

# NUCLEAR CARDIOLOGY AND STRESS TESTING

CARDIOLOGY RESIDENCY PROGRAM

McMASTER UNIVERSITY

ROTATION SUPERVISOR: DR. VIKAS TANDON

## OVERVIEW

The trainee will be involved in performing a large number of diagnostic treadmill exercise tests on out-patients and in-patients with suspected coronary artery disease. The trainee will be exposed to the performance and interpretation of exercise and pharmacologic thallium and technetium-sestamibi perfusion imaging as well as PET perfusion imaging with Rubidium. Other procedures performed include radionuclide angiography and viability assessments with both thallium rest/redistribution SPECT and FDG-PET imaging. The trainee will be expected to learn indications, interpretation and clinical application of these tests.

## GOALS AND OBJECTIVES

The goals and objectives for the rotation have been formulated to guide cardiology residents in identifying and acquiring the key competencies required to succeed as a consultant cardiologist and are based on the CanMEDS 2015 framework of the Royal College of Physicians and Surgeons of Canada. These key competencies include: medical expert, communicator, collaborator, leader, health advocate, scholar and professional. The rotation provides graded responsibility in achieving these objectives based on the resident's level of training and previous experience.

## PGY4/5:

The resident is able to:

- Proficiently administer, monitor and interpret exercise and pharmacological stress testing in accordance with clinical guidelines with a minimum of 75 stress tests being performed and logged.
- Assess the appropriateness of the test ordered relative to patient characteristics
- Establish a pre-test and post-test likelihood for CAD based on Bayesian analysis
- Obtain an appropriate consent from the patient
- Understand the various protocols used and the differences between them including the Bruce protocol, Modified Bruce, Naughton, and Modified Naughton
- Demonstrate an understanding of the Duke treadmill score and its utility in stress testing
- Discuss the basic principals of radiation safety
- Understand the basic principals of image acquisition, gamma cameras, and nuclear tracers used in the lab

## PGY6:

The resident builds on the previous skill set and is also able to:

- Understand principals of image interpretation and be able to describe findings in terms of size, severity, degree of reversibility and correlate with coronary territories
- Understand and describe prognostic significance of test results and the significance on prognosis for both pharmacologic and exercise perfusion imaging
- Identify defects which are suspected to be artifactual in nature (i.e. breast attenuation, diaphragmatic attenuation)
- Understand alternative diagnostic imaging and the role and merits of each based on patient characteristics
- Be able to complete a full nuclear stress dictation in accordance with format outlined in the ASNC guidelines.
- minimum of 75 tests need to be dictated and logged

- Understand the differences between different SPECT camera technologies and differences between SPECT and PET myocardial perfusion imaging
- Be able to understand the basic principals of resting RNA with ability to report pertinent findings
- Understand basic concepts of viability testing with thallium and FDG-PET

## CANMEDS COMPETENCIES

### A MEDICAL EXPERT

Global Objective: To acquire the medical knowledge and clinical skills necessary to provide high quality and safe patient-centered care.

1. Gain an understanding of the indications, advantages, disadvantages and technical limitations for the commonly used nuclear cardiology tests.
2. Show ability to understand the proper clinical application of the diagnostic information derived from the appropriate test.
3. Interpret the nuclear cardiologic results using other available clinical information provided including wall motion studies, perfusion studies at rest and with stress.
4. Gain experience in the technical performance and interpretation of the following techniques:
  - a. exercise treadmill stress tests
  - b. myocardial perfusion imaging (with either thallium, technetium or rubidium) using exercise, dipyridamole or dobutamine stress
  - c. radionuclide cine-angiography using gated equilibrium techniques.
5. Perform and interpret all exercise perfusion studies as well as dipyridamole and dobutamine perfusion studies.
6. As arranged by the Nuclear Cardiology Unit Director, the resident will gain hands on experience under qualified supervision at the side of the nuclear medicine technologist. The resident will observe and participate in the following procedures:
  - a. preparation and calibration of radiopharmaceuticals .
  - b. application of a gating device operation of a gamma camera (with quality control).
  - c. operation of the imaging computer system during acquisition and appropriate display of images.

