

# Pathways to the Future of Nuclear Medicine Task Force: Phase 1 Report

Hossein Jadvar, MD, PhD, MPH, MBA, on Behalf of the Nuclear Medicine Stakeholders

*Difficulties mastered are opportunities won.*

—Winston Churchill

The issue of what may constitute optimal training pathways for nuclear medicine and molecular imaging has been of major interest and discussion over the past decade (1–7). The underlying reasons for these efforts are multifactorial but include the evolving landscape for clinical nuclear medicine practice, such as introduction and rapid adoption of multimodality imaging; development of novel instrumentation, radiopharmaceuticals, and theranostics; and the realities of overall poor prospects in the job market for those physicians trained only in nuclear medicine (NM) without certification in diagnostic radiology (DR).

Most recently, the American Board of Nuclear Medicine (ABNM) and the American Board of Radiology (ABR) formed a task force and engaged in discussions that led to a joint proposal with the following principles: (1) that current NM and nuclear radiology (NR) programs be replaced by a single training pathway incorporating a combined 3-year DR curriculum and a 2-year NM curriculum targeted to medical students, resulting in a new primary certificate in NM/DR; and (2) that the new independent discipline of NM/DR be created under the umbrella of the ABR with ultimate dissolution of the ABNM. This proposal was publicly announced to stakeholders on June 3, 2015. Soon thereafter, SNMMI, the SNMMI Technologist Section, the SNMMI Young Professional Council, the American College of Nuclear Medicine (ACNM), and the ABNM–ABR Task Force opened surveys for comments. The results of these surveys were summarized and published (8, 9). SNMMI received the largest number of respondents, with 547 full members (~20% response rate), including 20% of responses coming from SNMMI international members. The results of all 5 surveys, including that of the SNMMI, were similar, with slightly more than half of respondents opposed to the proposal. The main concerns were: (1) the nonnegotiable dissolution of the ABNM (and hence loss of primary specialty status); (2) the notion of a single training pathway, which prohibited nonimaging specialists from entering NM training; and (3) the fact that DR trainees with 4-month NR training would have still been able to practice the full scope of NM, creating 2 parallel but very different pathways for NM clinical practice.

Based on the lack of broad consensus for the proposal, the ABNM announced to its diplomates on November 6, 2015, that the ABNM and ABR had agreed not to move forward with their proposal. Immediately after this announcement, SNMMI formed the Pathways to the Future of Nuclear Medicine Task Force to address the challenges, from fewer NM training programs and job opportunities to the increasing need for dual certification in DR and NM (10). The task

force was designed as a 2-phase process. In the first phase, SNMMI invited various organizations within the NM community to brainstorm and come up with solid proposals and/or practical action plans. The invited organizations and their representatives are listed in the Acknowledgments section of this article. This article summarizes the discussions that took place during 3 face-to-face meetings, 2 conference calls, and numerous e-mails. The next phase will be to approach the radiology community (e.g., ABR, American College of Radiology, Radiological Society of North America, Society of Chairs of Academic Radiology Departments, Residency Review Committee for Diagnostic Radiology, Association of Program Directors in Radiology) to discuss the collective results of the NM community's discussions in order to explore ways in which the consensus proposals might be amenable for closer collaboration between NM and DR for the benefit of value-driven, high-quality clinical NM practice. The goal is to guarantee comprehensive training of NM practitioners, with opportunities for specialists from other disciplines, that ensures that NM remains a vital, innovative component of quality patient care.

The Task Force discussed the challenges and offered a number of training pathways that were believed to accomplish the main objective of the Task Force: value-driven, high-quality clinical NM practice. The guiding principle was that NM would remain as an independent specialty but with genuine interest in and motivation to collaborate with the radiology community for the benefit of the field, its practitioners, and overall patient care. Table 1 summarizes the potential training pathways for future practitioners in NM. It was recognized that the majority of the workforce, perhaps in the range of 85%–90%, would be trained (and certified) in both DR and NM through a number of viable pathways. However, in view of historical precedents and some continued interest, training pathways are needed to cater to those nonimaging specialists (e.g., cardiologists, endocrinologists, neurologists, etc.) who would benefit from NM training (2 years after certification in a nonimaging field) in their clinical practices. These pathways also allow for training of a relatively small number of highly qualified research-oriented physicians who would be expected to be absorbed into academic practices. Finally, international physicians may want training in the United States with the goal of returning to their countries for clinical practice. The innovative training pathway of blending



**Hossein Jadvar, MD, PhD, MPH, MBA**

the fourth year of medical school with acceleration into the residency training is also acquiring some traction in other fields of medicine (e.g., family medicine, pediatrics, orthopedics) and should be considered. The advantages of this pathway are a decrease in the total number of years in training, with practical considerations such as decreased debt and/or repayment time.

