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# Nuclear Medicine Technologists in the U.S.: Findings from a 2005 Survey

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*The Center for Health Workforce Studies of the University at Albany has recently completed an analysis of the nuclear medicine technologist (NMT) workforce, part of a series of studies commissioned by SNM. The final 158-page report from this survey is now posted under the RESEARCH AND DATA link on the SNM Web site ([www.snm.org](http://www.snm.org)), freely available to all interested parties. The executive summary of this report and the preface to the complete document are published here in their entirety.*

## Preface

**I**n the fall of 2005 the Center for Health Workforce Studies (the Center), under a contract with the Society of Nuclear Medicine (SNM), conducted a survey of nuclear medicine technologists to learn about their demographic characteristics, education, employment, career paths, and attitudes about their profession. This report summarizes the survey responses and presents a variety of insights about the profession.

This report is the second of a series of six to be produced by this major study of the nuclear medicine workforce. The initial report, prepared in 2005, was based solely on then existing sources of data and information about nuclear medicine. Subsequent reports will be prepared on a national survey of nuclear medicine scientists conducted in the spring of 2006, a national survey of physicians involved in nuclear medicine planned for early 2007, national surveys of nuclear medicine educators and students conducted in 2006 and 2007, and a final report synthesizing the findings and conclusions from the several component reports and presenting a series of recommendations about both the field of nuclear medicine and the several nuclear medicine professions.

The report was prepared by Margaret Langelier and Paul Wing of the Center staff, with assistance from Ajita De. The authors acknowledge the contributions of Joanna Spahr, the project officer from SNM, to both the survey and the report. The contributions of the study advisory committee, chaired by Anthony Knight, are also gratefully acknowledged. Responsibility for the accuracy of the report rests solely with the authors.

The Center was established in 1996 to collect, analyze, and present data about health care workers to inform provider, professional, government, and education organi-

zations; policy makers; and the public. Today, the Center is a national leader in the field of health workforce studies. It supports and improves health workforce planning and access to quality health care through its capacity to collect, track, evaluate, and disseminate information about health care personnel at the national, state, and local levels. Additional information about the Center can be found on its website, <http://chws.albany.edu>.

Questions about this report, the larger study, or the Center can be directed to Ms. Langelier or Dr. Wing at 518-402-0250.

## Executive Summary

**N**uclear medicine (NM) is a small but important component of the larger field of medical imaging. Through a complex mix of scientific principles, technological devices, and skilled professionals, NM is having a disproportionate influence on the diagnosis and treatment of a growing number of illnesses and diseases. For some specialties like cardiology and oncology, the impact of NM is nothing short of a major paradigm shift.

This report summarizes the responses to a 2005 survey of practicing nuclear medicine technologists (NMTs), one of several professionals responsible for this transformation of both medical imaging and medical practice more generally. The report describes the demographic characteristics, education and training, licensure patterns, current employment, career paths, and work environment of these front-line professionals.

## THE 2005 SURVEY

The 2005 survey of NMTs was stimulated in large part by concerns that the profession must learn more about itself

in order to respond to the changes taking place in both the NM field and the NMT profession. This concern resulted in a survey of a stratified random sample of 4,000 of the 21,245 NMTs certified by NMTCB or ARRT in 2005. With over 2,200 responses to 60 questions about all aspects of the profession, this survey provides the most comprehensive picture of the NMTs ever developed. Table A-1 in Appendix A (see full survey report online) shows the total numbers of registered NMTs in the fifty states, along with the numbers of NMTs sampled in the 2005 survey and the numbers of respondents. A copy of the survey instrument is provided in Appendix B (see full survey report online).

The process of conducting the survey revealed some interesting insights about the “geographic penetration” of the NMT profession across the U.S. In terms of numbers of certified NMTs per million population in the fifty states and the District of Columbia, the profession has an extremely wide range of NMT to population ratios across the fifty states. At the high end of the spectrum are Nebraska (250 NMTs per million population), South Dakota (160), and West Virginia (143), and at the low end are Oklahoma (6.0), Nevada (7.7), and the District of Columbia (23).

