

specializing in obstetrics and in diagnostic imaging centers. According to the 2000 Sonography Benchmark Survey conducted by the Society of Diagnostic Medical Sonographers (SDMS), about three out of four sonographers worked in urban areas.

Training, Other Qualifications, and Advancement

There are several avenues for entry into the field of diagnostic medical sonography. Sonographers may train in hospitals, vocational-technical institutions, colleges and universities, and the Armed Forces. Some training programs prefer applicants with a background in science or experience in other health professions, but also will consider high school graduates with courses in math and science, as well as applicants with liberal arts backgrounds.

Colleges and universities offer formal training in both 2- and 4-year programs, culminating in an associate or bachelor's degree. Two-year programs are most prevalent. Course work includes classes in anatomy, physiology, instrumentation, basic physics, patient care, and medical ethics. The Joint Review Committee on Education for Diagnostic Medical Sonography accredits most formal training programs—76 programs in 1999.

Some health workers, such as obstetric nurses and radiologic technologists, seek to increase their marketability by cross-training in fields such as sonography. Many take 1-year programs resulting in a certificate. Additionally, sonographers specializing in one discipline often seek competency in others; for example, obstetric sonographers might seek training in and exposure to abdominal sonography to broaden their opportunities.

While no State requires licensure in diagnostic medical sonography, the American Registry of Diagnostic Medical Sonographers (ARDMS) certifies the competency of sonographers through registration. Because registration provides an independent, objective measure of an individual's professional standing, many employers prefer to hire registered sonographers. Registration with ARDMS requires passing a general physics and instrumentation examination, in addition to passing an exam in a specialty such as obstetrics/gynecology, abdominal, or neurosonography.

While formal education is not necessary to take the exams, an associate or bachelor's degree from an accredited program is preferred. Beginning in 2005, ARDMS will consider for registration only those holding an associate or higher degree. To keep their registration current, sonographers must complete 30 hours of continuing education every 3 years to stay abreast of advances in the occupation and in technology.

Sonographers need good communication and interpersonal skills because they must be able to explain technical procedures and results to their patients, some of whom may be nervous about the exam or the problems it may reveal. They also should have some background in math and science, especially when they must perform mathematical and scientific calculations in analyses for diagnosis.

Job Outlook

Employment of diagnostic medical sonographers is expected to grow faster than the average for all occupations through 2010 as the population grows and ages, increasing the demand for diagnostic imaging and therapeutic technology. Some job openings also will arise from the need to replace sonographers who leave the occupation.

Ultrasound is becoming an increasingly attractive alternative to radiologic procedures as patients seek safer treatment methods. Because ultrasound—unlike most diagnostic imaging methods—does not involve radiation, harmful side effects and complications from repeated use are rarer for both the patient and the sonographer. Sonographic technology is expected to evolve rapidly and to spawn many new ultrasound procedures, such as 3D-ultrasonography for

use in obstetric and ophthalmologic diagnosis. However, high costs may limit the rate at which some promising new technologies are adopted.

Hospitals will remain the principal employer of diagnostic medical sonographers. However, employment is expected to grow more rapidly in offices and clinics of physicians, including diagnostic imaging centers. Health facilities such as these are expected to grow very rapidly through 2010 due to the strong shift toward out-patient care, encouraged by third-party payers and made possible by technological advances that permit more procedures to be performed outside the hospital.

Earnings

Median annual earnings of diagnostic medical sonographers were \$44,820 in 2000. The middle 50 percent earned between \$38,390 and \$52,750 a year. The lowest 10 percent earned less than \$32,470, and the highest 10 percent earned more than \$59,310. Median annual earnings of diagnostic medical sonographers in 2000 were \$43,950 in hospitals and \$46,190 in offices and clinics of medical doctors.

Related Occupations

Diagnostic medical sonographers operate sophisticated equipment to help physicians and other health practitioners diagnose and treat patients. Workers in related occupations include cardiovascular technologists and technicians, clinical laboratory technologists and technicians, nuclear medicine technologists, radiologic technologists and technicians, and respiratory therapists.

