AMERICAN BOARD OF RADIOLOGY
16-MONTH PATHWAY TO SPECIALTY CERTIFICATION IN DIAGNOSTIC RADIOLOGY & SUBSPECIALTY CERTIFICATION IN NUCLEAR RADIOLOGY

Rotation Goals & Objectives - Dartmouth Hitchcock Medical Center

This document delineates the goals and objectives broadly for the ABR 16-month NM pathway at Dartmouth Hitchcock Medical Center. Much of this information was obtained directly from the ABR and Nuclear Regulatory Commission (NRC) webpages.

A sign off sheet and excel document will be provided to you (Geisel website) to keep track of all required items that must be completed by the end of residency.

Recommended reading material will be listed at the end of each G&O document. Articles are available in the Geisel website under ABR 16-Month NM Pathway. Textbooks are available in the resident library and/or can be purchased by the resident with their book funds.

Eligibility criteria and exam details for the Diagnostic Radiology certifying exam and Nuclear Medicine subspecialty certifying exam can be found on the ABR website. Certification in Nuclear Medicine via the American Board of Nuclear Medicine (ABNM) is also an option, but that will not be discussed in this document; additional information can be found on the ABNM website.

ABR Basic Requirements

1. **Training Time** must consist of 16 months of NR/NM training at any time during the 48 months of DR residency
    - 4 “core” NM months required for all DR residents
    - At least 8 additional months of dedicated NM training
    - Up to 4 months in approved NR/NM/molecular imaging-related rotations which must be detailed on the initial application to the ABR

2. **Clinical hybrid modality experience in PET/CT and SPECT/CT.**

3. **Therapeutic experience must fulfill NRC training and experience for AU eligibility under 10 CFR 35.390:**
    a. 700 hours of training and experience, including a minimum of 200 hours of classroom and laboratory training in basic radionuclide handling techniques applicable to the medical use of unsealed byproduct material requiring a written directive. Training must include radiation physics and instrumentation, radiation protection, mathematics pertaining to the use and measurement of radioactivity, chemistry of byproduct material for medical use, and radiation biology.
    b. **Supervised Work Experience**

- Ordering, receiving and unpacking radioactive materials safely and performing the related radiation surveys;
- Performing quality control procedures on instruments used to determine the activity of dosages, and performing checks for proper operation of survey meters;
- Calculating, measuring, and safely preparing patient or human research subject dosages;
- Using administrative controls to prevent a medical event involving the use of unsealed byproduct material;
- Using procedures to contain spilled byproduct material safely and using proper decontamination procedures;

c. **Therapeutic administrations**, with a minimum of
    a. 10 oral administrations of 131I NaI < 33mCi,
    b. 5 oral administrations of 131I NaI >33 mCi, and
    c. 5 parenteral administrations of an alpha emitter, beta emitter, and/or photon emitter <150 kV for which a written directive is required.

4. **Written attestation**: This must be obtained from the residency PD or from the pathway director, whomever meets AU requirements and has experience in administering dosages in the same dosage category/categories

<u>How This is Accomplished at DH</u>

- 16 months of clinical nuclear medicine during the resident's training
    - Dedicated NM rotations which include:
        - 2-month rotation at Duke
        - 3–4-week rotation at a pediatric hospital
    - NM-related rotations
        - Neuro
        - Body
    - Assigned readings for each rotation as listed in the NM G&O
    - Regular participation in multiple tumor boards and conferences, oncology clinics, and OR time (oncologic surgery)
    - Participation in therapies to include the consent process with an understanding of radiation safety and adverse effects, evaluation of lab values before/between scheduled therapies, and administration
    - 2 NM-themed lectures during the final residency year
- Attendance at clinical NM lectures
    - DH 2-yr curriculum - 50 hours
    - BCH and Duke lectures - 15-20 hours

- Completion of the physics workbook (40+ hours) - includes laboratory time, readings, written assignments, and pertinent RSNA physics modules
- DH physics problem sets – 7-8 hours (this includes review)
    - Includes assigned readings and RSNA physics modules

