Chronicle Guidance Publications

Nuclear Medicine Technologists

Occupational Brief Title Codes:
- D.O.T.: 078.361-018
- G.O.E.: 10.02.02
- S.O.C.: 29-2033
- O*NET™: 29-2033.00
- N.A.I.C.S.: 621111
- H.O.C.: RIS

Work Classification Based Related D.O.T. Occupations:
- Audiometrists
- Dental Hygienists
- Dialysis Technicians
- Ultrasound Technologists

Interests Based Related G.O.E. Occupations:
- Accupressurists
- Occupational Therapists
- Orthoptists
- Radiologic Technologists
- Respiratory Therapists

Skills Based Related O*NET Occupations:
- Anesthesiologists
- Optometrists
- Physician Assistants
- Radiation Therapists

Noteworthy Quote:

"Nuclear medicine is an exciting and evolving imaging modality that brings together science, math and computer technology with the latest medical advances in providing an array of procedures to diagnose and treat a myriad of diseases. Nuclear medicine uniquely provides information about both the structure and function of virtually any organ system in the body and, when combined with other imaging modalities, can provide a surprisingly advanced level of functional molecular information to previously determined anatomical information. This revolution in multi-modality imaging will shape medical imaging for years to come."
–Lyn M. Mehlberg, BS, CNMT, FSNMTS, Regional Quality Improvement Coordinator, Department of Imaging Services, St. Luke's Medical Center, Milwaukee, Wisconsin

Nuclear medicine technologists (NMTs) (`nu-cle-ar `med-i-cine tech`nol-o-gist) are highly specialized health care professionals who perform an integral role on the nuclear medicine team in diagnosing and treating disease. Nuclear medicine technologists have both direct and indirect patient care responsibilities to ensure that the best possible care is given.

Nuclear isotopes have been used in medical imaging since World War II, and nuclear medicine was formally recognized as a medical specialty by the American Medical Association in 1972. Nuclear medicine technology utilizes unsealed radioactive materials with state-of-the-art diagnostic imaging equipment to noninvasively determine the structure and function of various organ systems, often quantifying organ function in ways unique to medical imaging.

Fewer than 20 different radiopharmaceuticals are used today, but more than 100 different imaging procedures are available just by varying the type of radiopharmaceutical and route of administration, time delay, imaging technique and area of interest. Each radiopharmaceutical is made up of a radioisotope linked to a pharmaceutical that targets a specific organ; the study ordered dictates the radiopharmaceutical used. Some radiopharmaceuticals target the bone, heart and lungs; others trace glucose metabolism in the body. The most common procedures involve detecting bone cancer, heart disease, blood clots in the lung, or a source of infection or gastrointestinal (GI) bleeding and quantifying thyroid, GI or kidney function.

Work Performed

Nuclear medicine technologists have multiple primary responsibilities, including the safe handling of radioactive materials, the care and operation of radiation detection equipment (cameras), a thorough knowledge of the technical and

Nuclear medicine technologists operate diagnostic imaging equipment to trace radioactive compounds in the body. *Photo by Melinda Leonard*

Printed in United States of America, February 2006
Visit our Web Site www.ChronicleGuidance.com

CGP

biological principles within nuclear medicine, and providing competent, high-quality patient care.

Nuclear medicine technologists work under the direction of radiologists or physicians who are specialists in nuclear medicine and have been deemed authorized users.

Prior to the patient's arrival, the NMT performs quality control on the imaging cameras and prepares the radiopharmaceuticals for the day. Some departments order radiopharmaceuticals from a centralized radiopharmacy. Once the patient arrives, the nuclear medicine technologist verifies that the patient has been properly prepared for the procedure, takes a thorough medical history, verifies there are no contraindications for proceeding and ensures that the correct procedure is being performed. The NMT then administers the radiopharmaceutical, either by mouth or intravenous injection. After a specific time delay, the NMT performs the imaging procedure and processes the computer-generated images. Ultimately, the NMT provides the physician with the clinical and diagnostic information that is considered by the interpreting physician in the medical report provided for each procedure.

