requirements:

Specialty Training:

The following issues will be taken into consideration for institutional recognition.

I. Clinical facilities: Inpatient, Outpatient, diagnostic, therapeutic and emergency services in that specialty.
II. Staffing pattern: Number and qualification of teaching staff.
III. Academic activities: like regular clinical meetings, journal clubs, seminars etc.
IV. Academic facilities: library, classrooms, clinical meeting rooms, audiovisuals, Internet facilities, computer etc.
V. Research background of the department.
VI. Equipments for practical training.
VII. Teaching learning environment.
VIII. Organizational setup/Physical facilities.

Facilities and researches:

The followings are considered essential for a training program to be in department.

1. There must be sufficient number of new and follow-up patients to ensure inpatient outpatient experience. Such patients should have a wide variety of congenital and acquired cardiac malformations/disease. There must be supervision of trainees by teachers seeing patients in both inpatient and outpatient settings.
2. Up to date inpatient and outpatient care facilities are essential to accomplish the overall mission.
3. There should adequate facilities for cardiac catheterization, Echocardiography, radiological imaging facilities, ECG test, Exercise test and Holter recording, pace maker implantation, Cardio pulmonary resuscitation and paediatric cardiac interventions.
4. There should be active research program in cardiovascular and allied diseases.
5. Access to well-stocked library and internet in essential.

GOAL OF TRAINING

A clinician trained in the specialty of "Paediatric Cardiology" must have adequate knowledge on it and the ability to think about relevant differential diagnosis based on an accurate history and physical examination. He or she must understand Echocardiography, ECG and at the end of training must be able to do this test by themselves. He or she must have an understanding of the indications and contraindications for diagnostic and therapeutic procedures, the ability to think

clinically and appreciation of the humanistic and ethical aspects of medicines and various invasive procedures. In addition a trainee must also have ability to handle critical heart disease cases in neonatal and paediatric intensive care units. He or she must have sufficient knowledge on intensive care, blood gas analysis, ventilator management etc. this requires a reasonable long period of training with abundant exposure to patients under the supervision of an experienced clinical teachers. Facilities must be available for trainees to have all instruments/manpower available in the institute for training and trainee should participate actively in managing patients as well as in research as a means of fostering inquisitive through processes.

Evaluation of trainee competence through structured logbook:

Training program must have an established committee to evaluate trainee, regular training records detailing the progress of each trainee and a defined program of feedback to the trainee.

Elements of competence to be evaluated:

Trainees should demonstrate the followings:

1. An understanding and commitment to all elements of professionalism.
2. A through knowledge of history taking and ability to perform a comprehensive and accurate physical examination.
3. The ability to arrive at an appropriate differential diagnosis, to outline a logical plan for targeted and specific investigations and to formulate a plan for management and follow-up of the patient.
4. The ability to present effectively the result of conclusions orally and in writing.
5. A wide knowledge in cardiac and vascular Anatomy, Physiology, Haemodynamics, Pathology and Pharmacology.
6. Procedural skills appropriate to the level of training as outlined in training in Echocardiography, Cardiac Catheterization, Pericardiocentesis, ICU management and ventilatory management.

Methods of evaluating training competence:

The following methods should be followed for evaluation of trainee's competence

1. Observation during procedures, rounds and conferences
2. Formal evaluation forms from each faculty members who comes in contact with the trainee.

3. Formal in service examination to test the knowledge base, including interpretation of Echocardiographic and Angiographic findings and ECG trainings.
4. Formal assessment of clinical skills using a patient - based examination.
5. Logbook and competency examinations for all procedures.