### B COMMUNICATOR

Global Objective: To develop relationships with patients, families, and health professionals which facilitate the gathering and sharing of information essential for effective health care

1. Develop expertise in obtaining and synthesizing the relevant history from patients and obtaining informed consent for stress testing.
2. Gain experience in providing preliminary/verbal reports to the medical team about patients admitted to hospital.
3. Be able to accurately and efficiently communicate the formal results of the study and any treatment recommendations to the referring physician.

### C COLLABORATOR

Global Objective: To work effectively with other health care professionals to provide safe, high quality, patient-centered care

1. Collaborate effectively with the exercise and nuclear staff and technicians.
2. Collaborate effectively with colleagues to evenly distribute the workload and balance stress testing with study interpretation.

#### **D** LEADER

Global Objective: To develop a vision of a high quality health care system and take responsibility for effecting change to move the system toward the achievement of that vision

1. Use pretest screening to assess cost effectiveness of testing and make appropriate plans for ongoing follow up keeping in mind cost effectiveness of all investigations
2. Develop an understanding of the health care costs of exercise and nuclear stress testing and use best evidence to provide cost-appropriate care.
3. Develop effective time management skills.

#### **E** HEALTH ADVOCATE

Global Objective: To develop a partnership with patients, their families, and support agencies to influence health determinants

1. Incorporate disease prevention, health promotion, and health surveillance into interactions with individual patients seen in the stress/nuclear lab.
2. Assess cardiovascular risk factors in patients referred for stress testing and incorporate lifestyle and risk factor modification in exercise prescription.
3. Advocate for radiation safety and lowest allowable exposure

#### **F** SCHOLAR

Global Objective: To demonstrate a lifelong commitment to excellence in practice through continuous learning, the teaching of others, the evaluation of evidence, and contributions to scholarship

1. Recognize gaps in knowledge and develop strategies to fill these gaps through reading and consulting other members of the health care team.
2. Demonstrate the ability to critically appraise the medical literature and integrate best available evidence into practice.
3. Attend and contribute to nuclear cardiology journal club and teaching rounds and actively participate in the education of junior learners.

#### **G** PROFESSIONAL

Global Objective: To demonstrate ethical practice, high personal standards of behavior, dedication to the profession and maintenance of personal health

1. Deliver care with integrity, honesty and compassion.
2. Adhere to the professional and ethical codes, standards of practice, and laws governing practice.
3. Develop self-awareness of personal limitations and seek assistance when appropriate.



## Communicator

	Unsatisfactory	Provisional Satisfactory	Satisfactory	Very Good	Outstanding	
	1	2	3	4	5	N/A
Able to obtain and synthesize the relevant history from patients and can obtain informed consent for stress testing.	0	0	0	0	0	0
Is able to accurately and efficiently communicate the formal results of the study and any treatment recommendations to the referring physician.	0	0	0	0	0	0

## Collaborator

	Unsatisfactory	Provisional Satisfactory	Satisfactory	Very Good	Outstanding	
	1	2	3	4	5	N/A
Collaborates effectively with the exercise and nuclear staff and technicians.	0	0	0	0	0	0
Collaborates effectively with colleagues to evenly distribute the workload and balance stress testing with study interpretation.	0	0	0	0	0	0

## Leader

	Unsatisfactory	Provisional Satisfactory	Satisfactory	Very Good	Outstanding	
	1	2	3	4	5	N/A
Uses pretest screening to assess cost effectiveness of testing and makes appropriate plans for ongoing follow up keeping in mind cost effectiveness of all investigations.	0	0	0	0	0	0
Develops an understanding of the health care costs of exercise and nuclear stress testing and use best evidence to provide cost-appropriate care.	0	0	0	0	0	0