Radiopharmaceuticals localize in target-specified organs and produce gamma or positron emissions. Nuclear medicine technologists operate specialized detection cameras that transform these emissions into images giving detailed information about the organ of interest. The camera records this information in one of several formats: it can be analog or digital and can be displayed on paper, film or computer screen. Nuclear medicine technologists examine the quality of the images and process the studies. The physician studies the images to detect disease or changes in the function of organs such as the brain, the liver, the thyroid, the lungs, the heart or other body systems.

Nuclear medicine technologists may also assist a nuclear physician/nuclear radiologist in administering therapeutic isotopes to ablate or wear away the thyroid or lessen bone pain due to bone cancer. If a patient has a hyperactive thyroid gland, for instance, radioactive iodine will be administered to shut down excessive thyroid hormone production. The radioactive iodine travels through the patient's body and concentrates in the thyroid, and the beta emission from the radioactive iodine destroys enough of the malfunctioning tissue to correct the overactive gland.

Nuclear medicine technologists follow strict safety guidelines established by the Nuclear Regulatory Commission or by individual states. Technologists are responsible for the inventory, storage and use of radiopharmaceuticals as well as the proper disposal of radioactive waste. Nuclear medicine technologists see that medical records, including images and procedures, are complete and accurate.

Working Conditions

Nuclear medicine technologists work in a clean, safe environment, in either a hospital, clinic or imaging facility. NMTs must often move, lift or position patients, so physical stamina is important. Nuclear medicine technologists are well trained in the safe use and handling of radioactive materials and understand advanced practices and principles in radiation. This knowledge, coupled with federal and state regulations promoting radiation safety, makes for a safe working environment for NMTs. Radiation exposure to employees is minimized with the use of shielded syringes, gloves and other protective devices, such as monitoring devices, or badges, that measure environmental radiation levels. Most people would be surprised to know that radiation is naturally occurring in nature, and someone who watches more that four hours of television a day or travels frequently by airplane receives a higher radiation dose than a nuclear medicine technologist in any given month.

Hours and Earnings

Nuclear medicine technologists have numerous employment opportunities and may choose how often and what type of setting to work. Full-time employment as well as part-time opportunities are available in hospital and outpatient settings. Most hospitals require on-call shifts to cover nights, holidays and weekends, which offers opportunities for substantial overtime pay.

According to the Bureau of Labor Statistics (BLS), in May 2004 nuclear medicine technologists earned a mean annual salary of $61,210 a year. Salaries ranged from a high of more than $80,300 a year to a low of less than $41,800 a year. Salaries vary depending on employer, years of experience, level of education, certification and duties of the technologists. Those who work for the federal government generally earn less.

Full-time employees usually receive benefits including paid holidays, sick leave and vacations as well as health insurance and pension plans.

Education and Training

Potential nuclear medicine technologists must have a high school diploma and a solid background in mathematics and science. Educational programs in the field vary in length from two to four years and lead to an associate's or bachelor's degree. Someone who already has a bachelor's degree in a science-related field may enter nuclear medicine by completing a 12-month clinical and didactic internship. Graduates of accredited programs in nuclear medicine technology in any of the aforementioned pathways will be eligible to sit for one of two national certification exams in nuclear medicine technology.

Programs are accredited by the Joint Review Committee on Educational Programs in Nuclear Medicine Technology. Accredited programs include but are not limited to courses in anatomy, physiology, nuclear physics, mathematics, chemistry, computer science, nuclear instrumentation, radiopharmacy, patient care skills, radiation

safety, medical terminology and medical ethics. Students also learn decontamination procedures and federal regulations governing the handling of radioactive materials.

Students learn imaging techniques, camera operation, pharmacology and patient care skills during the clinical component of the program. They learn to maintain patient medical records and quality assurance in the nuclear medicine department.

