

**Proposed Specific Standards of Accreditation for a Program leading to Registration of  
Added Competency in  
Nuclear Cardiology/Cardiac Nuclear Medicine**

**Introduction**

Nuclear Cardiology or Cardiac Nuclear Medicine provides diagnostic and prognostic information for the evaluation of cardiac patients. Stress myocardial perfusion imaging is an important technique for the diagnosis and assessment of the extent of coronary artery disease and provides useful prognostic information. Gated blood pool imaging permits evaluation of both left and right ventricular function and is widely used. Imaging infarct-avid radiotracers permits assessment of myocardial necrosis and viability. New and emerging nuclear medicine technologies allow evaluation of myocardial blood flow, metabolism and viability. Understanding of the principles of nuclear medicine, cardiac physiology and disease, and pharmacology as well as stress testing is essential for the adequate performance and interpretation of Nuclear Cardiology or Cardiac Nuclear Medicine studies.

Nuclear Cardiology or Cardiac Nuclear Medicine was introduced into Canadian medical practice in the mid 1970s by both nuclear medicine physicians and cardiologists. The practice has developed in a number of models in different centres. These range from practice which is restricted to either of the specialties, to a division of responsibility between cardiologists who perform and interpret stress testing whilst the nuclear medicine physician interprets the imaging study, to collaborative models in which individuals from both specialties participate fully in all aspects of the practice, or read all studies in tandem.

At present, a physician who successfully completes the certification examination of the Royal College of Physicians and Surgeons in Nuclear Medicine is fully competent to supervise a nuclear medicine laboratory, direct the performance of Cardiac Nuclear Medicine-Nuclear Cardiology examinations and interpret those studies.

Standards for training in adult Cardiac Nuclear Medicine are hereby proposed by the Joint Working Group of the Canadian Association of Nuclear Medicine and the Canadian Nuclear Cardiology Society. This program is intended to provide advanced training in Cardiac Nuclear Medicine-Nuclear Cardiology at a post-certification level for those cardiologists wishing to develop added competence.

Successfully completing the certification program and successfully passing all components of the certification examination are absolute prerequisites for new entrants in the practice of cardiac nuclear medicine in Canada. The successful individual shall be able to perform and interpret cardiac nuclear medicine examinations exclusive of Positron Emission Tomographic studies. Where facilities and faculty permit, the training for PET will be to additional standards.

**Standard B.I                      Administrative Structure**

## **There must be an appropriate administrative structure for each training program.**

### Interpretation

1. The program directorship and co-directorship must be shared by Individuals who are, respectively, Fellows of the Royal College of Physicians and Surgeons of Canada in Nuclear Medicine and Cardiology with qualifications that are acceptable to the RCPSC for the overall conduct of the integrated training program. The program director must be assured of sufficient time and support to supervise and administer the program. The residency program director is responsible to the head of the sponsoring department and to the postgraduate dean for the faculty. The RCPSC must be informed when a new program director is appointed.
2. The program shall be under the auspices of the residency program in Nuclear Medicine and/or the Cardiology residency training program.
3. There must be a program coordinator or supervisor, responsible to the program director, at each institution or agency participating in the program. There must be active liaison between the program director and the program coordinators
4. There must be a residency program committee to assist the program director in the planning, organization, and supervision of the program.
  - a) This committee must include both nuclear medicine physicians and cardiologists
  - b) This committee should include coordinators for each major component of the program
  - c) This committee must include elected representation from the residents in the program.
  - d) The residency program committee must meet regularly, and keep minutes
5. The responsibilities of the program director, assisted by the residency program committee, include:
  - a) Development and operation of the program such that it meets the general standards of accreditation, and the specific standards of accreditation as set forth in this document;
  - b) Selection of candidates for admission to the program and the evaluation and promotion of residents in the program in accordance with policies determined by the faculty postgraduate medical education committee;
  - c) Maintenance of an appeal mechanism. The residency program committee should receive and review appeals from residents and, where appropriate, refer the matter to the faculty postgraduate medical education committee or faculty appeal committee;
  - d) Establishment of mechanisms to provide career planning and counseling for residents and to deal with problems such as those related to stress;
  - e) An ongoing review of the program to assess the quality of the educational experience and to review the resources available in order to ensure that maximal benefit is being derived from the integration of the components of the program.
  - f) The opinions of the residents must be among the factors considered in this review. Appropriate faculty/resident interaction and communication must take place in an open and collegial atmosphere so that a free discussion of the strengths and weaknesses of the program can occur without hindrance. This review must include:
    1. An assessment of each component of the program to ensure that the educational objectives are being met;
    2. An assessment of resource allocation to ensure that resources and facilities are being utilized with optimal effectiveness;
    3. An assessment of teaching in the program, including teaching in areas such as biomedical ethics, medico-legal considerations, teaching and communications skills, issues related to quality assurance and improvement, equity issues, and administrative and management issues, and
    4. An assessment of teachers in the program.

