

NATIONAL POSTGRADUATE MEDICAL COLLEGE OF
NIGERIA



CURRICULUM FOR SUBSPECIALTY IN PAEDIATRIC
CARDIOLOGY

FACULTY OF PAEDIATRICS

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PAEDIATRIC CARDIOLOGY SUBSPECIALTY CURRICULUM

Philosophy of the program

To provide a comprehensive and a well knitted knowledge in paediatric cardiology which will assist Paediatricians to upgrade their knowledge in that area. The course will also facilitate acquisition of skills required for the conduct of research in relevant areas in paediatric cardiology.

Introduction

Paediatric Cardiology is feasible in centres where there are about three or more consultant paediatric cardiologists, with the supporting personnel and equipment necessary to diagnose and treat children with cardiac conditions. These centres are usually well equipped, state of the art paediatric hospitals or major cardiothoracic centres of excellence. The subspecialty provides services from life in utero to adolescents and is concerned with diseases of the heart both acquired and congenital. The paediatric cardiologist in training must have a thorough grounding in paediatrics and should be capable of providing all round patient care.

Structure

Before commencing a subspecialty program in Paediatrics, a candidate must undergo a residency training and must be a Fellow in General Paediatrics of either College or any accredited institution abroad.

The residency program of the National postgraduate medical college of Nigeria is structured in three major stages:

Primary Examination: Candidates taking these exams is expected to have satisfactory knowledge of basic medical sciences and their clinical applications. These examinations can be taken from non-accredited institutions.

Part 1 Examination: Candidates presenting for this stage must be in an accredited institution and must have completed a posting of 24 months' durations in clinical rotations in general paediatrics and must have a broad knowledge of basic and clinical paediatrics.

Part II Examinations: Here candidates must stay for a minimum of 24 months and must be vast in research and managerial skills. Candidates must pass an oral examination and defend his dissertation before being awarded a fellowship degree.

SUB SPECIALTY TRAINING IN PAEDIATRIC CARDIOLOGY

Purpose of the Curriculum

The purpose of this curriculum is to define the process of training and the competencies needed for the award of a certificate of completion of training in Paediatric Cardiology.

The curriculum covers training across Nigeria. Subspecialty training in Paediatric Cardiology consists of core and higher speciality training. Core training provides physicians with the ability to access, treat and diagnose patients with acute and chronic medical symptoms; and with high quality review skills for managing inpatients and outpatients. Higher speciality training then builds on these core skills to develop the specific competencies required to practise independently as a consultant Paediatric Cardiologist.

Organization

For paediatric cardiology training to take root in Nigeria, it cannot exist alone. A program must be enacted that will rotate around it. It will contain both personnel and instruments.

They include physicians and expert nursing and ancillary team members:

Cardiothoracic Surgery, Paediatric Anaesthesiology, Paediatric Cardiology and Interventional Cardiology, Paediatric Intensive Care Medicine Neonatology, Medicine, Maternal-Fetal medicine, Adult Congenital Paediatric Cardiology, Advanced Practice Nursing, Genetics Nursing, Perfusionist, Respiratory Therapy, Nutrition Therapy, Social Workers, Occupational Therapy, and Physical Therapy

Diagnostic facilities should include a fully equipped paediatric echocardiography laboratory, a paediatric cardiac catheterization and electrophysiology laboratory, and appropriate additional facilities and capabilities for comprehensive laboratory and non-invasive diagnostic evaluations of critically ill children. Therapeutic components that must be on ground should include a paediatric cardiac catheterization laboratory equipped for interventional cardiology and transcatheter radiofrequency ablations, a cardiac operating suite suitable for surgical treatment of all paediatric cardiovascular patients, an extracorporeal membrane oxygenator (ECMO), and a cardiac intensive care unit (ICU) or paediatric ICU and/or neonatal ICU equipped and staffed to care for paediatric cardiovascular patients

Development

The demands of patients with congenital heart disease have changed considerably over the last decade with increasing expertise and technological advances being reflected in the training programme. In particular, this curriculum recognises the importance of concentration of expertise and avoidance of occasional practice in improving the long term care of patients with congenital heart disease. The increasingly complex practice of paediatric cardiology dictates that cardiologists should have at least one area of specialist area expertise. The current demand and lower threshold for specialist referral for cardiology opinion has led to the main changes in this curriculum, which relate to more clearly defined training.