Training:

1. Training in ECG recording and interpretation.
2. Training in 2D, M-Mode color doppler Echocardiography.
3. Training in pre-catheterization evaluation of the patient.
4. Training in trolley preparation for cardiac catheterization.
5. Training in post-catheterization procedure application and other post-operative management.
6. Training in giving central line.
7. Training in intubation and intensive care.
8. Training in cardio-pulmonary resuscitation (CPR).
9. Training in ETT.
10. Training in trans-oesophageal echo observation.
11. Training in fetal echo observation.
12. Training in diagnostic cardiac catheterization.
13. Training in critical, care medicine.
14. Training in interpretation of blood gas analysis.
15. Training in interpretation of haemodynamic data of cardiac catheterization.
16. Training in calculation of QP: QS, cardiac out put, pulmonary vascular resistance, shunt calculation.
17. Training in urgent pericardiocentesis in ICU.
18. Training in urgent pace maker implantation.
19. Training in endomyocardial biopsy-observation.
20. Training in Holter monitor.
21. Training in EPS study.

Purpose of training:

1. Identify congenital heart disease in earliest possible chance to reduce neonatal and infant mortality.
2. To do life saving interventions in time.
3. To refer the patient to a tertiary center at earliest possible chance to repair.
4. To maintain ventilatory function, oxygenation control of body temperature, nutrition during transport.
5. To refer the cases to cardiac surgeon in proper time.
6. To take care of post-operative cases.
7. Training on preventive part of heart disease.
8. Training on all diagnostic modalities to diagnose heart disease in earliest possible chance.

9. To have enough skill to suspect heart disease in children who are not symptomatic or have clinical signs.
10. Training on patient education and counseling.
11. Training on genetic aspect of disease.

Training procedure:

1. Participation in active patient management.
2. Work-up of new admissions.
3. Attending out patient clinics.
4. Attending echo laboratory procedure.
5. Attending catheterization laboratory procedure.
6. Reporting of ECG's.
7. Reporting of blood gas analysis.
8. Case presentation.
9. Reporting practice of echo and angiogram.

Clinical training:

1. New patient work-up 200 cases.
2. Echocardiography 100 cases.
3. ECG 200 cases.
4. Cardiac cath observation 50 cases.
5. 2nd hand assistance 20 cases.
6. 1st hand operation 5 cases.
7. Log book to be maintained during the program.
8. Pericardiocentesis 5 cases.
9. Central line 10 cases.
10. ETT 10 cases.

Evaluation:

A trainee should be evaluated at 6 months interval and at the end of training before final examination.

Training of ECG:

A trainee should know how to connect patient with electrodes and how to take ECG tracing. He/She should know how to interpret ECG.

Training on giving central line:

A trainee observes 20 procedures and assists 10 such cases before giving a line by himself.

Training on Echocardiography:

A trainee should read basic echocardiography book 1st for 3 months to have preliminary knowledge on sound waves, views and types of echocardiography. He/She should observe 100 echocardiography as observer, and then from 2nd year of training he should start practice with patient. In 3rd he/She should be able to perform echocardiography by himself/herself and reporting cases.

Training in intensive care:

A trainee should be attached to ICU 24 hours for 6 months period during training time and should intubate at least 20 patient during training period.

Training in cardiac catheterization:

A trainee should attend cardiac cath lab procedure for 2nd 6 months of training. He/she should participate in patient preparation for this time in 3rd 6 months. He/She should prepare trolley with scrub nurses and should apply pressure to puncture area. From the beginning of 3rd year he should start catheterization as 2nd assistant and then as primary operator in simple cases in last 6 months.

Training in pericardiocentesis:

Trainee should observe 10 such cases and assist another 10. Then he will have to perform the procedure by himself from the beginning of 3rd year.

Training in Research:

The subspecialty of paediatric cardiology is dedicated to continued progress in the prevention, diagnosis and treatment of cardiac disorders. This mission requires the availability of committed physician/investigators appropriately trained to elucidate biological mechanisms and the maternal history of cardiac diseases and to further requires that all future cardiologists be familiar with research principle and methods. It is recommended that all cardiologists are to be trained in institutions where research opportunities are readily available either on site or through programmatic affiliation with a research institution. It is further recommended that every cardiology trainee, including those preparing for a career in clinical practice, participates in research for a period of at least 6 months.

Research may either be basic (i.e. laboratory-base) or clinical (i.e. patient-base).