Although there is nothing wrong, per se, with having either a very high or very low ratio of NMTs per capita, it is important to recognize that states with very low ratios raise questions about the need for the profession. The fact that Nevada has a total of only 18 certified NMTs raises questions about whether other professionals are substituting for NMTs, or even if NM procedures are being conducted in Nevada. These and other questions raise doubts about the need for NMTs that undercut the status of the profession.

## KEY FINDINGS

The NMT profession is by most standards in excellent shape. Job satisfaction is high. Salaries are near the top of the scale for professions with similar educational requirements. The field of NM is poised for continuing growth and change. The future looks bright indeed.

That said, there are also reasons for concern, perhaps none more important than the under-appreciation by some in the profession of the risks of being left behind as the field of NM and medical imaging more generally continue to evolve and transform. Especially important risks are those related to new technologies. Fusion imaging technologies seem certain to take over from the multiple machine imaging modalities typically in place today. If NMTs do not acquire traditional imaging skills and certifications to complement their NM skills, radiologic technologists (RTs) and other hybrid professionals will increasingly be asked to perform tasks now reserved for NMTs.

NMTs also must be aware of the shift in the locus of NM services also taking place. As is true for many imaging modalities, NM is shifting out of hospitals into ambulatory facilities. It is also shifting away from NM physicians toward cardiologists, oncologists, and other specialists who

are becoming increasingly reliant on NM for both diagnostic and therapeutic purposes.

Some of the findings from the 2005 survey most relevant to the future of the NMT profession are provided below. The statistics provided are based on the responses to the survey by respondents who indicated they were active in NM.

## DEMOGRAPHICS

Demographic characteristics provide important insights about the composition and diversity of the NMT workforce as of 2005.

- Active NMTs were 64.4% female and 83.7% White (non-Hispanic). This was over-representation relative to the US general population (51.0% female and 74.7% White) in 2004 [American FactFinder, 2005]. Although the profession is not racially or ethnically diverse, it is gender diverse compared to most allied health professions.
- The mean age of active NMTs was 43.5 years and the median age was 44. This was older than the median age of the civilian labor force in 2004, which was 40.3 years [Toossi, 2005 (<http://www.bls.gov/opub/mlr/2005/11/art3exc.htm>)].
- Nearly one-third (32.9%) of active NMTs reported that they were 50 and older. This has important implications for future retirement patterns of NMTs, which will place additional pressure on education programs to prepare replacement workers compared to many health professions.

## EDUCATION

The educational background of the NMT profession helps clarify the knowledge, sophistication, and skill sets its members bring to the workplace.

- The percentages of active NMTs with associate degrees and bachelor's degrees at entry into the NMT profession were 29% and 31%, respectively.
- Five of eight (62.6%) of currently practicing NMTs entered their NMT education program with a prior college degree. This suggests the importance of maintaining certificate pathways or bachelor programs with articulated pathways to the profession for those with prior academic education.
- The percentage of active NMTs with college degrees was also high. More than nine out of ten (92.3%) indicated they had completed some college education, and nearly half (49.5%) had a bachelor's degree. Although this level of education is currently adequate for acquiring the knowledge and skills necessary for effective NMT employment, the lack of a consistent entry-level education is problematic for professionalization. It has been shown in many health professions

that not having a consistent educational standard undercuts the reputation of the profession, sometimes excluding practitioners from important policy discussions.

- The lack of graduate education for the NMT profession is a concern in light of efforts to move the profession into advanced practice. The experiences of other professions suggest that regulatory boards and legislators expect advanced education levels when asked to approve licensing for advanced practice professionals.
- Nearly a third (29.2%) of active NMTs expected to pursue further academic education. This is not surprising given the complexity and rapid evolution of the field of NM.