2.3 Training Pathway

Junior Residency: At this stage the trainee will start developing interest in paediatrics in general and paediatric cardiology in particular. The trainee should be conversant with cardiac disease in children in the tropics and bedside diagnosis and ability to use invasive and non-invasive procedures to make a diagnosis. This stage culminates in passing the part 1 exams

Senior residency: The candidates shall spend a minimum of 24 months. A period of exposure in an accredited institution abroad for at least 1 year is very mandatory. The trainee at the end of 24 months must prepare and defend his dissertation purely in paediatric cardiology and should also write an MCQ and oral examination all in Paediatrics and paediatric cardiology.

SUB-SPECIALTY EXAMINATION IN PAEDIATRIC CARDIOLOGY

1. Dissertation for FMCPaed (Paed Cardiology)

This is in partial fulfilment for the award of FMCPaed (Cardiology). The topic for research must be purely on either clinical or investigative aspect of paediatric cardiology. Both the internal supervisors and the nominated external assessors must be Paediatric Cardiologists of reasonable standing and experience.

2. Examination Format:

- a. Multiple choice questions in Cardiology (2hrs) consisting of 100 questions each of 5 stems covering all aspects of Paediatric Cardiology from basic sciences and clinical cardiology.
- b. General Paediatric Orals (1½hrs)
- c. Defence of dissertation in Paediatric Cardiology (2 hrs)
- d. Oral Examination in Paediatric Cardiology (2 hrs)

All candidates appearing for the examination must produce a letter from a cardiologist from the training institution attesting to the fact that the candidate has successfully undergone the training as required by college.

Purpose of the Curriculum

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The curriculum covers training across Nigeria.

At the end of the program, candidates are expected to develop the following competencies:

- Appropriate use and performance/interpretation of noninvasive tests (x-ray, ECG, echocardiography, Doppler ultrasound, ambulatory ECG, exercise testing, cardiac MRI)
- Develop skills in transthoracic and transesophageal echocardiography
- Developing plans for treatment, monitoring and follow-up
- Understanding of the natural history of congenital and acquired heart disease and appropriate plans for counselling and follow-up
- Incorporation of preventive cardiology into the overall care plan for the child and the family
 - Clinical competences of history and focused examination and consequent analysis of findings to anticipate possible problems of the child that will drive appropriate investigations and treatment
- To understand the indications, risks and limitations of diagnostic and therapeutic cardiac catheterization
- To be able to effectively communicate the rationale, techniques and risks/benefits of catheterization to the patient and family
- To understand the principles and techniques necessary to calculate flows, resistances, cardiac function and severity of stenosis by catheterization methods
- Understand the uses of appropriate angiography techniques and selective angiography
- Learn basic principles and techniques of standard interventional therapeutic techniques (balloon atrial Septostomy; balloon valvuloplasty), ASD, VSD, PDA catheter closures and stenting etc.

Programme Content and Objectives

- The most important function of the subspecialist training programme in paediatric cardiology is to inculcate in individuals who will become consultants with the capability of providing the highest standard of service to children with cardiac disorders and adolescents with congenital heart disease. The syllabus within this curriculum sets out the subject matter to be covered during training. The planned outcomes of the training programme are included, with succinct goals for achievement of a sound knowledge base and competencies as well as appropriate methods of learning and assessment throughout the programme.
- The education programme in paediatric cardiology aims to produce physicians who:
 - Communicate effectively with children, families, and colleagues
 - Coordinate effectively the work of the paediatric cardiology team
 - Manage time and resources to the benefit of themselves, their patients and their colleagues
 - Acquired and developed team and leadership skills
 - Work effectively with other health care professionals
 - Teach other physicians and health care professionals