In addition to the responsibilities of the program director and the residency program committee listed

above, the program director must submit, through the office of the postgraduate dean, an annual report to the RCPSC providing information on program applicants, individuals in the program, graduates of the program and those who have left the program without completing it. An annual report form will be sent out from the RCPSC each fall requesting this information for the current academic year.

## **Standard B.II: Goals and Objectives**

**There must be a clearly worded statement outlining the goals of the residency program and the educational objectives of the resident.**

### Interpretation

#### 1. Goals of the Program

To train physicians who will have added competency in the area of Nuclear Cardiology or Cardiac Nuclear Medicine To provide academic training for physicians who will be going on to academic careers in cardiac nuclear medicine.

#### 2. Educational Objectives of the Program

Successful residents will acquire a broad-based understanding of the principles, philosophy, core knowledge and skills of Nuclear Cardiology or Cardiac Nuclear Medicine

### *Knowledge*

#### General Objective 1:

The resident will have adequate knowledge of the basic sciences related to the practice of nuclear medicine.

##### Specific Objectives:

1. Knowledge of radiation physics and instrumentation
2. Knowledge of the practice of radiopharmacy
3. Knowledge of radiation biology and protection
4. Knowledge of application of computers to medical practice, including the use of computers for image analysis and storage
5. Understanding of the principles of trace kinetics

#### General Objective 2:

The resident will have adequate knowledge of the clinical practice of nuclear medicine.

##### Specific Objectives:

1. Knowledge of the diagnostic use of radionuclides, including principles of their use, cardiac techniques and indications, interpretation, and pitfalls in interpretation for in vivo imaging and non-imaging studies.
2. Knowledge of complementary and correlative roles of other diagnostic tests, specifically, cardiac catheterization, echocardiography, and cardiac MR.

#### General Objective 3:

The resident will have knowledge of quality assurance and regulatory issues.

##### Specific Objectives:

1. Know radiation safety and regulatory requirements including relevant national and international guidelines governing the transport and use of radiopharmaceuticals and radiation protection.
2. Know the principles of quality assurance as they relate to the practice of Nuclear Cardiology (or Cardiovascular Nuclear Medicine)

General Objective 4:

The resident will have in-depth knowledge of cardiac anatomy, physiology and pathophysiology.

Specific Objectives:

Knowledge of:

1. Cardiac metabolism and biochemistry
2. Coronary and cardiovascular anatomy and physiology
3. Valvular function and physiology
4. Cardiovascular electrophysiology and electrocardiography
5. Cardiovascular pathology and pathophysiology
6. Cardiovascular pharmacology

General Objective 5:

The resident will have in-depth knowledge of the diagnosis and therapy of coronary artery disease.

Specific Objectives:

- 1.) Knowledge of the history and physical examination pertinent to the diagnosis of coronary artery disease
- 2.) Knowledge of the principles of pre and posttest probability prediction of coronary artery disease.
- 3.) Knowledge of the application of sensitivity, specificity and predictive accuracy of non-invasive testing for Coronary Artery Disease.
- 4.) Understanding of prognostic evaluation of patients with valvular heart disease and coronary artery disease
- 5.) Knowledge of the medical therapies available for treatment of coronary artery disease
- 6.) Knowledge of the surgical and interventional therapies available for the treatment of coronary artery disease.

*Skills*

General Objective 6:

The resident will be able to prescribe and perform the appropriate Nuclear Cardiology (or Cardiovascular Nuclear Imaging) procedure.

Specific Objectives:

1. Advise the referring physician on the most appropriate investigation and/or sequence of investigations for the presenting clinical problem.
2. Obtain a history and perform a physical examination relevant to the consultation.
3. Supervise and administer the investigation as needed including the various physical, physiological and pharmacological interventions required for the Nuclear Cardiology or Cardiac Nuclear Medicine study. This specifically includes supervision of stress electrocardiography.
4. Analyze and interpret Nuclear Cardiology or Cardiac Nuclear Medicine imaging studies and related electrocardiograms, incorporating clinical, ECG, and other diagnostic studies to arrive at a diagnosis.
5. Communicate effectively with the referring physicians both orally and by written report. Communicate effectively with patients and their families.

General Objective 7:

The resident will demonstrate the skills required to care for patients referred for Nuclear Cardiology or Cardiac Nuclear Medicine investigations.

