patients. Because accuracy is essential, technicians must pay close attention to detail. Technicians who work at computer monitors for prolonged periods must guard against eyestrain and muscle pain.

Employment
Medical records and health information technicians held about 136,000 jobs in 2000. About 4 out of 10 jobs were in hospitals. The rest were mostly in nursing homes, medical group practices, clinics, and home health agencies. Insurance firms that deal in health matters employ a small number of health information technicians to tabulate and analyze health information. Public health departments also hire technicians to supervise data collection from health care institutions and to assist in research.

Training, Other Qualifications, and Advancement
Medical records and health information technicians entering the field usually have an associate degree from a community or junior college. In addition to general education, coursework includes medical terminology, anatomy and physiology, legal aspects of health information, coding and abstraction of data, statistics, database management, quality improvement methods, and computer training. Applicants can improve their chances of admission into a program by taking biology, chemistry, health, and computer courses in high school.

Hospitals sometimes advance promising health information clerks to jobs as medical records and health information technicians, although this practice may be less common in the future. Advancement usually requires 2 to 4 years of job experience and completion of a hospital's in-house training program.

Most employers prefer to hire Registered Health Information Technicians (RHIT), who must pass a written examination offered by AHIMA. To take the examination, a person must graduate from a 2-year associate degree program accredited by the Commission on Accreditation of Allied Health Education Programs (CAAHEP) of the American Medical Association. Technicians trained in non-CAAHEP accredited programs, or on the job, are not eligible to take the examination. In 2001, CAAHEP accredited 177 programs for health information technicians. Technicians who specialize in coding may also obtain voluntary certification.

Experienced medical records and health information technicians usually advance in one of two ways—by specializing or managing. Many senior technicians specialize in coding, particularly Medicare coding, or in tumor registry.

In large medical records and health information departments, experienced technicians may advance to section supervisor, overseeing the work of the coding, correspondence, or discharge sections, for example. Senior technicians with RHIT credentials may become director or assistant director of a medical records and health information department in a small facility. However, in larger institutions, the director is usually an administrator, with a bachelor's degree in medical records and health information administration. (See the statement on health services managers elsewhere in the *Handbook*.)

Job Outlook
Job prospects for formally trained technicians should be very good. Employment of medical records and health information technicians is expected to grow much faster than the average for all occupations through 2010, due to rapid growth in the number of medical tests, treatments, and procedures which will be increasingly scrutinized by third-party payers, regulators, courts, and consumers.

Hospitals will continue to employ a large percentage of health information technicians, but growth will not be as fast as in other areas. Increasing demand for detailed records in offices and clinics of physicians should result in fast employment growth, especially in large group practices. Rapid growth is also expected in nursing homes and home health agencies.

Earnings
Median annual earnings of medical records and health information technicians were $22,750 in 2000. The middle 50 percent earned between $18,700 and $28,590. The lowest 10 percent earned less than $15,710, and the highest 10 percent earned more than $35,170. Median annual earnings in the industries employing the largest numbers of medical records and health information technicians in 2000 were as follows:

Nursing and personal care facilities	$23,760
Hospitals	23,540
Offices and clinics of medical doctors	21,090

Related Occupations
Medical records and health information technicians need a strong clinical background to analyze the contents of medical records. Workers in other occupations requiring knowledge of medical terminology, anatomy, and physiology without physical contact with the patient are medical secretaries and medical transcriptionists.

Sources of Additional Information
Information on careers in medical records and health information technology, including a list of CAAHEP-accredited programs is available from:

➤ American Health Information Management Association, 233 N. Michigan Ave., Suite 2150, Chicago, IL 60601-5800. Internet: **http://www.ahima.org**

Nuclear Medicine Technologists

(O*NET 29-2033.00)

Significant Points

- Faster-than-average growth will arise from an increase in the number of middle-aged and elderly persons, who are the primary users of diagnostic procedures.
- Technologists with cross training in radiologic technology or other modalities will have the best prospects.

Nature of the Work
In nuclear medicine, radionuclides—unstable atoms that emit radiation spontaneously—are used to diagnose and treat disease. Radionuclides are purified and compounded like other drugs to form radiopharmaceuticals. Nuclear medicine technologists administer these radiopharmaceuticals to patients, then monitor the characteristics and functions of tissues or organs in which they localize. Abnormal areas show higher or lower concentrations of radioactivity than normal.

Nuclear medicine technologists operate cameras that detect and map the radioactive drug in the patient's body to create an image on photographic film or a computer monitor. Radiologic technologists and technicians also operate diagnostic imaging equipment, but their equipment creates an image by projecting an x ray through the patient. (See the statement on radiologic technologists and technicians elsewhere in the *Handbook*.)

