

HONG KONG COLLEGE OF RADIOLOGISTS

GENERAL GUIDELINES ON BASIC TRAINING (NUCLEAR MEDICINE)

1. General Aspects

1.1 In this document the following interpretation applies:

- *"Trainer"* = a Fellow of the Hong Kong College of Radiologists, or equivalent
- *"Trainee"* = a medical doctor registered as a trainee member with the Hong Kong College of Radiologists

1.2 **Objectives:** To provide supervised training aiming at

- (a) Comprehensive exposure to a broad spectrum of clinical specialties and the application of imaging modalities.
- (b) Acquisition of general nuclear medicine and radiation protection knowledge, skill and competence, with supervised responsibility for patient care.
- (c) A disciplined habit of reasoning and a logical approach to specific medical problems with respect to nuclear medicine.
- (d) Acquaintance with the updated practice and current literature on relevant subjects.
- (e) Ability to communicate with clinical colleagues and render appropriate recommendation on imaging investigation and patient management.
- (f) Ability to advise on the safest and most cost-effective means of arriving at a diagnosis, and to counsel against unnecessary imaging investigation.

1.3 This document will provide guidelines on the following:

- (a) Core knowledge
- (b) Training program
- (c) Training facilities
- (d) Nuclear medicine workload
- (e) Accountability

1.4 Hospitals to provide basic training must apply for accreditation by the College for evaluation including visitation to confirm that the training program, facilities, nuclear medicine workload and other aspects are appropriate.

1.5 Training accreditation is considered on the basis of standalone training hospital. A training hospital may be deficient in either clinical specialties (e.g. neurosurgery) or imaging modalities (e.g. PET scan), but such deficiencies should only form a minor portion of the workload. The trainees in such hospital need to have complementary rotation to another hospital, which can compensate for the deficiencies.

2. Core Knowledge

2.1 Basic sciences:

- (a) *Physical Science*: structure of matter, modes of radioactive decay, particle and photon emissions, and interactions of radiation with matter.
- (b) *Instrumentation*: nuclear medicine instrumentation with special emphasis on the gamma scintillation cameras, radiation detector collimation, associated electronic instruments and computers, and image production and display.
- (c) *Mathematics, Statistics, and Computer Sciences* including probability distributions, medical decision making, basic aspects of computer structure and function, programming and processing.
- (d) *Radiation Biology and Protection*: biological effects of ionizing radiation, means of reducing radiation exposure, calculation of the radiation dose, evaluation of radiation overexposure, medical management and disposal of radioactive substances and establishment of radiation safety programs.
- (e) *Radiopharmaceuticals*: production of radionuclides, radiochemistry, pharmacokinetics and formation of radiopharmaceuticals.
- (f) *Diagnostic Uses of Radionuclides*: clinical indications, technical performance and interpretation of in vivo imaging and function studies using radionuclides; use of scintillation cameras and external detectors; physiologic gating techniques; patient monitoring during intervention studies; understanding of the relationship between nuclear medicine procedures and other pertinent imaging modalities such as computed tomography, ultrasonography, and magnetic resonance imaging.
- (g) *Principles of Therapeutic Uses of Radionuclides*: patient selection, dose administration, including dosimetry and specific applications.
- (h) *Anatomy and Physiology*: the trainee is required to be familiar with the basic anatomy and physiology relevant to common nuclear medicine imaging examinations. There should be a clear understanding of topographic and cross-sectional anatomy as displayed by SPECT/PET imaging. A knowledge of normal variation in anatomy will also be expected.

2.2 Pathology and pathophysiology as related to diagnostic and therapeutic nuclear medicine procedures.

2.3 Current clinical practice.

2.4 Clinical nuclear medicine.

2.5 Medico-legal implications of nuclear medicine practice.

3. Training Program

3.1 The College organizes centralized Part I and Part II training courses, which should be attended by registered trainees.

3.2 The training department should provide relevant teaching in nuclear medicine technology, data analysis and clinical nuclear medicine to complement the centralized courses.

- 3.3 Hands on practical training for professional skill should be provided at each training department.
- 3.4 The overall minimum trainer:trainee ratio of the training department should be 1:2
- 3.5 It is recommended that a nominated tutor should provide personal guidance and continuous assessment for a trainee.
- 3.6 Training logbooks are provided to trainees to record training activities received by them.
- 3.7 Tutorial system should be in place and is preferably year round instead of solely preparatory for examinations.
- 3.8 Clinical Meetings
 - (a) Attendance of clinical meeting is an important aspect of training in clinical management of clinical problems: *Attendance of at least 1 clinical meeting per month*
 - (b) Case presentation by trainee provides good training.
 - (c) Trainees are encouraged to attend clinical meeting and the training department may take note of this point in the scheduling of the meeting.
 - (d) Clinical meeting attendance and case presentation should be recorded in the logbooks.
 - (e) Clinical meeting should take place in an environment that encourages the interchange of knowledge and experience among the participating disciplines.
- 3.9 PET scan and therapeutic nuclear medicine may be observed or assisted rather than independently performed at this stage. Exposure however is necessary.
- 3.10 Regular interaction between trainee and immediate supervisor is essential to prompt timely modification of individual training program. This should be documented at regular intervals in the trainee's logbook, and significant events should be brought to the attention of the College.
- 3.11 There must be regular written evaluation of the trainees, to verify that appropriate training has been undertaken during the specified period under the supervision of trainers, and to evaluate the knowledge gained and the level achieved.
- 3.12 The following are some of the measures of the quality of a training program:
 - (a) Performance of a department's trainees in the College examinations
 - (b) Research projects