Specific Objectives:

- 1.) The resident will demonstrate the ability to assess the risk of performing stress testing in individual patients.
- 2.) The resident will demonstrate the ability to interpret electrocardiograms, stress EKG

- and correctly evaluate rhythm disturbances.
- 3.) The resident must obtain and maintain current ACLS certification and demonstrate the ability to conduct a cardiac arrest (or resuscitation) appropriately.

General Objective 8:

The resident will be able to incorporate evidence-based decision-making in the practice of Nuclear Cardiology or Cardiac Nuclear Medicine Specific Objectives:

1. The resident will be able to access the relevant literature germane to all aspects of Nuclear Cardiology or Cardiac Nuclear Medicine
2. The resident will be able to apply critical appraisal skills to literature in Nuclear Cardiology or Cardiac Nuclear Medicine

General Objective 9:

The resident will demonstrate attitudes that will support the continued highest quality of practice throughout the resident's career:

Specific Objectives:

The resident will:

1. Demonstrate acceptance of responsibility as evidenced by punctuality, availability, self-motivation and conscientiousness.
2. Practice ethically and responsibly with appropriate respect for patients, colleagues and other health care professionals.
3. Show sensitivity to gender and equity issues
4. Show evidence of understanding and acceptance of the obligation of life-long continuing self-education

General Objective 11:

Teaching

- 1.) The resident will demonstrate an active interest in the education of technologists, residents, fellows, and referring physicians.

## **Standard B.III            Control and Organization of the Program**

**There must be an organized program of rotations or other educational opportunities, both mandatory and elective, designed to provide each resident with the opportunity to fulfill the educational requirements and achieve competence in the program.**

### Interpretation

The following are the minimum educational requirements in Nuclear Cardiology or Cardiac Nuclear Medicine. Additional experience may be required, at the discretion of the program director. Previous training will be assessed and the program designed to ensure that each candidate is able to fulfill the educational requirements.

1. Prerequisite
  1. Completion of the educational requirements for certification by the RCPSC in cardiology.
  
2. Program Requirements

A minimum of one year, which includes the following:

  1. A minimum of 9 months training in comprehensive Nuclear Cardiology or Cardiac Nuclear Medicine including supervision and reporting of cardiac nuclear medicine examinations and the supervision and interpretation of related stress tests. The trainee will be required to perform in their entirety 50 gated blood pool imaging studies, 50 exercise myocardial perfusion studies and 50 pharmacologic stress perfusion studies and interpret an additional 500 studies with clinical correlation
  2. A minimum of three months, intended to refine and promote specific skills in one of the following areas:
    1. Nuclear Medicine- this option will ordinarily be selected by residents who have completed the training requirements for cardiology
    2. A research project in the field of Nuclear Cardiology or Cardiac Nuclear Medicine that can run concurrently with the comprehensive portion.
    3. The Research Project is intended not to supplant training in relevant associated Nuclear Medicine skills.
    4. The training program must be structured, if desired by the resident, to allow further training towards full (and hence dual) certification in Nuclear Medicine
    5. Other relevant clinical training subject to local residency training program approval.

## **Standard B.IV            Resources**

**There must be sufficient resources including teaching faculty, the number and variety of patients, physical and technical resources, as well as the supporting facilities and services necessary to provide the opportunity for all residents in the program to achieve the educational objectives and receive full training as defined by the specialty training requirements in the program.**

Interpretation

The program must include the following:

1. A Nuclear Medicine Training program that provides full clinical services.
2. Experienced cardiac nuclear medicine and nuclear medicine faculty with university appointments
3. Faculty must include both cardiac nuclear medicine and nuclear medicine physicians, as well as experienced teachers from the disciplines of physics, radiopharmacy and medical radiation technology
4. Appropriate administrative support for the program
5. RCPSC accredited programs in Nuclear Medicine *and/or* Cardiology must be offered at the University and a full complement of nuclear medicine physicians with proven expertise in Cardiac Nuclear Medicine or Nuclear Cardiology.