## CERTIFICATION AND LICENSURE

In some states, certification is required to work as a NMT. A vast majority of active NMTs were certified by NMTCB and about a half had RT(N) certification from ARRT.

- Most (88.2%) of active NMTs were CNMT-certified. Half (50.1%) of them carried an RT(N) certification and 2.2% had an ASCP(NM) certification. About 39% were dually certified by the Nuclear Medicine Technology Certification Board and the American Registry of Radiologic Technologists and therefore had CNMT and RT(N) credentials.
- About three of eight (37.7%) active NMTs were licensed in another allied health profession or had other imaging certifications. Only about one in 20 (5.1%) reported having other certifications such as PET and PET/CT.
- Fewer than 70% of active NMTs indicated that the state in which they worked requires a license. This lack of licensure undercuts the professional standing of the NMT profession, especially in those states not requiring licensure, but also in other states as well.

## PRIMARY AND SECONDARY EMPLOYMENT

As might be expected, many NMTs work in inpatient hospital settings, but a high percentage of NMTs also practice in outpatient settings. Cardiology Specialty Centers were the primary employer of almost 16% of the active NMTs responding to the survey.

- More than half of actively practicing NMTs (54.8%) indicated that their primary work setting was a Hospital/Medical Center, and 15.9% indicated that their primary work setting was a Cardiology Specialty Center.
- The most common secondary work settings were also Hospital/Medical Center (35.7%), and Cardiology Specialty Centers (17.0%).

- There was a strong emphasis on clinical NM in the primary employment of active NMTs. The percentage of active NMTs providing only clinical services was similarly distributed across settings. Cardiology Specialty Centers had the highest percentage (76.5%) of NMTs providing full-time clinical services followed closely by the Academic Medical Centers (71.8%) and Hospital/Medical Centers (69.0%). Mobile units had the lowest percentage (59.4%) of NMTs providing full-time clinical services.

## WORK IN DIFFERENT IMAGING MODALITIES

General NM studies represented the bulk of services provided by NMTs. Only a small percentage of NMTs worked almost or full time in a specialized NM modality.

Active NMTs spent most of their time providing NM services, with 74.6% spending 100% of their time in NM. Only a few (4.6%) spent all of their time working in other modalities such as PET. Of the small number working in other modalities, only 2.0% spent all their working time in SPECT/CT and 5.2% in PET/CT.

## SALARIES

Salaries for NMTs are high relative to similar health professions. NMTs working in fusion hardware imaging modalities earned higher salaries overall than NMTs working in general NM. NMTs working in PET/CT command the highest salaries among NMTs providing imaging services. There were both regional and gender variations in salary levels. Most of the salaries reported below were total salaries including salary from call. A few are base salaries only.

- The mean total annual salary of full-time active NMTs (i.e., working more than 30 hours per week, including wages from call) was \$70,470 and the median was \$67,000. This difference can be explained by a number of outliers with high salaries who pulled the mean upward. This mean total salary was somewhat higher than the mean of \$67,429 from the ASRT Wage and Salary Survey for 2004. It was also higher than the mean annual salary of \$60,530 for NMTs reported by BLS for 2005, which was based only on salaries associated with individual jobs, not individual workers, some of whom have multiple jobs.
- There was a wide range in the total annual salary levels of the top and bottom percentiles of the respondents. The top 10% of the full time working NMTs earned \$93,000 or more annually while the bottom 10% earned \$42,000 or less in a year.
- Active NMTs working in fusion imaging modalities earned higher base salaries than NMTs working in General NM. Those who spent more than 75% of their time in PET had the highest mean annual base salary (\$68,870), followed by PET/CT (\$68,120). Those who

spent more than 75% of time in SPECT/CT earned less (\$53,450). Those in General NM earned \$59,350.

