NUCLEAR MEDICINE

James A. Haley Veterans Administration Hospital

Rotation Director: Dwight Achong, M.D.

General Goals: During this rotation, the resident will learn how to perform and interpret dynamic and static nuclear imaging of pathophysiologic processes, the use and handling of radiopharmaceuticals, and quality control of nuclear imaging instruments.

Daily Work:

The work day begins after morning conference. The hours of service on this rotation are from 8:00 a.m. until all scheduled cases including cardiac studies have been reviewed. When necessary (especially for the cardiac studies), the day may extend later than 5:00 p.m. and the resident should plan on staying until all of these studies are completed. The resident is responsible for monitoring and supervising all studies nuclear medicine studies performed in the department. Chart reviews and interviews with patients are helpful in many patients. In certain cases (e.g., thyroid examinations), a careful physical examination is necessary. Other relevant imaging studies should be located and reviewed.

Following review of the studies with the staff nuclear medicine physician, the resident will be responsible for performing the dictations and sign-off of reports in a timely manner. The resident will maintain a presence in the department until at least 4:30 p.m. for the purpose of consultations and for monitoring any on-going examinations.

During the course of residency training, each resident must observe and participate (observation alone is not sufficient) in certain technical aspects of nuclear medicine (e.g., camera quality control, kit preparation). A list of these procedures will be distributed to each resident and the resident will be responsible for obtaining the necessary signatures documenting his/her participation in these procedures. The time spent and topics covered should be documented and signed by your preceptor on the form provided. At the discretion of the program director, residents may make arrangements to complete these assignments at other times during their residency training as needed.

The resident must spend a total of 40 hours of hands-on laboratory work experience in the following areas:

1. Ordering, receiving, and unpacking radioactive material safely, and performing the related radiation surveys
2. Safe elution and quality control (QC) of radionuclide generator systems
3. Calculating, measuring, and safely preparing patient dosages

4. Calibration and QC of survey meters and dose calibrators
5. Safe handling and administration of therapeutic doses of unsealed radionuclide sources (i.e., I-131); written directives
6. Response to radiation spills and accidents (containment and decontamination procedures)
7. Radiation signage and related materials
8. Using administrative controls to prevent medical events involving the use of unsealed byproduct material

In addition, the resident will be responsible for keeping a log of all nuclear medicine therapy cases in which the resident participates. Each resident must participate in (and document) at least three cases of radioactive iodine therapy for hyperthyroidism and an additional three cases of radioactive iodine therapy for thyroid cancer. This requirement can be met by participation in I-131 therapy cases on nuclear medicine rotations at the James A. Haley VA Hospital, Tampa General Hospital and at the H. Lee Moffitt Cancer Center and Research Institute.

During the time on this rotation, the resident should also work on any uncompleted on-line nuclear medicine didactic lectures. To access the lectures on the Society of Nuclear Medicine (SNM) Lifelong Learning and Self-Assessment Program, go to http://www.snm.org and log in, then click on the education tab and then click on "Online Lectures". From there you will be able to access the modules. You should keep the certificate for each lecture you have completed in your portfolio and also provide a copy for your file to Rhonda Tuttle.

Basic Science Series:

- Basic Atomic and Nuclear Physics
- Basic Radiation Protection in Nuclear Medicine
- Cellular Responses to Radiation
- Charged Particle and Photon Interactions
- Collimators
- Computers in Nuclear Medicine
- Emission Tomography and Image Reconstruction
- Factors Affecting High Quality SPECT
- Gamma Camera Performance Evaluation and Quality Control
- Image Quality
- MIRD Dosimetry
- Nuclear Counting Statistics
- Radiation Characterization and Quantities
- Radiation Detectors
- Radiation Measurement Systems
- Radionuclide Production
- Scintillation Cameras
- SPECT Data Acquisition and Quality Control
- The Compounding, Quality Control and Mechanisms of Localization of Radiopharmaceuticals
- Whole Body Effects of Ionizing Radiation

Molecular Imaging Series:

- Introduction to Cell and Molecular Biology
- Identification of Novel Targets for Molecular Imaging Probes
- Novel Strategies for Development of New Molecular Imaging Probes
- Cardiovascular Applications – Reporter Probes
- Cardiovascular Applications – Imaging Atherosclerosis
- Cardiovascular Application – Imaging of Vascular Remodeling
- New Molecular Imaging Agents for Oncology
- New Developments: Alzheimer's Disease
- New Developments: Addiction

Oncology Series:

- Positron Emission Tomography: An Overview
- PET/CT: Lung Cancer and SPN Evaluation
- PET and PET/CT for Breast Cancer
- FDG PET: Applications in Colorectal Carcinoma
- FDG PET Evaluation in Malignant Melanoma

Suggested Reading:

- FA Mettler and MJ Guiberteau. Essentials of Nuclear Medicine Imaging (5th Edition).
- HA Ziessman, JP O'Malley, JH Thrall. Nuclear Medicine: The Requisites (3rd Edition).