Nuclear medicine technologists explain test procedures to patients. They prepare a dosage of the radiopharmaceutical and administer it

A nuclear medical technologist can view images of tissues or organs on a computer monitor.

by mouth, injection, or other means. When preparing radiopharmaceuticals, technologists adhere to safety standards that keep the radiation dose to workers and patients as low as possible.

Technologists position patients and start a gamma scintillation camera, or "scanner," which creates images of the distribution of a radiopharmaceutical as it localizes in and emits signals from the patient's body. Technologists produce the images on a computer screen or on film for a physician to interpret. Some nuclear medicine studies, such as cardiac function studies, are processed with the aid of a computer.

Nuclear medicine technologists also perform radioimmunoassay studies that assess the behavior of a radioactive substance inside the body. For example, technologists may add radioactive substances to blood or serum to determine levels of hormones or therapeutic drug content.

Technologists keep patient records and record the amount and type of radionuclides received, used, and disposed of.

Working Conditions

Nuclear medicine technologists generally work a 40-hour week. This may include evening or weekend hours in departments that operate on an extended schedule. Opportunities for part-time and shift work are also available. In addition, technologists in hospitals may have on-call duty on a rotational basis.

Because technologists are on their feet much of the day, and may lift or turn disabled patients, physical stamina is important.

Although there is potential for radiation exposure in this field, it is kept to a minimum by the use of shielded syringes, gloves, and other protective devices and adherence to strict radiation safety guidelines. Technologists also wear badges that measure radiation levels. Because of safety programs, however, badge measurements rarely exceed established safety levels.

Employment

Nuclear medicine technologists held about 18,000 jobs in 2000. About two-thirds of all jobs were in hospitals. The rest were in physicians' offices and clinics, including diagnostic imaging centers.

Training, Other Qualifications, and Advancement

Nuclear medicine technology programs range in length from 1 to 4 years and lead to a certificate, associate's degree, or bachelor's degree. Generally, certificate programs are offered in hospitals, associate programs in community colleges, and bachelor's programs in 4-year colleges and in universities. Courses cover physical sciences, the biological effects of radiation exposure, radiation protection and procedures, the use of radiopharmaceuticals, imaging techniques, and computer applications.

One-year certificate programs are for health professionals, especially radiologic technologists and diagnostic medical sonographers, who wish to specialize in nuclear medicine. They also attract medical technologists, registered nurses, and others who wish to change fields or specialize. Others interested in the nuclear medicine technology field have three options: A 2-year certificate program, a 2-year associate program, or a 4-year bachelor's program.

The Joint Review Committee on Education Programs in Nuclear Medicine Technology accredits most formal training programs in nuclear medicine technology. In 2000, there were 95 accredited programs in the continental United States and Puerto Rico.

All nuclear medicine technologists must meet the minimum Federal standards on the administration of radioactive drugs and the operation of radiation detection equipment. In addition, about half of all States require technologists to be licensed. Technologists also may obtain voluntary professional certification or registration. Registration or certification is available from the American Registry of Radiologic Technologists and from the Nuclear Medicine Technology Certification Board. Most employers prefer to hire certified or registered technologists.

Nuclear medicine technologists should be sensitive to patients' physical and psychological needs. They must pay attention to detail, follow instructions, and work as part of a team. In addition, operating complicated equipment requires mechanical ability and manual dexterity.

Technologists may advance to supervisor, then to chief technologist, and to department administrator or director. Some technologists specialize in a clinical area such as nuclear cardiology or computer analysis or leave patient care to take positions in research laboratories. Some become instructors or directors in nuclear medicine technology programs, a step that usually requires a bachelor's degree or a master's in nuclear medicine technology. Others leave the occupation to work as sales or training representatives for medical equipment and radiopharmaceutical manufacturing firms, or as radiation safety officers in regulatory agencies or hospitals.

Job Outlook

Employment of nuclear medicine technologists is expected to grow faster than the average for all occupations through the year 2010. The number of openings each year will be very low because the occupation is small. Growth will arise from an increase in the number of middle-aged and older persons who are the primary users of diagnostic procedures, including nuclear medicine tests.

Technological innovations may increase the diagnostic uses of nuclear medicine. One example is the use of radiopharmaceuticals in combination with monoclonal antibodies to detect cancer at far earlier stages than is customary today, and without resorting to surgery. Another is the use of radionuclides to examine the heart's ability to pump blood. Wider use of nuclear medical imaging to observe metabolic and biochemical changes for neurology, cardiology, and oncology procedures, also will spur some demand for nuclear medicine technologists.