- Develop clinical practice which is based on an analysis of relevant clinical research and have an understanding of research methodology
- Take advantage of information technology to enhance all aspects of patient care
- Maintain the highest standard in their professional field and show themselves able to respond constructively to assessments and appraisals of professional competence and performance
- Work effectively and efficiently in health care organisation
- Apply appropriate knowledge and skill in the diagnosis and management of children with cardiovascular disorders and adults with congenital heart disease

Structure of the Syllabus

Part 1- Common Learning Objectives

By the end of specialist training the trainee should have developed competence in the following:

- Good clinical care
- History, physical examination, investigations, treatment, note keeping and correspondence
- Good communication skills
- Maintaining good medical practice
- Teaching and educational supervision
- Research
- Management skills
- Discharge planning
- Resuscitation

- Nutrition

Part 2 – Clinical Learning Objectives

By the end of the education programme the trainee is expected to manage the following clinical problems:

- Cardiac failure in infants and children
- Cyanosis in the newborn period
- Cyanosis beyond the newborn period
- Evaluation of the child with a cardiac murmur
- Evaluation of children and adolescents with chest pain, palpitations, presyncope or syncope
- Patients with acyanotic congenital heart disease
- Left to right shunting defects
- Duct dependent systemic circulation
- Obstructive left heart lesions
- Acyanotic obstructive right heart lesions
- Patients with cyanotic congenital heart disease
- Duct dependent pulmonary circulation
- Transposition of the great arteries
- Cyanotic congenital heart disease with high pulmonary flow
- Complex cyanotic congenital heart disease

- Pulmonary hypertension
- Fontan circulation
- Inflammatory cardiovascular disease
- Cardiomyopathy and myocarditis
- Prevention and management of infective endocarditis
- Cardiovascular abnormalities in neonatal intensive care
- Cardiovascular evaluation of children with genetic disorders and syndromes
- Cardiac evaluation of the child with stridor
- Adolescent and adult congenital heart disease
- Arrhythmias
- Paediatric cardiac transplantation
- Nutrition and growth in congenital heart disease
- Assessment of children prior to cardiac surgery
- Care of children following cardiac surgery
- Management of critically ill children with cardiovascular compromise

Part 3 – Investigations and Procedures

Investigations and procedures all trainees are expected to select appropriately and either perform competently and/or interpret correctly

- 12 lead ECG
- Ambulatory ECG
- Exercise test
- Chest x-ray
- DC cardioversion

- Basic cardiac pacing
- Pericardiocentesis
- Balloon atrial septostomy
- Transthoracic echocardiography
- Transoesophageal echocardiography

Investigations all trainees should be able to select and interpret appropriately (the trainee is not expected to perform these tests)

- CT scanning
- Magnetic resonance imaging
- Cardiac catheterisation
- Radiation use and safety
- Tilt table testing

Part 4: Specialist Area Training Modules

Trainees wishing to develop a special interest should aim to achieve basic competence in that area during the first three years of the training programme. Trainees who enter a specific sub-specialist training post will spend a much greater proportion of clinical and research time devoted to the special interest after the general 3year training programme has been completed. In the majority of cases only one special interest should be developed, although in certain circumstances two compatible special interests may be accommodated in the training programme (for example CT and MRI with advanced echocardiography)

The main specialist training areas are as follows:

- Fetal cardiology
- Advanced imaging (CT/MRI)
- Diagnostic and therapeutic catheterisation
- Invasive electrophysiology and pacing in children and adults with congenital heart disease
- Pulmonary hypertension
- Heart failure and cardiac transplantation
- Advanced echocardiography

Pharmacology: In depth knowledge of the drugs used in cardiovascular practices- indications, dosage side effects and contraindications. Use of immunoassay techniques and electrophoresis in drug monitoring. This area shall cover but not limited to