Trainees seeking career in patient-based research need to acquire practical skills in clinical methods, including literature study, the choice of research question and study design, use of cost effectiveness and quality of life models, approaches to sampling populations and making clinical measurements, techniques of biostatistics and sample size estimations, ways to optimize quality control and data management, and ways to avoid bias. They must develop a clear understanding of current knowledge and important unanswered questions in their area of interest and of the

area of interest and of the ethics of research and human investigation. They need to acquire practical experience in the clinical analysis of current literature, in the use of computer (e.g.) literature review, data based management and analysis, communication, in presentation of their work in written and oral form.

The trainee must have sufficient protected time during the training period to participate in the course work outlined above and to initiate well defined prospective hypothesis-drive research project. He/She must have produced as a principle author and article of original work in cardiac diseases accepted in a journal (as accepted by the
BSMMU). This work may be done either during or before entry in to the training program.

Contents for the MD Phase-B Paediatric Cardiology course.

(MD Phase B in Paediatric Cardiology) Assesment :
The assessment will be organized in a manner to measure whether the student has attained capabilities to meet the objectives of the course or not.

The objectives of this part :

At the end of Paediatric Cardiology course the students should be able to

1. Take history including family, genetic, socio-economic.
2. Able to perform a comprehensive and accurate physical examination to arrive a diagnosis.
3. Think of rational differential diagnosis.
4. Outline appropriate investigations for confirmation of diagnosis and able to justify
   logically.
5. Provide evidence based comprehensive management.
6. Demonstrate procedural skills as outlined in the annex.
7. Provide essential care to Cardiac problems and organize follow up.
8. Efficiently use and maintain procedural equipments.
9. Make decision in the face of ethical dilemmas regarding Paediatric Cardiology related patient and research.
10. Communicate effectively with colleagues, nurses, patients and families in relation
    to patient care and will be able to provide adequate counseling to parents.
11. Develop a networking with the community to understand community cardiac problems and play role in the prevention and management.
12. Plan and carry out research in the field of Paediatric Cardiology.

► Contents:

Paediatric cardiology:

A. Basic Aspects:-

a) Cardiac Embryology
b) Cardiovascular Anatomy
c) Cardiac metabolism
d) Contraction of normal heart
e) Pathology of Cardiovascular system
f) Systemic blood flow and oxygen delivery
g) The pathophysiology of congestive heart failure
h) Regulation of myocardial blood flow and oxygen consumption
i) Pulmonary physiology and heart-lung interactions
j) Pulmonary oedema
k) Regulation of the Pulmonary Circulation
l) Foetal circulation and changes occuring after birth
m) Cardiac Electrophysiology
n) The physiology of exercise in children

B. Diseases of the heart, Pericardium, Myocardium, Aorta and blood vessels:

1. Structural congenital heart disease.
2. Inflammatory Cardiovascular heart disease.
3. Arrhythmias
4. Hypertension and hypertensive heart diseases in children
5. Connectiive tissue diseases of the cardiovascular system in children
6. Infective Endocarditis.
7. Heart disease and Pregnancy.
8. Diseases of aorta and blood vessels in children
9. Iatrogenic Heart Diseases in children
10. Cardiovascular involvement in systemic disease in children 11. Epidemiology of Cardiovascular diseases and preventive Cardiology in children.
12. Sudden Cardiac Death in children
13. Pulmonary embolism
14. Neoplastic Heart disease in children
15. Pulmonary Vascular disease
16. Other special problems and issues
    a) Chest pain in children and adolescents
    b) Coronary risk factors in childhood.
        i. Atherosclerosis ii. Systemic Hypertension
17. Circulatory shock.
18. Miscellaneous.