- Final NM physics exam – *Under development by our physicists*
- Attendance and successful completion of the Sensakovich physics course during R1 through R3 years - 36 hours
- Built in physics lectures during the Duke and BCH rotation - 3-6 hours
- Radiopharmacy visit(s) – 6-8 hours
    - Duke in-house radiopharmacy
    - Pharmalogic in Willison, VT

Required Activities

- Lecture Presentations:
    - Grand Rounds – NM-themed; topic must be discussed with and approved by NM attending
    - Pathway Lecture – Case conference from BCH & Duke
- NM-specific tumor boards/conferences:
    - Attend lymphoma TB regularly while on the NM service
    - Present at 1 lymphoma tumor board monthly (at minimum) and as needed.
    - Attend the monthly dementia conference while on the NM service and present at least once
    - Attend the cardiology fellow NM lectures with assigned NM attending.
- Therapy Participation:
    - Participate in at minimum, one INPATIENT high dose ^{131}I therapy. This can be one of the high doses required by the ABR.
    - While on the NM service, the pathway resident is expected to take an active role in therapies. One week a month (specific week to be determined by the staff physician), they will need to know the patient's clinical course and pertinent labs, participate in any and all consent processes, participate in therapy administrations, and they will be the point contact for any adverse events or patient questions.
- Scholarly Work:
    - Submit a research project to the SNMMI regional or national meeting.
- Other:
    - Membership with SNMMI
    - Completion of the various assigned RSNA Physics Modules which includes the end of module exams. Certificates for each module are required as proof of completion.
    - Completion of the Neuraceq Reader Training Program www.neuracegreadertraining.com/learn
    - Completion of all physics problem sets which are to be reviewed with a NM attending and/or the physicists (review dates TBD).
    - Complete the final NM physics exam *(under development).*

Patient Care

- Communicate effectively and demonstrate caring and respectful behaviors when interacting with patients and their families.
- Gather essential and accurate medical and radiologic history pertinent to the procedure for which the patient is scheduled or for the examination that the patient has had.
- Understand NRC regulations.
- Understand how to perform NM radiotherapy.
- Develop an understanding of radiation safety.

Medical Knowledge

Much of this information is taken directly from the ABR website with supplemental educational requirements as determined by the NM staff.

- Continue to build upon knowledge of radiation biology, instrumentation and QC, and both planar/SPECT and PET radiopharmacy.
- Hone PET/CT and SPECT/CT interpretation skills.
- Know the common indications and pitfalls for the various gamma and PET studies.
- Become familiar with TNM staging for commonly imaged malignancies.
- Be familiar with the lymph drainage patterns for commonly image malignancies of the head, neck, chest, abdomen, and pelvis.
- Provide timely and accurate protocoling and reporting
- Competently manage the NM service, overseeing scheduling needs and necessary protocol changes on a patient-by-patient basis.
- Radiotherapies – Be familiar with the common indications, contraindications (inclusive of relevant lab values), adverse reactions and their management, radiation safety protocols, and the administration protocol
    - I-131, Lutathera, Pluvicto, Xofigo
- Complete the nuclear medicine physics workbook, available on the Geisel webpage, by the end of the R4 year. This is critical in meeting the 80-hour minimum requirement of physics as delineated by the ABR and which is further explained in the workbook.
- Training must include clinical experience with a variety of pediatric (neonate/infant/child/adolescent) cases. A minimum of 100 pediatric NM cases must be interpreted.
    - If possible, the resident will spend 1-2 weeks on the NM service during their required 3-month rotation at BCH during their R2 year. **It is the resident's responsibility contact the BCH program coordinator to make this request.**
    - This requirement will be further supplemented by an additional 3-4 weeks at a pediatric hospital during the resident's R4 year.
- Attend and present at multidisciplinary conferences (listed on the next page); use the information from conference to tailor patient exams and provide clinically useful recommendations.

Interpersonal and Communication Skills

- Work professionally and effectively with the NM technologists.
- Communicate with referring clinicians to optimize and prioritize performance of studies for all patients.
- Communicate and document communication of critical findings with appropriate medical personnel in a timely fashion.
- Participate in NM consultations including determination of the necessity of inpatient PET requests.
- Participate in intra and interdepartmental conferences.