1. Diuretics
2. Anti-arrhythmic drugs
3. Anti-hypertensive drugs (including drugs for hypertensive emergencies)
4. Sympathomimetic and antagonists
5. Drugs for cardiac failure and cardiac insufficiency
6. Cardiac glycosides
7. Angiotensin – converting Enzyme inhibitors and Angiotensin receptor antagonists

8. Pharmacokinetics of the commonly used drugs in cardiology

EMERGENCY CARDIOVASCULAR MEDICINE

1. The concept of Cardio-Pulmonary Resuscitation
2. Shock-cardiogenic shock and circulatory collapse
3. Acute Pulmonary Oedema and pericardial effusion
4. Cardiac Tamponade
5. Arrhythmias and tachyarrhythmias
6. Hypertensive Emergencies
- 7.

SURGICAL MANAGEMENT OF CARDIOVASCULAR DISEASE

1. Heart failure
 - a. Cardiac transplantation
 - i. Indications including non-Heart Failure indications
 - ii. Patient assessment
 - iii. Team approach to transplantation
 - iv. Contra-indications
 - v. Post-Transplantation care
 - vi. Complications
2. Post op management of all congenital heart diseases
3. Surgical alternative to intra-venous pace-maker insertion
4. Team action in open-Heart Surgery (Pre-, Intra-, and post-surgery management of patients)
5. The Concept of Cardio- Thoracic Unit

Part 5 – Specialist Area Training

1. Fetal Cardiology

2. Specialist Imaging - Cardiac MRI and Thoracic CT	
Cardiac MRI	
Thoracic CT.....	
3. Cardiac Catheterisation	
4. Cardiac Pacing and Electrophysiology	
5. Adolescent and Adult Congenital Heart Disease	
Management of ACHD	
Multidisciplinary Approach to ACHD	
Apply understanding of CHD to the investigation of ACHD	
Apply knowledge of CHD to its medical and surgical treatment	
Apply knowledge of CHD to catheter based treatment of ACHD	
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6. Pulmonary Hypertension	
7. Transplantation Cardiology	
8. Advanced Echocardiography	

TRAINING INSTITUTIONS

1. Accreditation

All training Institutions admitting doctors for the sub-specialty training in paediatric Cardiology must be accredited by the college

REQUIREMENTS FOR ACCREDITATION

Accreditation in Paediatrics

Any department applying for accreditation in the sub-specialty of Paediatric Cardiology must have accreditation in general paediatrics. This is needed so as to ensure appropriate back-up training in other related specialties general paediatrics.

Paediatric Cardiology Unit

There must be present a paediatric cardiology unit/firm with a minimum of three Consultant with at least two being fellows of NPMCN of not less than 5 years' post-fellowship qualification. There shall be at least one Senior Resident and three junior Residents in the Unit.

Administrative Structure and Facilities

The Department must have a Head of Department, a Director of Training and a complement of administrative staff. Each Consultant must have an office.

Teaching Aids

The Department must have seminar room, an optional departmental library, residents room, audio-visual aids and computer systems with internet access facilities.

In-patient Facilities

Facilities in each ward should include: Nurses' station, Sister's office, Residents room, side laboratory, ECG room, Linen store, Treatment room, kitchenette, patient's day room, clean utility/sterling room, sluice rooms, toilets and showers or baths. There should be functioning wheel chairs and trolleys. Visitors chair should be provided. Equipment's and instruments for the performance of bedside procedures such as venepuncture, pericardiocentesis, thoracentesis, paracentesis abdominis, catheterization, dressing changes, lumbar puncture, cut down, liver biopsies etc. should be readily available in sterile packs.

Beds

There should be a minimum of 6 Cardiac' beds with self-adjusting facilities in each ward and at least 4 such beds in the intensive care unit.

