Cardiol Young 2005; 15: 676–680
© Cambridge University Press
ISSN 1047-9511



Newsletter from the Association for European Paediatric Cardiology

Recommendations for training in paediatric cardiology

Developed by the Professional Advisory Committee and the Council of the Association for European Paediatric Cardiology, accepted by the General Assembly on May 21st, 2005

The recommendations of the Association for European Paediatric Cardiology for training in the monospecialty of paediatric cardiology are described below. In order to be recognized as a paediatric cardiologist by the Association, these recommendations should also be fulfilled by any doctors studying in a country in which paediatric cardiology is not a monospecialty, but is a sub-specialty of paediatrics or adult cardiology.

The development of the requirements for training is the responsibility of the Professional Advisory Committee and the respective Working Groups of the Association, in collaboration with the Council of the Society.

Training in paediatric cardiology

Trainees should be exposed to all aspects of general paediatric cardiology, from fetal life to adolescence and adulthood. There are some areas of paediatric cardiology which will require additional training in sub-specialties after the basic training. The areas of sub-specialisation include fetal cardiology, different modalities in imaging, catheter interventions, invasive cardiac electrophysiology, and congenital heart disease in the adult, or the grown-up population. The latter requires collaboration between those working in the fields of paediatric and adult cardiology.

Centres performing generalised and specialised work in paediatric cardiology should be committed to providing extensive postgraduate training and regular courses.

Duration of training

It should be recognised that the recommendations of the requirements for training that follow should be regarded as the minimum to become a paediatric cardiologist. For some specific sub-specialties, additional training will be necessary.

In order to be recognized as a paediatric cardiologist:

- Trainees should complete a period of full-time equivalent training of at least 6 years. This should include a common trunk of paediatrics or adult cardiology, and at least 3 years full-time equivalent training in paediatric cardiology.
- Training in paediatrics should include at least 6 months in neonatology and neonatal intensive care.
- If entering from adult cardiology, the trainees should undertake at least 6 months of training in general paediatrics and 6 months in neonatology.
- A period of 6 months may be spent in closely related fields, such as paediatric cardiac surgery, paediatric cardiac intensive care, cardiac magnetic resonance imaging and computerised tomography, adult cardiology, morphology and embryology, genetics, and cardiovascular research.

Objectives of training and basic requirements of programme

The fundamental objectives of training are to provide the best quality of care for the patients, and a compassionate attitude to the patients and their parents or guardians.

- Programmes of training in paediatric cardiology should provide an environment for acquiring the knowledge, skills and clinical judgement essential for the specialty.
- Programmes should have an appropriate balance between clinical service, training, and academic endeavours.
- Programmes should encourage a commitment to continuous education, teaching, research, critical thinking, and deep insight into the practical and

https://doi.org/10.1017/S1047951105001964 Published online by Cambridge University Press

theoretical problems of the speciality. It is important, therefore, that the trainees should undertake clinical or basic research leading to publication of the findings.

Basic requirements

- Training in paediatric cardiology must take place in an institute with at least three specialists working full-time in paediatric cardiology, or more specialists working part-time but summing to the equivalent of three fulltime cardiologists.
- Most of this training should be in an institute which has facilities for cardiac catheterisation, and close connections to paediatric cardiac surgery.
- If a training institute does not fulfil all the criterions described in the "Requirements for Training Institutes and Trainers in Paediatric Cardiology" as established by the Association, then training should be completed as modules in different training institutes.

Training logbook

The logbook is a tool for the trainees, and their trainers, to keep track of progress. All relevant activities should be recorded by the trainees.

At each institute, trainers should be appointed to supervise and to act as mentors to the trainees. The trainees should maintain the logbook, which should be countersigned by the trainer at regular intervals, confiming that the trainees have satisfactorily achieved the requirements stated below.

Contents and targets of the specialist training

Basic knowledge and skills

Embryology, teratology, normal and abnormal anatomy of the cardiovascular system in the growing individual. A basic understanding of these aspects should be achieved during the first year. These can be achieved by regular teaching sessions, and by attendance at postgraduate courses, which should include teaching of the current nomenclature. In addition, the trainees should regularly review specimens, if available, under expert guidance.

Normal and pathological physiology of the cardiovascular system. Understanding of the principles of cardiovascular physiology is essential. This can be achieved by reading, as well as by personally performing haemodynamic studies. The knowledge should be supplemented by haemodynamic evaluation using echocardiography and cardiac catheterisation, and by working in the intensive care unit.