- The mean total annual salary for full time male NMTs (\$76,270) was greater than the mean total annual salary for full time female NMTs (\$66,380). This gender gap in salaries was reduced but not eliminated by controlling for other factors (e.g., age, education level, etc.).
- Mean total salaries in the Western U.S. [Region 9](\$82,890), in the Mid-Atlantic [Region 2] (\$71,260), in the Pacific Northwest [Region 10](\$71,020) and in New England [Region 1] (\$70,670) were higher than in other regions of the U.S. The lowest mean salaries were found in the Mountain Region [Region 8] (\$60,690) and Mid-West [Region 5] (\$63,210).

## **FUTURE PLANS**

The majority of active NMTs expected to remain in their current position over the next five years. A majority also indicated that they will need further training in order to continue in those positions.

- Six out of ten (60.5%) of active NMTs expected to remain in their current position for the next five years, while 6.1% expected to retire over the coming five years, 4.1% expected to seek another job outside the NM profession, and 3.5% expected to leave clinical NM.
- A majority (53.3%) of active NMTs reported that further training will be necessary to continue to work in NM in the future. Nearly one in five (19.5%) indicated they will need CT training; 37.7% indicated PET/CT; 13.1% indicated SPECT/CT; 3.0% indicated MRI training; 1.2% indicated Mammography/PET; and 4.9% indicated 'Other'. [The sum of the parts exceeds 53.3% because multiple responses were provided.]

## **JOB SATISFACTION**

Job satisfaction among active NMTs is very high. Although there is a high satisfaction index, there are aspects of NMT jobs that would benefit from change.

- The job satisfaction of active NMTs was very high. Nearly 19 out of 20 (94%) of working NMTs were very satisfied or somewhat satisfied with their jobs. A majority (53.7%) were very satisfied.
- Analysis of job satisfaction by imaging modality showed that similar percentages of active NMTs in the different modalities were very or somewhat satisfied in their current job.

## **CHANGES NEEDED TO CREATE GREATER JOB SATISFACTION**

Although the level of job satisfaction of NMTs was very high, 75% of working NMTs indicated that some change in

their job would increase their level of satisfaction. The most cited changes were higher pay and new equipment. Higher Pay was rated by NMTs in all the different work settings as the change that would bring the most job satisfaction to them.

## **THE JOB MARKET FOR NMTs**

About half of active NMTs indicated there were sufficient jobs for NMTs in their local area. However, there were regional differences in the appraisal of job availability.

- When asked to appraise the employment market in their local area, 52.5% of active NMTs indicated that there were sufficient jobs for NMTs; 18.5% indicated that there were more jobs than NMTs; and 29% indicated that there were too few jobs for NMTs.
- A regional analysis of the responses revealed that New England had the highest percentage (35.6%) of NMTs indicating that there were 'more jobs than NMTs' in their local areas and the Mountain Region had the highest percentage (43.6%) of NMTs indicating that there were 'too few jobs for NMTs' in their local area.

## **PERCEPTION OF EMPLOYER PREFERENCES**

Employers of NMTs indicated a preference for experienced NMTs over newly certified NMTs with training in fusion technologies.

Nearly nine of ten (88.8%) of active NMTs reported that employers prefer to hire experienced technologists as compared to 11.2% that indicated that employers prefer to hire newly certified NMTs with training in fusion technologies.

## **CHANGES IN THE WORKPLACE AFFECTING NMTs**

Among NMTs who reported changes in the workplace affecting their roles and functions, the most cited reason was the introduction of new equipment resulting in changing responsibilities.

About one in four (24.1% [n=416]) of active NMTs reported changes occurring in the workplace that were affecting their work. The most common (with 49.1% of those indicating a change was affecting the workplace) was that new equipment was changing responsibilities of NMTs. Other changes cited often were changes in workflow affecting the types of personnel working in NM (37.7%), and NMTs working with physicians other than NM physicians (35.1%). The least cited change (at 7.4%) was that NMTs were working more closely with radiation therapists.