## Scholar

	Unsatisfactory	Provisional Satisfactory	Satisfactory	Very Good	Outstanding	
	1	2	3	4	5	N/A
Attends and contribute to nuclear cardiology journal club and teaching rounds and actively participates in the education of junior learners.	0	0	0	0	0	0

## Professional

	Unsatisfactory	Provisional Satisfactory	Satisfactory	Very Good	Outstanding
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	1	2	3	4	5	N/A
Delivers care with integrity, honesty and compassion.	0	0	0	0	0	0
Adheres to the professional and ethical codes, standards of practice, and laws governing practice and demonstrates an awareness of personal limitations and seeks assistance when appropriate.	0	0	0	0	0	0

### OVERALL COMPETENCE (FOR LEVEL OF TRAINING)

	Incomplete 1	Unsatisfactory 2	Provisional Satisfactory 3	Satisfactory 4
Please check the appropriate box for the overall competency of this learner's training level	0	0	0	0

Was input sought from other faculty, allied health professionals, or patients and their family members?  
*(If yes, please please specify in the comment box provided immediately below)*
 Yes  No

Comments

#### Summative Comments

*(Any item evaluated above or below a 3, must include comments and examples to justify the rating)*

#### Formative Comments

*(Please provide 1-2 items for the resident to improve upon in order to progress along the competency continuum)*



## Communicator

	Unsatisfactory	Provisional Satisfactory	Satisfactory	Very Good	Outstanding	
	1	2	3	4	5	N/A
Able to obtain and synthesize the relevant history from patients and can obtain informed consent for stress testing.	0	0	0	0	0	0
Is able to accurately and efficiently communicate the formal results of the study and any treatment recommendations to the referring physician.	0	0	0	0	0	0

## Collaborator

	Unsatisfactory	Provisional Satisfactory	Satisfactory	Very Good	Outstanding	
	1	2	3	4	5	N/A
Collaborates effectively with the exercise and nuclear staff and technicians.	0	0	0	0	0	0
Collaborates effectively with colleagues to evenly distribute the workload and balance stress testing with study interpretation.	0	0	0	0	0	0

## Leader

	Unsatisfactory	Provisional Satisfactory	Satisfactory	Very Good	Outstanding	
	1	2	3	4	5	N/A
Uses pretest screening to assess cost effectiveness of testing and makes appropriate plans for ongoing follow up keeping in mind cost effectiveness of all investigations.	0	0	0	0	0	0
Develops an understanding of the health care costs of exercise and nuclear stress testing and use best evidence to provide cost-appropriate care.	0	0	0	0	0	0

## Scholar

	Unsatisfactory	Provisional Satisfactory	Satisfactory	Very Good	Outstanding	
	1	2	3	4	5	N/A
Attends and contribute to nuclear cardiology journal club and teaching rounds and actively participates in the education of junior learners.	0	0	0	0	0	0

## Professional

	Unsatisfactory	Provisional Satisfactory	Satisfactory	Very Good	Outstanding
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	1	2	3	4	5	N/A
Delivers care with integrity, honesty and compassion.	0	0	0	0	0	0
Adheres to the professional and ethical codes, standards of practice, and laws governing practice and demonstrates an awareness of personal limitations and seeks assistance when appropriate.	0	0	0	0	0	0

### OVERALL COMPETENCE (FOR LEVEL OF TRAINING)

	Incomplete 1	Unsatisfactory 2	Provisional Satisfactory 3	Satisfactory 4
Please check the appropriate box for the overall competency of this learner's training level	0	0	0	0

Was input sought from other faculty, allied health professionals, or patients and their family members?  
*(If yes, please please specify in the comment box provided immediately below)*
 Yes  No

Comments

#### Summative Comments

*(Any item evaluated above or below a 3, must include comments and examples to justify the rating)*

#### Formative Comments

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