Epidemiology, human genetics and medical statistics. During the first year of training, the trainees should, by reading and attendance at relevant courses, become familiar with epidemiology, human genetics and medical statistics.

Cardiovascular pharmacology. In early part of the training, the trainees should acquire knowledge of the actions and side-effects of cardiovascular drugs, and their interactions with other pharmacological substances in different diseases and at different ages.

Clinical knowledge with regard to the aetiology, symptomatology, and clinical diagnosis of congenital and acquired diseases of the cardiovascular system

- For a sound practice of paediatric cardiology, precise knowledge of the cardiovascular symptoms and signs and their interpretation, as well as their general and specific effects on other systems, is required. This must be gained by participation in the daily clinical work of the department, studying both in-patients and out-patients.
- In the early part of the training, the clinical work should be under the supervision and guidance of an experienced paediatric cardiologist, from whom the trainees can learn the basic arts of history taking and physical examination.
- The trainees should acquire knowledge of different types of medical, surgical, and interventional treatments of cardiovascular diseases. The knowledge should include the indications for treatment, the results of the treatment, the associated complications, and the early and late outcome.
- The trainees should become familiar with the electrophysiological mechanisms and aetiology of disorders of cardiac rhythm. This knowledge should include indications and treatment strategies for the non-invasive and invasive electrophysiological evaluation of patients with arrhythmias, and methods of treatment and their side-effects or complications.

Specific technical skills

Basic electrocardiography

- Interpretation and formal reporting of the electrocardiogram should start early in the first year.
- By the end of the training period, the trainees should have reported at least 1,000 electrocardiographic recordings.
- These should be audited by one of the trainers.

Arrhythmias

- The trainees should obtain basic knowledge and experience in the evaluation of cardiac arrhythmias. This should include interpretation and reporting of 24-hour ambulatory recordings.
- Towards the end of the training, the trainees should have personally reported at least 100 recordings.
- These should be audited by one of the trainers.

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Echocardiography

Attendance at a basic postgraduate course in echocardiography is essential in the early part of the training, preferably in the first year.

- Trainees should gain a thorough understanding of the cardiac anatomy and physiology of paediatric and congenital cardiac diseases, and a thorough knowledge of sequential segmental analysis of congenital cardiac malformations.
- Trainees performing echocardiography must reach an in-depth understanding of the physics of ultrasonic imaging, and the practical use of ultrasonic equipment.

All paediatric cardiologists performing paediatric echocardiography in children should be able to perform, interpret and report:

- transthoracic echocardiographic studies in patients with all forms of paediatric and congenital cardiac diseases both pre- and postoperatively
- systolic, diastolic and regional myocardial function, by studies including M-mode, contrast, Doppler, and other advanced techniques
- transoesophageal echocardiographic studies
- fetal echocardiographic studies
- studies during interventional procedures
- At least 1,000 echocardiographic studies in patients with paediatric and congenital cardiac diseases independently or under supervision.
- At least 75 transoesophageal and 50 fetal echocardiographic studies independently or under supervision.

Exercise testing

The trainees should become familiar with the protocols for exercise testing, and the interpretation and the clinical use of cardio-respiratory exercise test.

- A minimum of 40 exercise tests should be supervised by the trainees and audited by one of the trainers.

Other cardiovascular imaging and nuclear cardiology

The trainees should gain sound knowledge of radiation protection of patients and staff and the effects of radiation on human cells, tissues and the growing body.

Chest x-ray

At the start of training, the trainees should learn to interpret chest x-rays of the patients under the care of the department.

- By the end of the training, the trainees should be acquainted with the interpretation and the clinical use of chest x-rays.
- At least 1,000 x-rays should be interpreted and by reported the trainees. This should be supervised and audited by a paediatric cardiologist, or by a cardiovascular radiologist.

Cardiovascular computerised tomographic scanning and cardiovascular magnetic resonance imaging

The trainees should become familiar with the methodologies, the diagnostic potential, and the limitations of cardiovascular computerised tomographic scanning and cardiovascular magnetic resonance imaging.

At completion of training, the trainees should be have knowledge of the clinical application and the interpretation of the techniques used for cardiovascular computerised tomography and cardiac magnetic resonance imaging in patients with congenitally malformed hearts.

Nuclear cardiology

The trainees should acquire knowledge of the indications, the diagnostic value, the limitations, and details of the techniques of procedures such as single photon-emission cardiac tomography, positron-emission tomography, and studies of ventricular function and lung ventilation and perfusion.