## **THINGS LIKED AND DISLIKED ABOUT NUCLEAR MEDICINE**

NMTs indicated that salary and fringe benefits and pride in the NM profession were the primary reasons for working in

the profession. The most dissatisfying aspects of work for NMTs were that management does not foster a positive work environment and the lack of opportunity for advancement.

- When asked to rank the top three reasons for working in nuclear medicine, the most frequently selected response was ‘salary and fringe benefits’, followed by ‘pride in the NM profession’.
- ‘Salary and fringe benefits’ was rated highest in all settings except academic medical centers, which rated ‘positive patient interaction’ as the highest rated reason why NMTs work in NM.
- Nearly half (47.2%) of the active NMTs indicated that there were aspects of their work that were dissatisfying. Respondents in most settings rated ‘Management does not foster a positive work environment’ as the most dissatisfying factor, followed by ‘There are no opportunities for advancement’.

## RECOMMENDATIONS

Three classes of recommendations are provided below, one for individual NMTs, one for the NMT profession more generally, and one for SNM. These recommendations flow primarily from the survey responses, including the open-ended comments presented in Appendix C (see full survey report online), but are supplemented by conversations with practitioners and leaders in the NMT profession.

The recommendations are based in part on the impressions of the authors that the NMT profession and its related education programs appear to be somewhat complacent about the future. Major transformations of NM—including all NM professions—seem very likely over the next five to ten years. If nothing is done to ensure an orderly transition into the future, there is a real risk that individual NMTs, the NMT profession more generally, and the Society for Nuclear Medicine may lose some of their current control over the future of their profession.

### Individual NMTs

- Support the activities of SNM to upgrade the minimum education requirements for NMT certification to the bachelor’s degree at entry level. This will enhance future opportunities for professional advancement. It will recognize the time and effort required for NMTs to acquire the extensive scientific and clinical knowledge and skill sets needed in their professional practice. The high number of NMTs already holding college degrees suggests demand for academic education in the professional environment. Further, the large percentage of active NMTs expecting to pursue academic education in the future is also an indication of demand in work environments for higher levels of education, probably at the bachelor’s level. Many active NMTs cited the need for further professional education to remain in their current jobs. This

suggests that current NMT education may be inadequate to support the requirements of future employment. New technologies may be driving this demand as some imaging modalities require an understanding of cross sectional anatomy and cross sectional imaging to effectively operate the equipment. Current academic curricula must change to accommodate the suggested demand. New technologies must also be considered when any alteration to professional educational preparation is made.

Another reason for migrating entry-level education to the bachelor’s level is that a number of NMTs indicate that they are in management/supervisory positions in their workplaces. Supervisory positions require knowledge and skills beyond the clinical curriculum that could be incorporated into a bachelor’s degree course of study.

Although not a primary reason for changing the entry-level academic requirement for the NMT profession, many allied health professions are migrating entry-level education to the bachelor’s level. This is necessary for any health profession attempting to create career ladders for professionals through advanced practice at the master’s level.

Many individuals come to the NMT profession with previous academic education and health care experience. In determining academic requirements, consideration must be given to maintenance of post bachelor’s certificate programs or articulated bachelor degree programs that provide credit for previous education and experience.

- It is important to encourage use of the newly established CT and/or MRI certification processes for current NMTs. It is hard to imagine a situation in which an employer would prefer an NMT with only NM education and certification over an NMT with both NM *and* radiologic education and certification. Although the survey responses do not indicate a sizeable salary boost from such a joint certification, the fact is that the potential for growth in the numbers of dually certified imaging technologists is much greater among RTs than it is among NMTs.

### The NMT Profession

- Seek uniform licensure standards for NMTs in all fifty states. Licensure recognizes the unique role that a profession plays in serving the needs and protecting the safety of the public. Licensure increases the status of a profession and provides opportunities to participate in policy discussions about professional practice and education. This will provide a stronger foundation for the NMT profession as competition with other imaging professions grows. Studies of a number of allied health professions suggest that uniform licensure requirements further professionalism in a group. Current SNM efforts to support the CARE legislation should be encouraged in

order to elevate the profession. Universal licensure will also facilitate regulation and implementation of advance practice.

