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NMAA: Past, Present, and Future

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A new pathway for the nuclear medicine technologist (NMT) was created with the advent of the Nuclear Medicine Advanced Associate (NMAA). The NMAA pathway expands the scope of practice or roles and responsibilities for NMTs interested in advanced clinical skills and seeking more responsibility in the clinical setting. The clinical expectations and competencies for the NMAA are based on the existing scope of practice, knowledge base, and clinical skills expected of other lateral middle-level providers, primarily physician assistants, radiologist assistants, and nurse practitioners. The primary goal of the NMAA profession is to provide qualified and competent physician extenders to improve and enhance the overall quality of care provided to patients receiving nuclear medicine services.

NMAAs are required to demonstrate a high level of autonomy, technical sophistication, advanced clinical knowledge, and strong critical thinking and decision-making skills. NMAA programs are seeking highly capable and motivated professionals comfortable with the sciences and looking for increased clinical responsibilities and education at an advanced-degree level. NMAAs are projected to work in general nuclear medicine settings and in specialty settings such as oncology and cardiology. The scope of practice for the NMAA is anticipated to subsume many of the patient care and managerial functions currently provided by a wide array of ancillary personnel and will also include the advanced knowledge and skills of the practicing NMT (*1*). Additionally, the NMAA may assume certain physician tasks under the discretion of the overseeing radiologist or attending physician.

Candidates for NMAA programs will be credentialed by the Nuclear Medicine Technology Certification Board and have clinical practice experience deemed appropriate by institutional admissions committees. The certification board will provide an examination for the credentialing of advanced imaging practitioners starting in June 2011 (*2*).

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HISTORY

The British Institute of Radiology initiated advanced practice in imaging sciences (radiography, nuclear medicine, and sonography) and has over 10 y of experience in the United Kingdom (*3*). The role and development of advanced practice in the United Kingdom piqued the interest of Society of Nuclear Medicine Technologist Section (SNMTS) leadership in the United States. In 1999, Martha Pickett, CNMT, FSNMTS, a past president of the SNMTS, gave a presentation at the Society of Nuclear Medicine (SNM) Southwest Chapter meeting to gather initial technologist feedback before exploring an advanced-practice pathway for NMTs in the United States. Because the response from the audience was so positive, a detailed SNMTS survey was created and mailed to technologist members. The results of this survey were published in the December 2000 issue of the *Journal of Nuclear Medicine Technology* (*4*). Conclusions indicated that the surveyed NMTs were routinely performing duties that exceeded the current scope of practice. Table 1 (*4*) [**Table 1**] lists the clinical tasks and levels of formal training identified as exceeding the scope of practice for current NMTs. Surprisingly, 63.8% were requested by a physician to provide an interpretation of a nuclear medicine procedure and 22.3% had administered morphine. In addition, 62% of the respondents indicated there was a need for the advanced-level NMT and 78% indicated the position would be helpful. The technologist survey was a clear indicator for the need for and interest in proceeding with the development of an NMT advanced-practice model in the United States. During these early discussions and surveys, the title of this profession was Nuclear Medicine Practitioner. After several iterations and discussions with the American College of Radiology, the Nuclear Medicine Practitioner title was changed to Nuclear Medicine Advanced Associate, thus the NMAA designation.

In 2005, a survey was sent to 1,500 physicians from the American Society of Nuclear Cardiology, American College of Nuclear Physicians, and American College of Radiology to assess physician support and intent (*5*). The results of this survey were as follows: 72.5% of the respondents thought that the NMAA would be helpful in performing exercise stress tests; 50.7%, in performing and interpreting electrocardiography; 83%, in being certified to provide advanced cardiac life support, 53%, in freeing up a radiologist, nuclear medicine physician, or cardiologist; 61.6%, in improving efficiency, especially in busy depart-

TABLE 1
Performance of Clinical Tasks and Level of Formal Training to Perform These Tasks

Clinical task	Has performed	Formally trained
Administered furosemide	62.0%	9.6%
Administered angiotensin-converting enzyme inhibitors	41.5%	6.4%
Administered dipyridamole or adenosine	59.6%	13.8%
Administered morphine	22.3%	3.2%
Administered cholecystokinin	69.1%	8.5%
Administered acetazolamide	15.9%	6.3%
Monitored glucose levels of patients undergoing PET studies	13.8%	3.2%
Performed cardiac stress testing	23.4%	2.1%
Obtained informed consent from patients	47.9%	10.6%
Provided limited patient physical examination such as for thyroid or breast imaging	26.6%	9.6%
Performed electrocardiography on patients	43.6%	21.3%
Interpreted electrocardiograms	13.8%	8.5%
Monitored patients under conscious sedation	23.4%	4.3%
Performed urinary catheterization on patients	11.7%	9.6%
Interpreted a nuclear medicine result (on physician request)	63.8%	7.4%

ments; and 64%, in being available when the direct presence of a physician is not possible.