Cardiac catheterisation and angiocardiography

Haemodynamic investigations and angiocardiography

The techniques of cardiac catheterisation and angiocardiography will be encountered throughout the period of training. The trainees, therefore, should have knowledge of the impact of radiation on human cells and the growing body, and of the need for protection against radiation for both the patient and the staff.

Ideally, the trainees should learn the technique of cardiac catheterisation and angiocardiography after gaining experience in the non-invasive techniques. Acquiring the knowledge and skills will include initially working as an assistant to an experienced investigator. With increasing experience and understanding of the principles of haemodynamic investigations, the trainees should progress to performing these studies as the first operator under supervision. Besides learning the technical details, it is essential that the trainees become proficient at the calculations of haemodynamic shunts and resistances, and able to present the data during clinical meetings. The trainees should learn good practices in the catheterisation laboratory, the method of angiocardiography, its benefits and limitations, and the associated risks.

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- The minimum number of cardiac catheterisation procedures performed by the trainees under supervision should be 100, at least 50 of which should be as the first operator.

Interventional catheterisation

At completion of the training, the trainees should be able to perform balloon atrial septostomy independently.

- The trainees should have assisted in or performed as the first operator at least 50 common interventional procedures, such as balloon atrial septostomy, balloon dilation of valves or arteries, closure of intracardiac and extracardiac defects and vessels, and implantation of stents.

Diagnosis and treatment of disorders of cardiac rhythm and electrocardiology

The trainees should attend a basic course in electrophysiology and diagnosis and management of arrhythmias, and participate in the non-invasive and invasive electrophysiological evaluation of patients with arrhythmias.

Diagnosis of arrhythmias

After basic understanding of electrocardiography, the trainees should become familiar with the electrophysiological mechanisms and underlying aetiologies of disorders of cardiac rhythm.

Medical treatment of arrhythmias

The trainees should acquire detailed knowledge and skills in the medical treatment of disorders of arrhythmias.

Cardioversion of tachyarrhythmias

Termination of atrial and ventricular tachycardias by direct current cardioversion, and transoesophageal or transvenous overdrive pacing, should be learned early in the training. This should initially be under supervision, and later the trainees should be able to terminate tachyarrhythmias independently.

Cardiac pacing

The trainees should become familiar with insertion of endocardial pacing electrodes in emergency situations, the different modes of cardiac pacing, and their indications. At the end of the training, the trainees should be able independently to programme the most commonly used parameters of a cardiac pacemaker.

Diagnostic and therapeutic invasive electrophysiology

The trainees should acquire knowledge of the principles, indications, techniques, and the results of invasive electrophysiology.

Noninvasive treatment of cardiovascular diseases

The trainees should acquire in-depth knowledge and practical experience of the medical management of congenital and acquired cardiac diseases, including heart failure, disturbances of rhythm, and hypertension.

- The trainees should be able to initiate investigations and management of these patients, initially under supervision, and independently towards the end of their training.

Care of patients

In-patients

Throughout the training, trainees should be involved in the management of in-patients under supervision. These should include patients from neonates to adolescents and adults, with a variety of congenital and acquired cardiac diseases.

Out-patients

Throughout the training, the trainees should be involved in the management of out-patients. These should include patients from neonates to adolescents and adults, with a variety of congenital and acquired cardiac diseases.

Intensive care

Trainees should spend at least 6 months in the paediatric intensive care unit, and should become involved in the treatment of a variety of congenital and acquired cardiac diseases in patients of all age groups.

On-call commitment

Throughout the training, the trainees should participate in the on-call schedules of the department, with backup support provided by a paediatric cardiologist, in order to provide the trainees with adequate experience in the management of emergency cases.

Certification of completion of training

Certification of activities in the logbook

The trainees should keep an accurate personal logbook of all activities undertaken over the entire

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period of training. The various requirements should be countersigned and certified by the trainer. It is the responsibility of the trainer to audit and certify these activities. The trainees should also keep copies of certificates of attendance at various courses.

Annual appraisal and assessment

The trainer, and/or the Head of the Department of the Institute providing the programme of training, should carry out appraisals and assessments at least annually to evaluate the progress of the trainees.

Final examination

Ideally, the training should be completed by a final examination. This should include practical, oral, and written components. It is recognised that such an examination is not as yet available in all the countries in Europe.

Examination of the Association for European Paediatric Cardiology

The Association for European Paediatric Cardiology is in the process of developing a European examination for a European Diploma for Paediatric Cardiology.

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