On the other hand, cost considerations will affect the speed with which new applications of nuclear medicine grow. Some promising nuclear medicine procedures, such as positron emission tomography

(PET), are extremely costly, and hospitals contemplating them will have to consider equipment costs, reimbursement policies, and the number of potential users.

Earnings

Median annual earnings of nuclear medicine technologists were $44,130 in 2000. The middle 50 percent earned between $38,150 and $52,190. The lowest 10 percent earned less than $31,910, and the highest 10 percent earned more than $58,500. Median annual earnings of nuclear medicine technologists in 2000 were $44,000 in hospitals.

Related Occupations

Nuclear medical technologists operate sophisticated equipment to help physicians and other health practitioners diagnose and treat patients. Cardiovascular technologists and technicians, clinical laboratory technologists and technicians, diagnostic medical sonographers, radiation therapists, radiologic technologists and technicians, and respiratory therapists also perform similar functions.

Sources of Additional Information

Additional information on a career as a nuclear medicine technologist is available from:

➤ The Society of Nuclear Medicine-Technologist Section, 1850 Samuel Morse Dr., Reston, VA 22090. Internet: **http://www.snm.org**

For career information, send a stamped, self-addressed business size envelope with your request to:

➤ American Society of Radiologic Technologists, Customer Service Department, 15000 Central Ave. SE., Albuquerque, NM 87123-3917, or call (800) 444-2778. Internet: **http://www.asrt.org/asrt.htm**

For a list of accredited programs in nuclear medicine technology, write to:

➤ Joint Review Committee on Educational Programs in Nuclear Medicine Technology, PMB 418, 1 2nd Avenue East, Suite C, Polson, MT 59860-2107. Internet: **http://www.jrcnmt.org**

Information on certification is available from:

➤ American Registry of Radiologic Technologists, 1255 Northland Dr., St. Paul, MN 55120-1155. Internet: **http://www.arrt.org**

➤ Nuclear Medicine Technology Certification Board, 2970 Clairmont Rd., Suite 610, Atlanta, GA 30329. Internet: **http://www.nmtcb.org**

Occupational Health and Safety Specialists and Technicians

(O*NET 29-9011.00, 29-9012.00)

Significant Points

- Almost half of occupational health and safety specialists and technicians work in Federal, State, and local government agencies that enforce rules on health and safety.
- For positions as specialists, many employers, including the Federal Government, require 4-year college degrees in safety or a related field.

Nature of the Work

Occupational health and safety specialists and technicians, also known as *occupational health and safety inspectors* and *industrial hygienists*, help keep workplaces safe and workers unscathed. They promote occupational health and safety within organizations by developing safer, healthier, and more efficient ways of working. (Industrial engineers, including health and safety—who have similar goals—are discussed elsewhere in the *Handbook*.) *Occupational health and safety specialists* analyze work environments and design programs to control, eliminate, and prevent disease or injury caused by chemical, physical, and biological agents or ergonomic factors. They may conduct inspections and enforce adherence to laws, regulations, or employer policies governing worker health and safety. *Occupational health and safety technicians* collect data on work environments for analysis by occupational health and safety specialists. Usually working under the supervision of specialists, they help implement and evaluate programs designed to limit risks to workers.

Occupational health and safety specialists and technicians identify hazardous conditions and practices. Sometimes, they develop methods to predict hazards from experience, historical data, and other information sources. Then they identify potential hazards in existing or future systems, equipment, products, facilities, or processes. After reviewing the causes or effects of hazards, they evaluate the probability and severity of accidents that may result. For example, they might uncover patterns in injury data that implicate a specific cause such as system failure, human error, incomplete or faulty decision making, or a weakness in existing policies or practices. Then they develop and help enforce a plan to eliminate hazards, conducting training sessions for management, supervisors, and workers on health and safety practices and regulations, as necessary. Lastly, they may check on the progress of the safety plan after its implementation. If improvements are not satisfactory, a new plan might be designed and put into practice.

Many occupational health and safety specialists inspect and test machinery and equipment, such as lifting devices, machine shields, or scaffolding, to ensure they meet appropriate safety regulations. They may check that personal protective equipment, such as masks, respirators, safety glasses, or safety helmets, is being used in workplaces according to regulations. They also check that dangerous materials are stored correctly. They test and identify work areas for potential accident and health hazards, such as toxic fumes and explosive gas-air mixtures, and may implement appropriate control measures, such as adjustments to ventilation systems. Their investigations might involve talking with workers and observing their work, as well as inspecting elements in their work environment, such as lighting, tools, and equipment.

To measure and control hazardous substances, such as the noise or radiation levels, occupational health and safety specialists and technicians prepare and calibrate scientific equipment. Samples of

Almost half of occupational health and safety specialists and technicians work for Federal, State, or local government agencies.