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A Report on the Current State of Nuclear Medicine Physics Training: The Findings of the AAPM/SNMMI Joint Task Force

Beth A. Harkness[1] and Frederic H. Fahey[2]

[1]Department of Radiology, Henry Ford Hospital, Detroit, MI

[2]Division of Nuclear Medicine and Molecular Imaging, Department of Radiology, Boston Children's Hospital, Boston, MA

For correspondence or reprints contact:

Beth A. Harkness

Department of Radiology

Henry Ford Hospital\Detroit, MI

Email: bethh@rad.hfh.edu

Phone: 313-916-4338

Fax: 313-916-1087

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The Society of Nuclear Medicine and Molecular Imaging and the American Association of physicists in Medicine (AAPM) decided in 2012 to establish a joint task force to review state of nuclear medicine physics training and to assess what may need to be done to improve nuclear medicine physics training opportunities in the future. The mission of this task force was to assemble a group of stakeholders in nuclear medicine and medical physics to:

- Estimate the demand for board-certified nuclear medicine physicists in the next 5–10 years,
- Identify the critical issues related to supplying an adequate number of physicists who have received the appropriate level of training in nuclear medicine physics, and
- Identify approaches that may be considered to facilitate the training of nuclear medicine physicists.

The chair of the task force was active within both the SNMMI and the AAPM. Other members of the task force included representatives from the SNMMI, the AAPM, the American Board of Science in Nuclear Medicine (ABSNM), the American Board of Radiology (ABR) and the Commission for the Accreditation of Medical Physics Educational Programs (CAMPEP which accredits medical physics educational programs). The task force first met face-to-face in July 2012. Over the next 2 years, the task force met regularly by both face-to-face meetings and conference calls as well as communicating via email.

The task force delivered its final report in 2014 which was approved by the Boards of Directors of both organizations. The final report was recently published as a white paper in the Journal of Applied Clinical Medical Physics (*1*). This commentary will summarize the findings of the final report. However, readers are encouraged to review the full report.

Since the earliest days of nuclear medicine, the physicist has been an essential member of the development and clinical nuclear medicine team. The construction and implementation of nuclear medicine instrumentation and the development of clinical protocols has relied on the collaboration between the physician and the physicist. The nuclear medicine physicist has a strong understanding of physics and physiology and is expert in the instrumentation for measurement and imaging of radiopharmaceuticals and dosimetry for diagnostic and therapeutic procedures. The nuclear medicine physicist is responsible for devising and maintaining an appropriate quality assurance program for all imaging and non-imaging equipment within nuclear medicine. This includes hybrid devices that have incorporated computed tomography and magnetic resonance into the PET scanner or gamma camera. It is essential that the nuclear medicine physicist have a basic understanding of physiology and molecular processes due to the functional nature of nuclear medicine. It is also important that the nuclear

medicine physicist comprehend the physical and dosimetric aspects of radionuclide therapy. The well-trained diagnostic medical physicist may have a very good, basic understanding of nuclear medicine physics with some overlap in the skill sets of the two types of physicist. However, nuclear medicine physics includes aspects that are unique and essential that may not be routinely covered within diagnostic imaging training.

The current workforce of nuclear medicine physicists within the US was reviewed. Sources that were reviewed included the SNMMI membership database, the CRCPD database of certified medical physicists and the findings of the professional survey performed by the AAPM for 2012. The conclusions of this evaluation were that, in the US, nuclear medicine physicists comprise less than 10% of the total number of qualified medical physicists and the number of nuclear medicine physicists is estimated to be between 350 to 450. It was estimated that there are less than 60 individuals that classify themselves as primarily a nuclear medicine physicist.

Two organizations provide certification for nuclear medicine physicists in the US, the American Board of Radiology (ABR) and the American Board of Science in Nuclear Medicine (ABSNM). For ABR certification, potential diplomates are required to pass a 3-part examination. The ABR reviews the training and experience of their applicants before allowing them to sit for the exam. Since 2014, this has included the completion of a medical physics residency program. The ABR also requires participation in their Maintenance of Certification (MOC) program. Thirty-seven medical physicists were certified in Nuclear Medical Physics by the ABR between 2010 and 2014. For ABSNM certification in Nuclear Physics and Instrumentation, candidates must pass a 2-part examination. The ABSNM also has certain training and experience requirements that applicants must meet prior to being allowed to sit the exam. However, at present, there is no ABSNM requirement for the completion of a nuclear medical physics residency. As of January 1, 2015, the ABSNM has an approved MOC policy. Thirty-four physicists were certified in Nuclear Physics and Instrumentation by the ABSNM between 2010 and 2014.