- Promote standardized, legislated legal scope of practice for NMTs in all fifty states. Until scope of practice is standardized, it will be relatively easy to raise questions about the knowledge base and skill sets required to be an NMT that will undercut professional status and reputation. The NMT certification process indicates that skill sets at entry to the profession are similar and do not vary geographically. Legislated scope of practice should reflect that universal skill set and not vary dramatically from state to state.
- Augment the knowledge base and skill sets required for NMTs to include fusion imaging with the latest technologies. The sooner that all or most NMTs are able to use all kinds of imaging equipment, the sooner they will be positioned as the practitioner of choice in a wide range of settings and practices. This will also give NMTs a competitive edge in the labor market for imaging technologists. This becomes increasingly important as the NMT moves into imaging environments in which competition will be more readily apparent. The fact that many NMTs currently work in radiology departments and that NM studies are primarily read by radiologists suggests that positioning in the workplace is already changing.
- Track closely the work of scientists and vendors on new imaging technologies and adjust curricula for both initial education and continuing education to ensure that active NMTs have the skills required to use the equipment effectively. The first profession in the field that can use new equipment effectively will have a competitive advantage over other professions in the labor market.
- Work to achieve appropriate levels of labor market “penetration” for NMTs in all fifty states. Even one state with low penetration will provide opportunities for detractors to question the need for licensure or even NMTs more generally. It also provides opportunities for employers to “experiment” with new or unorthodox staffing arrangements, which might supplant the need for NMTs at some point in the future. Opportunities for usurpation of NMT jobs should be a continuing concern for the profession. The current disparities in geographic penetration also suggest opportunities to establish new education programs or to expand distance learning programs.
- Provide opportunities for interested NMTs to extend their professional education to the graduate level. In addition to providing opportunities for career advancement, this would enhance the status of some practitioners and provide opportunities for participation in policy discussions that otherwise might not be available. This might be accomplished by creating joint

programs with other disciplines, e.g., business administration. This will be especially important as advanced practice opportunities for the profession are established. Pharmaceutical dispensing and prescribing privileges in many states and at the federal level are often keyed to graduate education.

### **Society of Nuclear Medicine**

- Strengthen the position of SNM as the best place to get information, training, and certification in NMT, and NM more generally. This will strengthen the reputation of SNM as the key organization supporting the NM field and NM professions, despite the relatively small size of NM compared to the other imaging specialties competing for status and position in the informal marketplace.
- Strengthen the role of SNM in the provision of continuing education in NM. Regardless of the final disposition of NM among the many specialties and professions that seem likely to rely on NM tools and techniques, there will certainly be a need for continuing education and certification for both the basic and the latest tools and techniques. This may be the best source of revenue for the future. Special attention should be given to making the educational offerings all encompassing, that is, serving all levels of professionals and all different specialties.
- Educate NMT professionals about alternative professional opportunities about which they may not be aware. Professional organizations often do this through their journals on a regular basis by highlighting interesting or novel jobs. Increasing the understanding of active NMTs of the array of professional possibilities open to them will contribute to job satisfaction and increase retention for the profession as a whole.
- Build coalitions and collaborate with other professional organizations with a stake in NM. In the current health care environment, disruptive innovation abounds. It is important to be prepared for all possibilities so that change is manageable and so that the professional association can maintain a proactive position in promoting the interests of NMTs.
- Prepare for the possibility that NM may not survive as a separate specialty. Although this may not happen, it may be that NM will be distributed among other medical specialties with stakes in NM, e.g., radiology, cardiology, oncology, pulmonary medicine, neurology, etc. SNM can still survive as an organization if it carves out an appropriate niche related to the education, training, certification, and credentialing of professionals of all types desiring to understand and use NM tools and techniques. This will be easier to the extent that SNM welcomes all professions and specialties involved in NM.