

2 **CARDIAC RADIOLOGY**

2.1 **Introduction**

- 2.1.1 This curriculum outlines the subspecialty training requirements for specialist registrar training in cardiac radiology.
- 2.1.2 All specialist registrars in clinical radiology will have basic knowledge of cardiac imaging during core training and will already have acquired the basic skills.
- 2.1.2 The period spent in training will vary according to the needs of the trainee. For a person wishing to specialise primarily in cardiac radiology, a period of around 12 months substantially devoted to the subject is recommended.
- 2.1.2 The aim of subspecialty training in cardiac radiology is to enable the trainee to become clinically competent and to consistently interpret the results of cardiac investigations accurately and reliably. Where appropriate, trainees should also be capable of providing a comprehensive and safe interventional diagnostic and therapeutic service.
- 2.1.2 Those clinical radiologists who plan to practise cardiac radiology as one of a mixture of activities (albeit that cardiac radiology will be a particular responsibility within those activities) should normally undertake 6 months of subspecialty training in cardiac radiology.

2.2 **Objectives**

- 2.2.1 The aim of establishing a curriculum for subspecialty training in cardiac radiology is to ensure that trainees acquire:
- knowledge of the relevant embryological, anatomical, pathophysiological, biochemical and clinical aspects of cardiac disease
 - an in-depth understanding of the major imaging techniques relevant to cardiac disease
 - an in-depth understanding of the use of potentially hazardous techniques (eg angiography) and substances (eg adenosine, dobutamine, iodinated contrast media)
 - clinical knowledge relevant to cardiology so that the trainee may confidently discuss the appropriate imaging strategy for the clinical problem with the referring clinician
 - detailed knowledge of current developments in the specialty
 - direct practical exposure with appropriate graded supervision in all forms of cardiac imaging and intervention
 - knowledge and skills to enable safe practice of analgesia and sedation
- 2.2.2 The trainee should be fully competent in intermediate and advanced life-support. Formal ALS certification should be considered.
- 2.2.3 Experience will be documented in the Royal College of Radiologists (RCR) Trainee Personal Portfolio (TPP) and procedural numbers recorded in a log book.
- 2.2.4 The training scheme should arrange an attachment that fulfils all the requirements of the subspecialty curriculum.

- 2.2.5 If experience to fulfil the requirements of subspecialty training cannot be gained in one training centre, it will be necessary for the trainee to have a period of attachment(s) to other training centres. There are, in any case, advantages for trainees in visiting other departments at home or abroad to follow particular interests in greater depth.
- 2.2.6 The expected outcome at the end of this subspecialty training will be that the trainee can select the appropriate imaging strategy for cardiac problems, supervise (and perform where appropriate) the appropriate examination(s) and accurately report on the examination findings. The trainee should be competent in all aspects of cardiac imaging and (where appropriate) intervention.

2.3 **Overview of training**

- 2.3.1 The main document, to which this appendix should be regarded as an attachment, *Structured Training in Clinical Radiology*, outlines the core knowledge and skills acquired during core training, together with the optional experience, in which practical experience is not essential but a theoretical knowledge is required. The trainee undergoing subspecialty training should ideally be actively involved in cardiac imaging within an educational environment with graduated supervision.
- 2.3.2 The training department must provide access to appropriate computed tomography (CT), magnetic resonance imaging (MRI), echocardiography, radionuclide imaging and digital angiography. Centres should also provide access to specialised relevant radionuclide imaging [including positron emission tomography (PET)].
- 2.3.3 Clinical knowledge will be acquired by a variety of means, including close liaison with the appropriate surgical and medical teams and combined clinicoradiological conferences. The following clinical inter-relationships are desirable:
- cardiology (adult and paediatric)
 - cardiac surgery (adult and paediatric)
 - cardiac pathology
 - cardiac anaesthesia/critical care and emergency medicine
- 2.3.4 In order to further clinical knowledge relevant to the subspecialty it may be appropriate for the trainee to have a regular attachment to:
- cardiac out-patient clinics
 - cardiac ward rounds
 - cardiac care units
 - theatre sessions

The trainee should be encouraged and given the opportunity to attend and lead appropriate clinicoradiological meetings.

- 2.3.5 The trainee should be encouraged to attend appropriate educational meetings and courses.
- 2.3.6 The trainee should participate in relevant clinical audit, management, and clinical governance, and have a good working knowledge of local and national guidelines in relation to radiological practice.
- 2.3.7 Trainees will be expected to be familiar with current cardiac radiology literature.

- 2.3.8 The trainee should be encouraged to participate in research, and to pursue one or more projects up to and including publication. An understanding of the principles and techniques used in research, including the value of clinical trials and basic biostatistics, should be acquired. Presentation of research and audit results at national and international meetings should be encouraged.
- 2.3.9 The trainee should continue to participate in the specialist registrar general on-call rota, with appropriate consultant back-up.