Diagnostic Facilities

- a. **Sphygmomanometers:** Standard sphygmomanometers with appropriate sized cuffs must be available in appropriate numbers in the outpatient and in-patient areas.
- b. **Electrocardiographs (ECG):** There should be dedicated ECG machines for outpatient and in-patient areas. Appropriately trained and qualified radiographers should man the machines. Residents in cardiology should be able to operate the machine and interpret the recordings.
- c. **Cardiac Monitors/Pulse Oximeters CVP:** All the intensive Care unit beds must have cardiac monitors pulse oximeters and cup equipment's attached to them. Each

cardiology Ward should have at least 2 Cardiac monitors and several central venous pressure catheters.

- d. **Echocardiograph:** There should be at least one functioning echocardiograph machine with M-mode, 2-Dimensional Doppler and colour-flow facilities. The machine should be capable of simultaneous ECG recording.
- e. **Exercise Electrocardiography Facilities:** A treadmill or bicycle ergometer (or both) should be available with all the necessary equipment's for safe stress ECG recording.
- f. **Catheterization Laboratory (Cath. Lab):** A fully equipped catheterization laboratory with functioning fluoroscopes, Monitors, defibrillators, resuscitation equipment's, and other necessary facilities must be available for cardiac catheterization and pacemaker insertions.
- g. **Radiology Services:** A well-established radiology department with at least 2 full-time consultant Radiologists. Should be able to provide plain X-ray services of all parts of the body and contrast studies of the gastro-intestinal tract and genitor-urinary system.
- h. **Blood Gas Analysis:** There should be facilities for blood gas analysis at least in the ICU.

Nursing Personnel

There should be subspecialty cardiac paediatric nurses for at least one cardiac nurse to eight patients in the wards and one nurse to a patient in the intensive care unit.

Support Services

The institution should have support services from the following departments, each being headed by a medically qualified consultant working with full complement staff of qualified medical personnel and where applicable medical laboratory Scientists. Each should be capable of offering relevant service for effective cardiology and general medicine practice in a tertiary institution.

- a. Haematology and Immunology
- b. Morbid Anatomy
- c. Chemical Pathology
- d. Microbiology
- e. Physiotherapy
- f. Accident and Emergency
- g. Dietetics

CURRENT TEXTBOOKS AND JOURNALS

1. Textbooks

Paediatric Cardiology

- I. Schneider Echo Text Book in paediatric
- II. Paediatric cardiology for Practitioners by Myung Park
- III. Clinical heart diseases for infants and children by Ross M Ungerleider, MD, David G Nichols, Philip J Spevak
- IV. How to Read Pediatric ECG by Kevin Park
- V. Two-Dimensional Echocardiography in Infants and Children by J P Lintermans
- VI. Heart physiology and Pathophysiology by Nick Sperelakis (Editor)
- VII. Heart Development by Richard P. Harvey (Editor).
- VIII. Electrocardiography in Clinical Practices: Adult and Pediatric by Timothy K, Md Knilans

General Paediatrics

- I. Nelson text book of Paediatrics 19th or 20th Edition
- II. Paediatric and Child Health in tropical region: Current edition
- III. Hutchison's clinical paediatric text book
- IV. Essentials of Clinical Methods in Paediatrics and Research and Basic Statistics 2nd Ed. 2014. Egbuna Kunle Obidike.
- V. Pictorial Paediatric Companion: Clinical Features and Underlying Diseases. 2006. Egbuna Kunle Obidike
- VI. Paediatrics in Pictures. Questions and Answers. Philip O. Abiodun
- VII. Heart Failure: A practical approach to treatment. William T, Abraham, Henry Krum

Journals

a. Cardiology

- I. BMC Cardiovascular science
- II. Cardiology of the Young
- III. Indian Journal of cardiology

- IV. Annals of Paediatric cardiology
- V. Nigerian journal of cardiology.
- VI. Paediatric Cardiology - Springer
- VII. World Journal for Paediatric and Congenital Heart Surgery
- VIII. Congenital Heart Disease and Paediatric Cardiology Journal

- IX. Journal of Hypertension
- X. Heart
- XI. Echocardiography
- XII. Tropical Cardiology
- XIII. Journal of the American College of Cardiology
- XIV. Journal of the Nigerian Cardiac Society