Because the field of nuclear medicine changes so quickly, those in the profession must update their skills regularly. Continuing education opportunities are available through professional societies like the Society of Nuclear Medicine (SNM) and the American Society of Radiologic Technologists (ASRT), as well as through meetings and online programs sponsored by vendors, local hospitals and for-profit entities.

Certification and Professional Societies

Upon successful completion of an accredited program in nuclear medicine technology, individuals can be certified as nuclear medicine technologists through examination by one or both of the two national certifying agencies. Many employers and an increasing number of states require nuclear medicine technologists to hold a certificate from the Nuclear Medicine Technology Certification Board (NMTCB) or the American Registry of Radiologic Technologists (ARRT). Some technologists have certificates from both organizations.

Candidates must have graduated from an accredited school of nuclear medicine technology to sit for either exam. There is an alternate eligibility pathway for radiologic technologists who work in nuclear medicine and have direct supervision by a certified NMT. These individuals must document four years of on-the-job training. Those who pass the NMTCB qualifying examination may use the credential Certified Nuclear Medical Technologist (CNMT). Candidates who pass the ARRT exam become registered nuclear medicine technologists and may use the credential Registered Technologist [RT(N)] after their names. Some states require licensing and accept certification from the NMTCB or ARRT in fulfillment of state licensure requirements.

Many nuclear medicine technologists find joining a professional organization valuable to their careers. Membership and networking with colleagues help them keep abreast of important trends and developments in nuclear medicine.

The Society of Nuclear Medicine represents 16,000 members who are physicians, technologists, physicists, scientists and pharmacists specializing in the research and practice of nuclear medicine. In addition to publishing journals, newsletters and books, the society also sponsors international meetings and workshops; offers grants, awards and scholarships; and provides an informative career center. SNM's Technologist Section (SNMTS)—with its own governance structure, budget and purpose—represents more than 8,500 technologists and provides educational opportunities, guidance and support for NMTs worldwide.

The American Society of Radiologic Technologists is the world's largest radiologic science organization with 118,000 radiologic technologists, including nuclear medicine technologists, in the United States and overseas. ASRT offers conferences and workshops and publishes research findings and information about professional development and continuing education.

Personal Qualifications

Nuclear medicine technologists must have solid communication skills, an aptitude for science, an understanding of the basic principles of the profession, the desire to provide the best possible care to their patients, and the inner drive to keep abreast of the new techniques and advances that keep this profession constantly evolving.

Occupations can be adapted for workers with disabilities. Persons should contact their school or employment counselors, their state office of vocational rehabilitation, or their state department of labor to explore fully their individual needs and requirements as well as the requirements of the occupation.

Where Employed

According to the Bureau of Labor Statistics, in the year 2004, there were about 17,520 nuclear medicine technologists at work throughout the United States. About two-thirds of all jobs are in hospitals. They may also work in private clinics, public health institutions, imaging centers and research institutions. Some work for radiopharmaceutical suppliers or nuclear imaging equipment manufacturers. Others teach nuclear medicine technology at colleges and universities.

Employment Outlook

The long-range employment outlook for nuclear medicine technologists is very good. The impending change in U.S. population demographics—with aging Baby Boomers leaving the workforce and becoming patients, coupled with a retiring NMT workforce and expanding need for imaging—will likely create a shortage of NMTs by 2012. The Bureau of Labor Statistics expects employment to grow faster than the average for all occupations through the year 2012. BLS also predicts that the demand for imaging procedures will increase by 140 percent in the next 20 years. Nuclear medicine will continue to be at the forefront of modern clinical medicine and technological development, with development of new radiopharmaceuticals for diagnostic and therapeutic purposes, research and development of cancer-detecting and cancer-killing agents such as genetically engineered antibodies, and expanding the clinical use of positron emission tomography (PET), now combined with once-distinct imaging modalities into multi-modality imaging technologies such as PET/CT and PET/MR.