Due to the small number of nuclear medicine physicists that are currently certified and their mean age, there is a critical need for medical physics residency programs accredited by CAMPEP that can provide clinical training in nuclear medicine physics. A number of models for medical physics residency training including two-year programs in nuclear medicine physics, completing an addition year in nuclear medicine physics following the completion of an imaging medical physics residency and the completion of a doctor of medical physics (DMP) degree program. There is also a “hub and spoke” model where a central site provides administration for the program while the residents can receive instruction at associated sites. Currently, there are 11 imaging medical physics residency programs

listed on the CAMPEP website providing 10-15 residency slots within North America. At this time, no programs exist that are specifically nuclear medicine physics residencies. However, there are a number of imaging residency programs that allow residents to choose to concentrate in nuclear medicine physics after their first year of a two-year program making them eligible to sit for the ABR certification exam in nuclear medical physics.

To encourage new or existing imaging residencies to expand their programs to include nuclear medicine physics training, the SNMMI has awarded 2 nuclear medicine physics residency training grants in 2104 and 2015, each of which supported the training of a nuclear medicine physics resident. Building on the success of this program, the AAPM and SNMMI have partnered on a joint nuclear medicine training residency program in 2016 that will support two programs for two years. Details of this program are available on the AAPM (www.aapm.org) and SNMMI (www.snmmi.org) websites.

The Joint AAPM-SNMMI Task Force has studied the training needs for nuclear medicine physicists. As a result of this evaluation, the recommendations of the Joint AAPM-SNMMI Task Force are:

1. This report should be provided as a guidance document for future efforts. At a minimum, this report should be distributed to the relevant professional societies (AAPM, SNMMI, COMP) as well as certifying (ABR, ABSNM, CAMPEP, ABMP, CCPM) and accreditation bodies (ACR, IAC, Joint Commission).
2. This report should also be made widely available to interested individuals, perhaps through the websites of the above professional organizations.
3. All nuclear medicine physics certifying bodies should incorporate formal residency training as a requirement for board certification as well as a maintenance of certification program.
4. The Joint Task Force reviewed current data regarding the state of the field, but was not able to provide an evaluation of future needs. Therefore, a nuclear medicine physics work force committee should be formed to evaluate future needs in the field, perhaps under the AAPM Work Force Assessment Committee.
5. Relevant professional organizations should continue to fund residency training in nuclear medicine physics to encourage new and established imaging residency programs to incorporate nuclear medicine physics training into their programs.

The above recommendations are based on a combination of several factors:

a. the high median age of qualified nuclear medicine physicists
b. the poorly understood training and certification processes
c. the shortage of formal training programs

Professional organizations such as the AAPM and, most importantly, the SNMMI, as well as others, must continue to support the training of nuclear medicine physicists and continue to evaluate the needs of the field in a changing clinical and professional environment. To remain a vital and progressive field, nuclear medicine needs well-trained medical physicists to meet the complex requirements of quality patient care and to advance the field. If there are not enough qualified nuclear medicine physicists, nuclear medicine as a whole will see a negative impact.

REFERENCE

Harkness BA, Allison JD, Clements JB et al. AAPM/SNMMI Joint Task Force: report on the current state of nuclear medicine physics training. *J Applied Clin Med Phys*. 2015;16(5):3-13.

Table 1. The Joint AAPM-SNMMI Task Force of Nuclear Medicine Training

Member	Organization	Place of Business
Beth A. Harkness, Chair	AAPM/SNMMI	Henry Ford Hospital, Detroit, MI
Jerry D. Allison	ABR	Georgia Regents Univ, Augusta, GA
Jessica B. Clements	AAPM	California Permanente Medical Group, Los Angeles, CA
Charles W. Coffey	CAMPEP	Vanderbilt University, Nashville, TN
Frederic H. Fahey	SNMMI	Boston Children's Hospital, Boston, MA
Dustin A. Gress	AAPM	MD Anderson Cancer Center, Houston, TX
Paul E. Kinahan		University of Washington, Seattle, WA
Edward L. Nickoloff	AAPM	Columbia University, New York, NY
Osama R. Mawlawi	ABSNM	MD Anderson Cancer Center, Houston, TX
Robert D. MacDougall		Boston Children's Hospital, Boston, MA
Robert J. Pizzuitello	AAPM	Upstate Medical Physics, Victor, NY