## **Standard B.V            Academic and Scholarly Aspects of the Program**

**The academic and scholarly aspects of the program must be commensurate with the concept of a university postgraduate education. A spirit of enquiry during clinical discussions, seminars, rounds, and conferences will in part, demonstrate the quality of the scholarship in the program. Scholarship implies an in-depth understanding of basic mechanisms of normal and abnormal states and the application of current knowledge to practice.**

Interpretation:

1. Organized scholarly activities such as journal clubs, research conferences and seminars must be a part of every program.
2. The academic program must include organized teaching in the clinical sciences relevant to Nuclear Cardiology or Cardiac Nuclear Medicine and the basic sciences relevant to nuclear medicine.
3. The program must ensure that the residents gain understanding of the basic principles and practice of biomedical ethics as it relates to Nuclear Cardiology or Cardiac Nuclear Medicine
4. The program must ensure that residents learn effective communication skills for interacting with patients and their families, colleagues, students, and co-workers from other disciplines. Clearly defined educational objectives for teaching these skills and mechanisms of formal assessment should be in place.
5. Residents must be given opportunities to develop effective skills in collaborating with other nuclear medicine professionals and other member of the health care team.
6. Residents must be given opportunities to develop effective teaching skills by teaching junior colleagues and students, as well as through conference presentations, clinical and scientific reports, and patient education.
7. Residents must be given opportunities to develop skills required to manage a Nuclear Cardiology or Cardiac Nuclear Medicine facility.

8. The program must provide residents with opportunities to gain an understanding of the principles and practice of quality assurance and improvement. Opportunities should be provided for residents to participate actively in such programs in their hospital departments.
9. There must be a faculty member with the responsibility to facilitate the involvement of residents in research and other scholarly work. The academic program must provide the opportunity for residents to learn biostatistics and the critical appraisal of research methodology and medical literature. Residents should be encouraged to participate in clinical research during the course of the program, and gain experience in data presentation and discussion of research results.
10. A satisfactory level of research and scholarly activity must be maintained among the faculty with the program as evidenced by activities such as
  - A.) Research grants to staff and other research expenditures;
  - B.) Publication by staff in peer-reviewed journals;
  - C.) Involvement by staff and residents in current research projects

#### **Standard B.VI            Evaluation of Resident Performance**

**There must be a mechanism in place to ensure the systematic collection and interpretation of evaluation data on each resident enrolled in the program.**

Interpretation

1. Programs must have a comprehensive assessment plan including assessment criteria and methods, based on the objectives of the program.
2. Assessments of the performance of individual residents in the program are to be kept on file in the office of the postgraduate dean
3. For each resident deemed by the program director to have completed the program, an Confirmation of Program Completion and Declaration of Competence form on University letterhead must be filed with the RCPSC.

#### **Standard B. VII            Examination**

**Upon the completion of training, there must be a formal examination, which must be successfully passed in all components prior to attaining certification. Passing this examination affirms that the candidate has successfully completed and complied with all aspects of the training program as set out above and is able to practice cardiac nuclear medicine under the terms, settings and conditions set out in Standard B. VII.**

The exam shall consist of the following component parts:

Written Examination:

1. Basic Sciences of Nuclear Cardiology/ Cardiac Nuclear Medicine
2. Clinical Examination of Nuclear Cardiology/Cardiac Nuclear Medicine

Oral Examination:

1. Basic Sciences of Nuclear Cardiology/ Cardiac Nuclear Medicine
2. Clinical Examination in Nuclear Cardiology / Cardiac Nuclear Medicine

Subject to the condition set by the RCPS exam standards of the exam will conform to standards currently acceptable to the RCPS.

An exam committee consisting of a member of the executive of the CANM, a member of the Executive of the CNCS, a member of the RCPS Nuclear medicine Exam committee and a member of the RCPS Cardiology exam committee.

**Standard B.VII. Conditions of Certification**

**Successfully completing the above certification program is an absolute prerequisite for the certification of added competence.**

**The successful individual shall be able to:**

**Perform and interpret **Nuclear** Cardiology or Cardiac Nuclear Medicine examinations exclusive of Positron Emission Tomographic studies. Certification in cardiac Positron Emission Tomography will require additional training.**

**References**

Ritchie JL, Gibbons RJ, Johnson LL, Maddahi J, Schelbert HR, Wackers FJ, Zaret BL: COCATS Task Force 5: Training in Nuclear Cardiology. J Am Coll Cardiol 1995;25(1);1-34.

Manuel D. Cerqueira, MD, FACC-Chair Heinrich R. Schelbert, MD, PhD, FACC Frans J. Th. Wackers, MD, FACC Mario S. Verani, MD, FACC (Update COCATS 1995) Task Force 5: Training in Nuclear Cardiology\* J am. Coll Cardiol 2002 April 3 12 Complete document at <http://www.acc.org/clinical/training/adult.htm>

NRC training and licencing requirements

[http://www.asnc.org/resources/nrc\\_requirements.cfm](http://www.asnc.org/resources/nrc_requirements.cfm)

*General Standards of Accreditation*, The Royal College of Physicians and Surgeons of Canada, September 1997