Entry Methods

Job openings are posted and accessible from a variety of locations. Professional organizations are one of the best sources for listings of potential employment opportunities. The Society of Nuclear Medicine publishes two journals that offer job postings—*The Journal of Nuclear Medicine* and the *Journal of Nuclear Medicine Technology*—as well as online job postings. The American Society of Radiologic Technologists also publishes job openings in its journal, *Radiologic Technology*. Trade journals, such as *Advance*, and online job sites, such as monster.com, are excellent sources of job openings. Colleges may have placement offices that help graduates find jobs, and often unpaid internships turn into paid full positions upon graduation.

Advancement

Technologists with associate degrees may continue their studies to earn bachelor's or master's degrees in medical imaging, radiologic sciences, health care administration or a similar field. Advanced degrees are often necessary for career advancement, thus they translate into higher pay. Staff NMTs may seek management positions and become team leaders, leads or supervisors. Most radiology departments require a bachelor's degree at minimum for advancement to manager, administrator or director. Technologists may choose to specialize in nuclear cardiology, PET/CT imaging, quality management or radiation safety/medical physics or to become a computer specialist with advanced training in radiology information systems. Some NMTs choose to leave direct patient care to take positions in sales, marketing or research. Those with advanced degrees and clinical experience may serve as clinical or didactic instructors in nuclear medicine technology programs, offered through hospitals, colleges or universities.

For Further Research

American Medical Association, 515 North State Street, Chicago, IL 60610-5453. Web site: www.ama-assn.org

American Registry of Radiologic Technologists, 1255 Northland Drive, St. Paul, MN 55120-1155. Web site: www.arrt.org

American Society of Radiologic Technologists, 15000 Central Avenue, SE, Albuquerque, NM 87123-3917. Web site: www.asrt.org

Nuclear Medicine Technology Certification Board, 2970 Clairmont Road, Suite 935, Atlanta, GA 30329-4421. Web site: www.nmtcb.org

Society of Nuclear Medicine, 1850 Samuel Morse Drive, Reston, VA 20190-5316. Web site: www.snm.org

Acknowledgments

Chronicle Guidance Publications appreciates the cooperation of the following who reviewed the information in this brief.

Lyn M. Mehlberg, BS, CNMT, FSNMTS, Regional Quality Improvement Coordinator, Department of Imaging \ Services, St. Luke's Medical Center, 2900 West Oklahoma Avenue, Milwaukee, WI 53215.

Kathleen Murphy, MS, CNMT, NCT, FSNMTS, Professor, Program Director, Nuclear Medicine Technology, Gateway Community College, 88 Bassett Road, North Haven, CT 06473.

Briefs Related to This Title

Anesthesiologists. **Brief 452.**
Audiologists. **Brief 595.**
Cardiovascular Technologists. **Brief 437.**
Dental Hygienists. **Brief 18.**
Dialysis Technicians. **Brief 528.**
Kinesiotherapists. **Brief 36.**
Medical Assistants. **Brief 5.**
Medical Technologists. **Brief 16.**
Nursing Assistants. **Brief 407.**
Occupational Therapists. **Brief 74.**
Ophthalmic Technicians. **Brief 680.**
Ophthalmologists. **Brief 13.**
Optometric Technicians. **Brief 229.**
Optometrists. **Brief 85.**
Perfusionists. **Brief 558.**
Physical Therapists. **Brief 25.**
Physician Assistants. **Brief 502.**
Radiographers. **Brief 344.**
Radiologists. **Brief 462.**
Respiratory Therapists. **Brief 450.**

For a complete list of brief and reprint titles with current pricing information call:
Chronicle Guidance Publications, Inc.
66 Aurora Street
Moravia, New York 13118-3569
Phone 1 800 622-7284 FAX (315) 497-3359
Visit our Web Site at
www.ChronicleGuidance.com