- (c) Publication in professional literature
 - (d) Lectures and presentation at local, regional or international professional conventions.
 - (e) Contribution to College, regional or international professional activities
 - (f) Output of nuclear medicine physicians subsequently becoming consultants or senior nuclear medicine physicians in the territory.
- 3.13 Rotation of trainees among training departments to broaden the clinical exposure of the trainees is advisable.

4. Training Facilities

- 4.1 The hospital administration should be supportive of training in nuclear medicine.
- 4.2 A comprehensive scope of clinical services is available in the hospital.
- 4.3 A full range of nuclear medicine imaging techniques is available in the hospital. The training department should have preferably two gamma cameras with SPECT capabilities. It is desirable that the department has additional nuclear medicine equipment and facilities, such as PET camera, bone densitometer, radiopharmaceutical preparation laboratory, radioassay laboratory and cell labeling facilities.
- 4.4 The training department must provide adequate space, equipment and other pertinent facilities to ensure an effective educational experience for the trainees in nuclear medicine, including
- (a) Departmental library with current books and journals on nuclear medicine, readily available during off-hours and weekends.
 - (b) Film museum, and related training materials like videotapes, CDR, slides, computer programs etc. The teaching file should be indexed, coded and currently maintained.
 - (c) Study room
 - (d) Internet access to online nuclear medicine resources such as journals, image libraries & case studies.
- 4.5 The trainees must have ready access to a major medical library.
- 4.6 There should be ongoing research and teaching activities in a training department.
- 4.7 Medical physics support for the department, including
- (a) Radiation safety and protection
 - (b) Equipment quality assurance
 - (c) Information technology

5. Nuclear Medicine Workload

- 5.1 A minimum amount of regular workload is necessary for a trainee to be exposed to the spectrum of normal variants and pathology, and to have sufficient hands-on experience. At least 2000 nuclear medicine procedures, excluding bone densitometry, should be performed in the training department each year. These should cover a wide range of examination categories to provide the trainee with the required workload as specified in 5.2.
- 5.2 It is recommended that at least 3000 procedures must be supervised and reported by the trainee during basic training, and the quality of these audited. These should include a wide range of pathology, and include paediatric studies. A suggested minimum number for each examination category is as follows:

Examination Category	Requirement
Cardiovascular system	450
Endocrine system	200
Urogenital system	350
Tumours & inflammation	100
Pulmonary system	150
Skeletal system	700
Central nervous system Gastrointestinal / Hepatobiliary system Haematopoietic and lymphatic system Radionuclide therapy	50
PET / PET/CT	50

6. Accountability of the Training Department

- 6.1 It is advisable that the Training Supervisor is not the same person as the Administrative Head of the Department.
- 6.2 Accountability of the **Training Supervisor**:
- To initiate application for training accreditation by the College, with submission of the required data.
 - To manage the training department and be responsible for the total supervised training provided in the department in accordance with the training regulations and guidelines.
 - To report immediately to the College any significant discrepancy from the status on accreditation, in respect of training manpower, facilities and workload that may have occurred or are expected to occur.

- (d) To initiate timely consultation with the College on matters related to training.
- (e) To advance the views of the College and to disseminate to the trainees relevant information from the College.
- (f) To facilitate the trainees to attend training and educational activities.
- (g) To provide annual return to the College on the status of trainers and trainees, and the assessment forms of the trainees in the department.
- (h) To meet the trainees regularly, to be able to evaluate and provide advice to the trainees in Nuclear medicine.

6.3 Accountability of the **Trainee**:

- (a) To register as a trainee with the College on entry into the training system.
- (b) To be aware of the scope, program, facilities, workload and other aspects of training required in nuclear medicine.
- (c) To participate in the training courses organized by the College, and the training activities held at the training department.
- (d) To participate in and contribute to scientific and other activities organized by the College.
- (e) To enter the training records in the logbooks regularly.
- (f) To interact with the trainers during the regular appraisal sessions.
- (g) To bring to the notice of the Training Supervisor, and if necessary the College, of any deficiency in the training program for improvement at the specific training department.
- (h) To prepare for the examinations and assessments of training at different levels.