Professionalism

- Incorporate ethical practice, professional regulation and high personal standards of behavior.
- Work with any and all health care professionals to provide patient-focused and most appropriate care:
    - Consult with ordering providers to recommend the best imaging test
    - Address patient questions and concerns
    - Document these communications in the medical record, as appropriate.
- Understand how to be a committed, ethical, and professionally responsible physician.
- Understand patient privacy issues.
- Apply for ABR and/or ABNM certification examination.
- Become a member of SNMMI. Membership in other professional societies is also highly encouraged (ACNM, RSNA, ARRS, ASNC). This can be reimbursed by the department.

- Complete ABR/NRC requirements to become AU eligible.

Practice-Based Learning and Improvement

- Spend time working side by side with the technologists to gain full understanding of the commonly utilized protocols (i.e., performance of V/Q scans and routine of the cardiac stress lab).
- Starting and carrying out a QI project is encouraged but not required.
- Be familiar with NM protocols at DH and SNMMI practice guidelines.

Systems Based Practice

- Learn to use all relevant computer systems (MIM at DH, Hermes at BCH, Synapse at Duke) to include workflow creation and troubleshooting, particularly at DH.
- Understand basic billing and coding.
- Understand cost effectiveness.

Tumor Boards & Conferences

Below are the Tumor Boards and Conferences that the resident can become involved in. Attendance is encouraged throughout residency, with increasing level of participation expected as an R4. Not listed here are liver tumor clinic and colorectal conference. For access to the WebEx links and the patient lists, contact DCCtumorboard@hitchcock.org

There is an expected minimum number of tumor boards the resident is expected to be the primary presenter for – this applies to both the NM rotation and NM-related electives. This is further detailed in the respective G&O.

GI Tumor Board

- Weekly, Tuesdays at 6:45 AM
- Primary Radiology Attending: Body
- Attend regularly while on the body service

Comprehensive Thoracic Oncology Program (CTOP)

- Weekly, Tuesdays at 8:00 AM
- Primary Radiology Attending: Killam/Toy

- Attend regularly while on the cardiothoracic service.

Melanoma Tumor Board

- 1st and 3rd Tuesdays of the month at 7:00 AM
- Primary Radiology Attending: No radiology presence at this time

Lymphoma Tumor Board

- Weekly, Tuesdays at 4:00 PM
- Primary Radiology Attending: Seltzer
- Expectation:
    - Attend regularly while on the NM service
    - Present at minimum once a month and as needed (no exceptions made for late shift)

Sarcoma

- 2nd and 4th Tuesdays at 7:30 AM
- Primary Radiology Attending: Cheung

Dementia Conference

- Monthly, 3rd Thursday at 12:15 PM
- Primary Radiology Attending: Seltzer

Updated 6/20/2025 by Dr. Dominguez-Konicki

- Attend regularly and review the cases with the supervising NM radiologist

GU Conference

- Weekly, Thursdays at 7:00 AM
- Present at the 2-3 assigned conferences as part of the DR residency program as assigned by Dr. Silas.

GU Tumor Board

- Weekly, Thursdays at 4:30 PM
- Primary Radiology Attending: Body

Endocrine Conference

- 2nd and 4th Thursdays at 4:00 PM
- Primary Radiology Attending: Maeder

Pediatric Tumor Board

- 2nd and 4th Thursdays at 4:00 PM
- Primary Radiology Attending: Foster

RECOMMENDED READING

Textbooks:

- Essentials of Nuclear Medicine and Molecular Imaging (7th edition) - Mettler
- Nuclear Medicine: The Requisites (4th edition) - Ziessman
- Essentials of Nuclear Medicine Physics and Instrumentation – Powsner

**Mettler and Powsner should be read in their entirety by the end of residency.*

**Completion of MCQs for the first 3 textbooks is high yield and strongly recommended.*

Articles:

- Pertinent articles to be listed and available on the Geisel webpage

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