On the basis of the results of the technologist and physician surveys, the SNMTS Advance Practice Task Force prepared a position paper that was published in the December 2006 issue of the *Journal of Nuclear Medicine Technology* (*5*). This paper addressed education and training issues. The next step was the development of a curriculum and competency standards. In 2008, the *Nuclear Medicine Advanced Associate Curriculum Guide* was developed by the SNMTS Advance Practice Task Force (*6*). Members of this task force included technologists, nurses, educators, pharmacists, and physicians. The 146-page curriculum reflects many of the guidelines of the Accreditation Council for Graduate Medical Education and outlines the learning objectives for the NMAA. Areas of focus include patient care, clinical nuclear medicine, interpersonal and communication skills, professionalism, practice improvement, and system-based practice. Also included are specific appendices from the American Society of Radiology Technologists on educational curricula for patient assessment, management and education, pathophysiology, pharmacology, and contrast media. In 2007, clinical competencies were established from the areas of education being created in the draft of the curriculum guide (*7*). In February 2010, with the adoption of the NMAA competencies and curriculum, the NMAA scope of practice was approved by the National Council of Representatives and the SNMTS Executive Board (*1*). This document outlines the guidelines or boundaries for what the NMAA should be able to perform with the additional education.

The vision and persistence of Martha Pickett and numerous members of the SNM and SNMTS created the foundation for the start of the NMAA profession in the United States.

THE FIRST NMAA PROGRAM

In 2004, Martha Pickett from the University of Arkansas Medical Sciences (UAMS) and William Hubble from Saint Louis University, original members of the SNMTS Advance Practice Task Force, began discussions on starting the first NMAA program in the United States. Pickett recommended using a consortium model developed at the UAMS for its genetics program. A consortium is an agreement, combination, or group formed to undertake an enterprise beyond the resources of any one member. The advantages of this model allow participants to pool their human, financial, and physical resources. A program becomes more viable when one institution pools resources with others rather than trying to develop it alone. An increased economy of scale and economy of scope is also recognized with consortium-based programs and is especially attractive for institutions with low student enrollments and limited resources. Economy of scope is the result of the increase in geographical presence that members have when participating campuses are located in different parts of the country. A consortium model takes 2 different forms, one being a centralized model (host institution and members) and the other being a decentralized model (independent hosts with shared contractual educational content). The UAMS was prepared to offer the program solo but was willing to participate in the consortium if other universities were interested.

In 2005, representatives from the nuclear medicine programs at UAMS, Saint Louis University, and the University of Missouri–Columbia met in St. Louis to form a centralized consortium. The initial agreement was drafted with Martha Pickett, William Hubble, and Glenn Heggie as representatives from each university. Rebecca Ludwig from the UAMS was also present to assist in transforming the genetics program consortium to meet the needs of the new consortium. The meeting was productive, and the title of

the first consortium-based NMAA program was decided to be Nuclear Imaging Consortium for Education. After meetings took place at each of the participating campuses, the program began to take shape. The Nuclear Imaging Consortium for Education was to be implemented in a fashion parallel to that of the existing radiologist assistant program and be offered in a graduate-friendly format. This format included minimal course prerequisites, part-time or full-time enrollment, ability to complete clinical activities as part of the work day (if permitted by the employer), and online delivery of the didactic course work with few campus visits. UAMS was designated as the host organization of the consortium, and Saint Louis University and University of Missouri–Columbia were designated as contributing members. Students would enroll at the UAMS, and the members would support the program with additional academic, clinical, and administrative support services. The degree would be granted by the UAMS. Martha Pickett was designated as the program director. The complexity of an agreement that satisfies the legal needs of 3 separate universities was daunting. Finally, in late 2008, an agreement was signed and the group established the first NMAA program.

In 2009, 6 students were accepted from across the United States and the course work was approved. The course work included a 22-mo curriculum using a competency-based model in which responsibilities and functions are defined by clinical competencies integrated with physician interaction and supervision. The application requirements included an earned bachelor degree, Graduate Record Examination score, and Advanced Cardiac Life Support certification. Applicants needed a minimum of 2 y of full-time nuclear medicine experience within the previous 3 y, references, a clinical affiliation, and most significantly, a physician preceptor. At completion of the program, graduates would be granted a Master of Imaging Science from the Department of Imaging and Radiation Sciences at UAMS. A sample of the curriculum is on the UAMS Web site (www.uams.edu/chrp/nuclearadvanced/program.asp).