C. Cardiovascular Pharmacology

Sl No	Name of topics
1	Anti-arrhythmic drugs
2	Anti-hypertensive drugs
3	Ionotropic agents
4	Digoxin
5	Diuretics
6	After load reducing agents
7	Chronotropic drugs
8	Antibiotics
9	Antivirals
10	Antifungals
11	Cardiopulmonary resuscitation and drugs
12	Complication of drugs

D. Manifestations of cardiac diseases

Sl No	Name of topics
1	Dyspnoea
2	Cyanosis
3	Cough
4	Feeding difficulty
5	Failure to thrive
6	Recurrent pulmonary/Respiratory tract infections
7	Haemoptysis

E. Diagnostic and therapeutic methods:

1. History and physical examination.
2. The chest roentegenogram
3. The Electrogram
4. Phonocardiography
5. Carotid, Apex and Jugular Venus pulse tracing
6. Echocardiography.
7. Doppler Echocardiography
8. Transesophageal Echocardiography and Stress Echocardiography
9. Exercise Testing
10. Growth and Nutrition
11. Pharmacologic therapy
12. Current topics in congenital Heart Surgery.
13. Paediatric Heart Transplantation.
14. Non-cardiac Surgery in patients with Heart disease.
15. Electrophysioligy.
    a) Development and function of the cardiac conduction system
    b) The normal Electrocardiogram

c) The syncope and the assessmenr of the autonomic nervous system
d) Electrophysiologic studies
e) Electrophysiologic therapeutic Catheterisation
f) Disordirs of Cardiac rhythm and conduction
g) Sudden Cardiac death

16. Nuclear Cardiology foundations
17. Nuclear magnetic Resonance imaging and position Emission Tomography. Basic science aspects.

F. Invasive and Intervention cardiology:

1. Introduction to cardiac catheterization
   a) History
   b) Catheters
   c) Procedures
   d) Sterilisation
   e) Pre-Procedure preparation of patients
2. Indication and complication of catheterization and contrast agents
   a) Right heart catheterization and its indication
   b) Left heart catheterization and its indication
3. Device closure of ASD, VSD, PDA, and PDA coil embolism.
4. Indications and Procedure of septostomy
5. Pheripheral angiogram, angioplasty and stenting.
6. Coronary angiograms, indication and interpretation of views and complication
7. Balloon valvoplasty
   a) PTMC
   b) Others ballooning and complication
8. Prosthetic valve
9. Follow up of patients after Prosthetic valve replacement
10. Temporary pacemaker
11. Permanent pacemaker
12. Lecture on assisted device
13. Sedation and monitoring during diagnostic Procedure

G. Paediatric Cardiac Surgery:

1. Pre operative Selection of Patients
2. Post-operative monitoring and management.
3. General anesthesia and Non-cardiac surgery in patient with heart disease.
4. Intensive care unit (ICU)
5. Paediatric Heart Transplantation

H. Practical Cardiology:

1. Laboratory
2. Radiology
3. Echocardiography-2D, M-mode, Doppler, TEE, Contrast Echo 4. Phonocardiography
5. Pericardiocentesis
6. Cardiac Catheterization- To participate in at least 20 procedures.
7. Paediatric cardiac intervention "to observe/ participate in atleast 20 interventions
8. Oxygen therapy
9. Use of ventilator
10. Signal average ECG
11. Holter Monitoring
12. Ambulatory BP monitoring
13. Blood gas analysis
14. Myocardial Biopsy
15. Pace maker checkup
16. TEF
17. Vascular Doppler study
18. Tilt Table test

I. Cardiac Emergencies:

1. Cardiac emergencies in children
2. Cardiopulmonary resucitation
3. Cardioversion
4. Venepuncture, Arterial puncture, Venus cutdown
5. Cardiac pacing
6. Oxygen therapy
7. Use of Respiratory ventilator
8. Blood gas analysis

J. Clinico-pathological Conferences: Eighty percent of such should be attended

K. Doctors undergoing the course shall be placed in the word on the management of patients and practical works.

L. Case report.

M. Publication, presentation in scientific session.

► Placements of the trainees:

The students will be placed in Paediatric Cardiology ward and will be engaged in the following activities:

1. Management of all Paediatric Cardiology related emergencies.
2. Management of admitted patient indepently.
3. Acquisition of practical skills/performing procedures.
4. Follow-up at out patient department.
5. Participation in decision-making with other colleagues.
6. Rotation inpatient duty and out patient consultation.