2.4 **Requirements of subspecialty training**

- 2.4.1 A sound understanding of the basis of cardiac imaging including:
- the embryology, anatomy, normal variants and physiology of the cardiovascular system
 - the pathological processes of both benign and malignant processes involving the cardiovascular system
 - the epidemiology of cardiac diseases
 - local, national and where appropriate, international imaging guidelines

- 2.4.2 Knowledge of the full range of radiological diagnostic techniques available, in particular:
- the indications, contra-indications and complications of each imaging method
 - the factors affecting the choice of contrast media and radiopharmaceuticals
 - the effects and side effects of these agents

Particular emphasis should be placed on the strengths and weaknesses of the different imaging methods in various pathological conditions. The appropriate choice of imaging techniques and/or the appropriate sequence of imaging techniques in the investigation of specific clinical problems should be emphasised.

- 2.4.3 Acquisition of specific skills to enable:
- the conduct, supervision and accurate interpretation of all imaging techniques used in the investigation of cardiac diseases to a high professional standard
 - where appropriate the safe and effective practice of interventional techniques
 - good communication with patients and professional colleagues
 - accurate informed consent to be obtained
 - continuing accreditation of life-support status
- 2.4.4 A clear understanding of the role of multidisciplinary meetings, including:
- planning of investigations including the selection of appropriate tests and imaging techniques for the diagnosis and treatment of cardiac disease
 - planning and outcomes of treatment
 - the detection of errors in diagnosis and complications of treatment
 - an understanding of relevant cardiac pathology
- 2.4.5 Procedural competence will need to be reviewed at intervals, and this regular review should also assess the number of cases required in order to ensure competence; these numbers will vary from trainee to trainee. During the training period (6–12 months) the trainee should, in patients suffering from all forms of cardiac disease, gain experience in the following techniques:
- plain radiography
 - cardiac ultrasound including Doppler echocardiography (150–350)
 - CT (50–100)

- magnetic resonance (50–100)
- coronary angiography (100–200)
- nuclear medicine (100–200)

The range of numbers of procedures in parentheses provide guidance as to what might be expected for someone developing more than one subspecialty interest up to that which might be expected for a trainee aiming to become a dedicated cardiac radiologist.

2.4.6 A trainee will keep abreast of all other imaging techniques relevant to their practice.

2.4.7 Trainees may also wish to acquire experience in the following interventional technique:

- coronary angioplasty and stenting

2.4.8 Trainees should acquire experience in all the practical procedures listed above, and the number of cases undertaken should be recorded in their log book.

2.4.9 Regardless of the imaging technique concerned, the consultant trainer must be satisfied that the trainee is clinically competent, as determined by an in-training performance assessment, and can consistently interpret the results of investigations accurately and reliably.

2.4.10 During the training period the following weekly sessional commitments are suggested as a work profile for subspecialty trainees. Trainees may follow a suitable work plan for a period of 6 or 12 months depending on their long term aims:

- chest x-ray film interpretation (one session)
- echocardiography (one session)
- cardiac CT and MRI (two sessions)
- coronary angiography/left and right heart catheterisations (one session)
- nuclear cardiology (one session)
- the remaining four sessions per week would be used to maintain experience in general radiology according to departmental service requirements, study and research

2.4.11 The techniques listed and the time devoted to each will be reviewed at intervals. It is recognised that some studies will become obsolete and new imaging techniques will be developed.

2.4.12 The trainee should become familiar with providing analgesia and/or sedation where required, as well as the necessary continuous monitoring required to perform this safely.

2.4.13 The trainee should be aware of local and national guidelines on consent, and be capable of obtaining informed patient consent for practical procedures.

2.5 **Appraisal and assessment**

2.5.1 Regular appraisal of the trainee will occur as described in the RCR TPP.

2.5.2 Methods of trainee assessment will include:

- regular direct observation of clinical techniques (including communication skills, ability to obtain informed consent and sedation skills) by the trainer and/or external observer

- regular formal review of the trainee's skills in the accurate interpretation of investigations for cardiac diseases
- a final assessment of overall professional competence prior to the final record of in-training assessment (RITA) review

2.5.3 **Review of training programme**

- It is expected that trainees will complete a feedback form (RCR TPP) for each subspecialty training period undertaken.
- It is expected that the training committee responsible for organising subspecialty training will review and analyse these feedback forms and act appropriately to ensure that training complies with the relevant subspecialty curriculum. The analysis and subsequent actions should be formally recorded.
- The RCR Training Accreditation Committee (TAC) will regularly review these records to ensure that subspecialty training complies with the appropriate subspecialty curriculum.

2.5.4 **Review of subspecialty curriculum**

The Education Board of the RCR will regularly review this subspecialty curriculum to ensure that it complies with current cardiac radiological practice.