The students who enrolled in the first class were aware of the challenges and obstacles they would face by being the pioneers entering this profession. The first year presented many challenges that any new profession must face, without existing NMAAs to teach and orchestrate instruction. The didactic courses were taught online with Blackboard (Blackboard Inc.), a common online educational tool. Each of the consortium members provided course work instructions. WIMBA (Blackboard Inc.), collaborative learning software, was used for online conferencing for real-time class discussions. The fact that students were from different time zones presented challenges for live conference calls. However, WIMBA allows recording and archiving of presentations for review at a later time. It quickly became evident that a physician preceptor is a critical component for ensuring the quality of clinical education for the NMAA interns. The physician preceptor provides the interns with the clinical skill sets necessary to perform the many advanced duties assigned to them. Physician preceptors have to be available and approachable, because they are directly engaged in the training of the NMAA intern. To improve future classes, the pioneer NMAA interns identified areas of deficiencies in the program. Clinical affiliations were added to the NMAA program to provide clinical training that did not exist in the NMAA's current clinical setting. NMAA students stated that this pathway did provide them the opportunity to expand their skills in the clinical site. Enrollment in the program provided a pathway for NMAAs to legitimately perform many of the clinical skills identified in the 2005 survey of NMTs. Increased interest in the program led to an enrollment of 10 students in the fall of 2010. Martha Picket retired in May 2010, and Jim Bellamy, of the UAMS faculty, assumed her role as director of the program. The Medical College of Georgia was added as a consortium member in the fall of 2010.

CREATION OF THE ADVANCED ASSOCIATE COUNCIL

Mark Wallenmeyer, a past president of the SNMTS, initiated the process for transition of the SNMTS Advanced Practice Task Force or NMAA committee to the first technologist council, the Advanced Associate Council. With the approval of SNM and SNMTS leadership in 2010, the NMAA committee transitioned to the Advanced Associate Council in October 2010. William Hubble was elected as the first president of the NMAA council. The council's mission is to assist those interested in developing a NMAA program at their facility and to support the practice and policy needs of the NMAA and other areas of technologist advanced practice, as well as to assist with activities associated with nurturing and growing the NMAA profession, including effecting the necessary culture change to allow this designation to function properly. The council has an SNM Web site (www.snm.org/aa) that contains documents, presentation material, white papers, curriculum guides, and other support for members wishing to find out more about the NMAA profession.

CONCLUSION

The development and acceptance of the NMAA profession in the clinic and by stakeholders is an ongoing process. The support of the Nuclear Medicine Technology Certification Board to provide certification in 2011 is significant. Continuing education programs for NMAA graduates are being developed. SNMTS leadership has been working with the American College of Radiology for approval of the NMAA, and the roles and responsibility have been sent to them for approval in 2011. State licensure will take significant commitments by members of the SNMTS and the NMAA graduates. Accreditation for NMAA programs needs to be established and has been discussed with the Joint Review Committee on Educational Programs in Nuclear Medicine Technology. The council is seeking grant funding to encourage the initiation of additional NMAA programs. The pathway that NMAA creates for NMTs is critical for the advancement of the profession. It

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was the belief of the NMAA founders that NMTs would make the best physician extenders for patients and clinics.

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REFERENCES

1. NMAA Scope of Practice Task Force. *SNMTS Scope of Practice for the Nuclear Medicine Advanced Associate.* Reston, VA: Society of Nuclear Medicine; 2009.
2. Perry D. NMTCB report. *J Nucl Med Technol.* 2010;38:15A–16A.
3. Pickett M. Advanced practice in nuclear medicine: a pathway to clinical leadership. *J Nucl Med Technol.* 2007;35:13A–14A.
4. Pickett MW, Waterstram-Rich K, Turner LW. The future of nuclear medicine technology: are we ready for advanced practice? *J Nucl Med Technol.* 2000;28: 280–286.
5. SNMTS Advance Practice Task Force. Position paper on the development of a middle level provider in nuclear medicine: the nuclear medicine practitioner. *J Nucl Med Technol.* 2006;34:236–243.
6. SNMTS Advance Practice Task Force. *Nuclear Medicine Advanced Associate Curriculum Guide.* Reston, VA: Society of Nuclear Medicine; 2008.
7. SNMTS Advance Practice Task Force. Nuclear medicine practitioner competencies. *J Nucl Med Technol.* 2007;35:39–41.