► Teaching Methods:

A. Self-directed learning will be encouraged through-
1. Participation in ward-rounds
2. Hand-on experience
3. Interactive learning sessions
4. Independent ward-rounds
5. Bed side teaching-learning
6. Tutorials
7. Clinical presentations
8. Journal clubs
9. Clinico-pathological conferences
10. Seminars, symposiums
11. Watching video clips of different procedures and it's technical aspects.
12. Grand rounds/meetings with Department of pathology and other investigative divisions.
13. Elective period of training in other institutions in the country e.g. NICVD, CMH.
14. Carry out research and patient follow up.
15. Writing scientific papers.

► CME/CPD:

The trainee will be encouraged to participate in CME programs, workshops, meetings
organized by national and international professional and specialist organization relevant to the specialty of paediatrics. Hand on experience and learning sessions will
be organized in the community setting for a period of four weeks.

► Additional qualities:

1. Develop expertise in organizing Cardiology care in the primary, secondary and tertiary levels of health care systems.
2. Develop expertise in playing the assigned role in national and internaional
   programs relevant to Paediatric Cardiology.

► Training in research methods:

In addition to acquiring clinical skills, it is recommended that all trainees participate in a research program during the course. Research may be in clinical and public health aspects of Paediatric Gastroenterology and Nutrition.

Trainees will acquire skills in research methodology, literature search of clinical epidemiology and biostatistics. They also need to develop practical experience in the critical analysis of current literature. Computer skills in literature search data-base management and statistical analysis are essential requirements for the trainees. In accordance with the rules of the BSMMU, the trainee must produce a thesis of original research which has been properly supervised. The thesis will be examined by **four** independent reviewers appointed by BSMMU.

► Internal evalutation of the trainee:

A committee will be established by the institute to evaluate trainee's competence.
The evaluation will be based on clinical skills, clinical presentations, skills in procedures, taking part in seminars, journal clubs, assessment of knowledge based on interpretation of radiological and pathological reports and adequate handling of Paediatric Cardiac patients. All theses should be recorded and marked.
(Note: The logbook will be prepared by the institute)

► The pre-requisite for appearing in the examination

All the students must go through the course

1. Satisfactory completion of the training program as outlined in the course. This must be certified by concerned authorities as recognized by the BSMMU.
2. Thesis: The candidate will be required to submit one thesis on original research done during the course. Progress will be reviewed quarterly and feedback given to candidate by the supervisors. The candidate will need to make 3 formal presentation to the department of the a) protocol, b) midcourse progress, c) final report.

► Assessment system for MD Phase –B in Paediatric Cardiology. (Total marks-400)

Paper-I -100 marks
Written paper on diagnosis and management of clinical problems of Paediatric Cardiology (the weightage should be 60% and 40% consecutively).

Paper-II -100 marks
Diagnosis and management of Paeditric Cardiac
disorders, management of complications, clinical management and supportive care. (weightage should be 60% and 40% consecutively).

Clinical:
-Long case- 50 marks
-Short case- 50 marks

Structured Oral examination: 50 marks
Theoretical knowledge of higher level, it's clinical application, logical reasoning,
attitude and communication skill.
OSPE-----10 stations: 50 marks
Relevant X-rays, other imaging, Instruments
Photographs
Chart
Laboratory data.
Attitude and communication skill

► Requirements for appearing in the Assessment of MD Phase-B in Paediatric Cardiology:

MD Phase B examination will be held in January and July each year. Candidates
will need to submit the following with their application:

a. Evidence /certificate of passing FCPS/MD from DU/BSMMU or any University recognized by Paediatrics.
b. A completed logbook
c. A thesis prepared during the specialty training period. The thesis will be defended by the candidate.
d. Copies of certificates of successful completion of training in Paediatric Cardiology from the hospitals/institutions.
e. Prescribed fees
f. Photograph of the candidate.

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