Educational Goals and Objectives:

First and Second Year Residents

By the end of the second year, the resident should be able to:

Patient Care:

- Perform physical examination and history relevant to the nuclear medicine study, especially thyroid examination.
- Describe clinical indications and techniques for all frequently performed nuclear exams.
- Interview PET patients to obtain clinical history needed for scan interpretation.

Medical Knowledge:

- Describe basic radiopharmaceutical preparation and basic nuclear medicine physics and instrumentation.
- Discuss common types of pathology for frequently performed nuclear medicine exams.
- Review all types of nuclear medicine exams to ensure that the exam is complete and request additional views when necessary.
- Use a systematic approach to identify common abnormalities on frequently performed nuclear medicine exams.

- Describe the normal biodistribution of radiopharmaceutical for commonly performed nuclear medicine exams.
- Participate actively in nuclear cardiology reading session and understand basic concepts of nuclear cardiology interpretation.

Interpersonal and Communication Skills:

- Perform appropriate basic consultations with referring physicians after having first reviewed scans with attending nuclear medicine physician.
- Dictate all non-cardiac nuclear medicine examinations, including PET, performed in a routine day in a coherent fashion after having reviewed scans with attending nuclear medicine physician.
- Communicate appropriately with all Nuclear Medicine technical and clerical staff.
- Call referring physicians with any urgent or unexpected positive results.

Practice-Based Learning and Improvement:

- Identify, rectify and learn from personal errors.
- Incorporate feedback into improved performance.
- Efficiently use electronic and print resource to access information.

Professionalism:

- Demonstrate appropriate professional behavior towards patients, nuclear medicine technical and clerical staff, and other physicians.
- Respect patient confidentiality and privacy.
- Present oneself as a professional in appearance and communication.
- Demonstrate responsible work ethic.

Systems-Based Practice:

- Review for appropriateness any requests for studies that the technical and clerical staff are uncertain about; also, all studies that are on the list requiring pre-approval.
- Attend multi-disciplinary conferences, including oncology conferences, when appropriate.
- Demonstrate knowledge of ACR standards and appropriateness criteria.
- Demonstrate knowledge of cost-effectiveness imaging practices, including appropriate utilization of high-cost procedures like PET.

Third and Fourth Year Residents

By the end of the fourth year, the resident should be able to achieve all of the above (first and second year) objectives, plus the following:

Patient Care:

- Independently run almost all facets of the daily operations of the nuclear medicine department.
- Appropriately answer questions from patients and family members, including those related to radiation safety issues from radiopharmaceutical exposure.

Medical Knowledge:

- Prepare basic radiopharmaceutical kits, describe radiopharmaceutical QC, and assay and administer radiopharmaceuticals in a proper fashion.
- Discuss in detail nuclear medicine physics and instrumentation, as well as planar SPECT and PET camera quality control.
- Interpret all types of nuclear medicine examinations, including an understanding of the normal biodistribution of all radiopharmaceuticals and the ability to provide an appropriate differential diagnosis list for all abnormalities.
- Interpret all types of nuclear cardiology examinations.
- Interpret all types of PET examinations

Interpersonal and Communication Skills:

- Independently perform consultations with referring physicians regarding appropriate choice of studies and interpretation of all types of nuclear medicine studies.
- Actively participate in teaching of junior residents and medical students.

Practice-Based Learning and Improvement:

- Identify, rectify and learn from personal errors.
- Incorporate feedback into improved performance.
- Efficiently use electronic and print resource to access information.

Professionalism:

- Demonstrate appropriate professional behavior towards patients, nuclear medicine technical and clerical staff, and other physicians.
- Respect patient confidentiality and privacy.
- Demonstrate responsible work ethic.

Systems-Based Practice:

- Have general familiarity with Nuclear Medicine regulatory requirements.

Mechanism of Evaluation:

- Monthly evaluation forms by all Nuclear Medicine attending physicians.
- 360 Degree Evaluation by Nuclear Medicine technical and support staff
- Mock oral board exam in Nuclear Medicine and ACR in-service exam.
- Imaging conference presentations.
- Nuclear Medicine technical competency evaluation; check-list of technical aspects of Nuclear Medicine that residents must observe or perform.
- Case conference unknown case sessions.