It is important to reiterate that the Task Force recognized that the majority of the future high-quality practitioners of NM will likely be dual certified by both the ABR and the ABNM. But given the multidisciplinary nature of NM, which has been strengthened through its innate diversity, there is room and need for a small number of nonradiologists who will benefit from and contribute to the field of NM and molecular imaging.

The Task Force recognized the already substantial alignment between ABR and ABNM for many of these training pathways, with several programs successfully offering, for example, embedded 16-month NM training within the 4-year DR training, 1-year NR fellowship training after DR residency, or combined DR/NM residency training including the 5-year clinician–scientist pathways with dual certification in DR/NM. These major alignments will need to be leveraged, remaining barriers removed, and new bridges built to achieve the desired measure of success, which is adequate numbers of future physicians in the workforce practicing high-quality NM with good job prospects.

The next phase of the Task Force, which will begin immediately, will focus on further alignments with the radiology

**Table 1**  
Potential Training Pathways for Future Practitioners in Nuclear Medicine

Training pathway	Target physicians	Expected % of future workforce	Strengths, impact on NM field	Weaknesses, barriers
3-y NM residency	MD/PhDs researchers IMGs	<5%	Committed to NM; researchers important for advancing the field; ABNM certification	Academic; small market
NM embedded in DR (16 mo of NM during 4 y of DR)	DR residents interested in NM; body imaging or neuroradiology trainees who may also be interested in PET	~15%	Important for community NM practice; improvement over current 4-mo basic training during DR residency; likely will be dual certified by ABR/ABNM	May be challenging to embed 16 mo within 4 y; few currently successful programs; will need PR efforts in medical school and early in DR residency programs
1-y NM fellowship for radiologists	Radiology residents interested in NM; body imaging or neuroradiology trainees who may also be interested in PET; DR programs that cannot offer the embedded pathway; IMGs in ABR alternate pathway	~60%	Traditional pathway for radiologists; important for community NM practice; improvement over current 4-mo basic training during DR residency; may be certified by ABR/ABNM/ABR-NR	Selected by minority of DR residents; may have less NM cultural immersion
Combined NM/DR residency program	Highly motivated NM-oriented individuals recruited from medical school	~15%	Committed to NM; researchers may be interested	Will need PR efforts in medical school
2-y NM after nonimaging board certification	Cardiology, neurology, endocrinology, internal medicine, etc.	<5%	Historically major contributions to NM; improves NM publicity; certification by ABNM	Mostly academic; small market
Early start in senior year of medical school with accelerated residency	Medical students	<5%	Early identification with DR/NM; probable reduced debt and/or loan repayment period; needs to be vetted by ACGME	Untested; will need PR efforts in medical school

NM = nuclear medicine; IMG = international medical graduate; ABNM = American Board of Nuclear Medicine; DR = diagnostic radiology; ABR = American Board of Radiology; PR = public relations; ABR-NR = ABR–Nuclear Radiology subspecialty certification; ACGME = Accreditation Council for Graduate Medical Education.

leadership and community. Bennett Greenspan, MD, MS, the current SNMMI president-elect with extensive experience in physician training issues and who also holds certifications from ABR, ABNM, and the ABR-NR, will chair Phase 2 discussions with the radiology community. In a short time, the path will doubtlessly become clearer, and both radiology and NM communities will work together to ensure high-quality clinical NM practice for the ultimate benefit of our patients.

## ACKNOWLEDGMENTS

Task force members in Phase 1 included representatives from the SNMMI leadership team (Hossein Jadvar, MD, PhD, MPH, MBA, as the Task Force chair, Bennett Greenspan, MD, as Associate Chair of the Task Force, and Sally Schwarz, RPh, MS, BCNP), SNMMI Board of Directors (Vasken Dilsizian, MD), SNMMI House of Delegates (Leonie Gordon, MD), SNMMI Academic Council (David Brandon, MD), SNMMI Young Professionals Committee (Erin Grady, MD), SNMMI-Technologist Section leadership (Aaron Scott, CNMT, and Sara Johnson, CNMT, MBA), ABNM (Munir Ghesani, MD), ACNM (Patrick Colletti, MD, Rathan Subramaniam, MD, PhD, MPH), ACNM Nuclear Medicine

Resident Organization (Shana Elman, MD), Accreditation Council for Graduate Medical Education–Nuclear Medicine Residency Review Committee (Jon Baldwin, DO), and the Nuclear Medicine Program Directors (Daniel Lee, MD).

## REFERENCES

1. Coleman RE, Delbeke D, Guiberteau MJ, et al. Concurrent PET/CT with an integrated imaging system: intersociety dialogue from the Joint Working Group of the American College of Radiology, the Society of Nuclear Medicine, and the Society of Computed Body Tomography and Magnetic Resonance. *J Am Coll Radiol.* 2005;2:568–584.
2. Graham MM, Metter DF. Evolution of nuclear medicine training: past, present, and future. *J Nucl Med.* 2007;48:257–268.
3. Harolds JA, Smith GT, Baker SR. Trends and different educational pathways for training physicians in nuclear medicine. *Acad Radiol.* 2008;15:1596–1603.
4. Schelbert HR. Nuclear medicine at a crossroads. *J Nucl Med.* 2011;52:10S–15S.
5. Harolds JA, Guiberteau MJ, Metter DF, Oates ME. Career prospects for graduating nuclear medicine residents: survey of nuclear medicine program directors. *J Am Coll Radiol.* 2013;10:593–598.
6. Guiberteau MJ, Graham MM. ACR-SNM task force on nuclear medicine training: Report of the task force. *J Am Coll Radiol.* 2011;8:388–392.
7. Oates ME, on behalf of the Diagnostic Radiology Participants of ACR/SNM Task Force II. Integrated residency training pathways of the future: diagnostic radiology, nuclear radiology, nuclear medicine and molecular imaging. *J Am Coll Radiol.* 2012;9:239–244.
8. Jadvar H. ABNM announces decision on proposed changes. *J Nucl Med.* 2015;56:21N–22N.
9. Jadvar H. The future of nuclear medicine. *J Nucl Med.* 2016;57:13N.
10. Jadvar H. Pathways to the future of nuclear medicine. *J Nucl Med.* 2016;57:15N.

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Department of Radiology, and director of the Mallinckrodt Institute of Radiology at Washington University School of Medicine (St. Louis, MO). His research played an important role in development of radioimmunotherapy for non-Hodgkin lymphoma. He has been a leader in expanding applications of PET to diagnose a broad array of human cancers and other diseases. He has been at the forefront of efforts to combine quantitative data from PET imaging with that from other modalities to more precisely diagnose and characterize cancers.

## Berson–Yalow Award

Dongzhi Yang, PhD, received the Berson–Yalow Award. The award was created in honor of Rosalyn Sussman Yalow, PhD, and Solomon A. Berson, MD, who together developed the radioimmunoassay technique in the 1950s. SNMMI established the award in 1977, the year that Yalow received the Nobel Prize for Physiology and Medicine. Judges for the Berson–Yalow award choose the investigator who submits the most original abstract presentation at SNMMI’s Annual Meeting and who has made significant contributions to basic or clinical radioimmunoassay research or any area of research using the indicator–dilution method. Yang is a postdoctoral research fellow in molecular imaging at the University of Michigan (Ann Arbor). He received his PhD in analytical chemistry from Northeastern University (Shenyang, China) in 2008 and teaches at Xuzhou Medical University (China). His projects involve PET imaging with novel agents and antibodies for targeted

radiotherapy and cancer detection. His winning abstract was titled “ImmunoPET of urokinase plasminogen activator (uPA) system: broad applicability in cancer imaging.”

## Henry N. Wagner, Jr., MD, Best Paper Award

Mark T. Madsen, PhD, professor of radiology in the Department of Nuclear Medicine at the University of Iowa in Iowa City, and colleagues received the Henry N. Wagner, Jr., MD, Best Paper Award for “Personalized kidney dosimetry for Y-90 DOTATOC radionuclide therapy” (abstract 582). This award, honoring the best abstract and accompanying presentation at the Annual Meeting, celebrates the many contributions of nuclear medicine pioneer Henry N. Wagner, Jr., MD.

## Walter Wolf Young Investigator Award

Yong-Il Kim, MD, PhD, Seoul National University Hospital (South Korea) received this year’s Walter Wolf Young Investigator Award for the abstract titled “Prognostic value of pre-treatment Ga-68-RGD PET-CT in predicting disease free survival in patients with breast cancer: a comparison study with dynamic contrast enhanced MRI” (abstract 548). This annual award recognizes a young investigator for originality, scientific methodology, and overall contributions to molecular imaging or therapy through original research showing the importance and value of correlative imaging in all fields of medicine.