Sources of Additional Information

For more information on a career as a diagnostic medical sonographer, contact:

► Society of Diagnostic Medical Sonographers, 12770 Coit Rd., Suite 708, Dallas, TX 75251. Internet: <http://www.sdms.org>

► The American Registry of Diagnostic Medical Sonographers, 600 Jefferson Plaza, Suite 360, Rockville, MD 20852-1150. Internet:

<http://www.ardms.org>

For a current list of accredited education programs in diagnostic medical sonography, write to:

► The Joint Review Committee on Education in Diagnostic Medical Sonography, 1248 Harwood Rd., Bedford, TX 76021-4244. Internet:

<http://www.caahep.org>

Emergency Medical Technicians and Paramedics

(O*NET 29-2041.00)

Significant Points

- Job stress is common due to irregular hours and treating patients in life-or-death situations.
- Formal training and certification are required but State requirements vary.
- Employment is projected to grow faster than average as paid emergency medical technician positions replace unpaid volunteers.

Nature of the Work

People's lives often depend on the quick reaction and competent care of emergency medical technicians (EMTs) and paramedics, EMTs with additional advanced training to perform more difficult

pre-hospital medical procedures. Incidents as varied as automobile accidents, heart attacks, drownings, childbirth, and gunshot wounds all require immediate medical attention. EMTs and paramedics provide this vital attention as they care for and transport the sick or injured to a medical facility.

Depending on the nature of the emergency, EMTs and paramedics typically are dispatched to the scene by a 911 operator and often work with police and fire department personnel. (Police and detectives and firefighting occupations appear elsewhere in the *Handbook*.) Once they arrive, they determine the nature and extent of the patient's condition while trying to ascertain whether the patient has preexisting medical problems. Following strict rules and guidelines, they give appropriate emergency care and, when necessary, transport the patient. Some paramedics are trained to treat patients with minor injuries on the scene of an accident or at their home without transporting them to a medical facility. Emergency treatments for more complicated problems are carried out under the direction of medical doctors by radio preceding or during transport.

EMTs and paramedics may use special equipment such as backboards to immobilize patients before placing them on stretchers and securing them in the ambulance for transport to a medical facility. Usually, one EMT or paramedic drives while the other monitors the patient's vital signs and gives additional care as needed. Some EMTs work as part of the flight crew of helicopters that transport critically ill or injured patients to hospital trauma centers.



Emergency medical technicians and paramedics often are the first to examine a patient during an emergency.

At the medical facility, EMTs and paramedics help transfer patients to the emergency department, report their observations and actions to staff, and may provide additional emergency treatment. After each run, EMTs and paramedics replace used supplies and check equipment. If a transported patient had a contagious disease, EMTs and paramedics decontaminate the interior of the ambulance and report cases to the proper authorities.

Beyond these general duties, the specific responsibilities of EMTs and paramedics depend on their level of qualification and training. To determine this, the National Registry of Emergency Medical Technicians (NREMT) registers emergency medical service (EMS) providers at four levels: First Responder, EMT-Basic, EMT-Intermediate, and EMT-Paramedic. Some States, however, do their own certification and use numeric ratings from 1 to 4 to distinguish levels of proficiency.

The lowest level—First Responders—are trained to provide basic emergency medical care because they tend to be the first persons to arrive at the scene of an incident. Many firefighters, police officers, and other emergency workers have this level of training. The EMT-Basic, also known as EMT-1, represents the first component of the emergency medical technician system. An EMT-1 is trained to care for patients on accident scenes and on transport by ambulance to the hospital under medical direction. The EMT-1 has the emergency skills to assess a patient's condition and manage respiratory, cardiac, and trauma emergencies.

The EMT-Intermediate (EMT-2 and EMT-3) has more advanced training that allows administration of intravenous fluids, use of manual defibrillators to give lifesaving shocks to a stopped heart, and use of advanced airway techniques and equipment to assist patients experiencing respiratory emergencies. EMT-Paramedics (EMT-4) provide the most extensive pre-hospital care. In addition to the procedures already described, paramedics may administer drugs orally and intravenously, interpret electrocardiograms (EKGs), perform endotracheal intubations, and use monitors and other complex equipment.

Working Conditions

EMTs and paramedics work both indoors and outdoors, in all types of weather. They are required to do considerable kneeling, bending, and heavy lifting. These workers risk noise-induced hearing loss from sirens and back injuries from lifting patients. In addition, EMTs and paramedics may be exposed to diseases such as Hepatitis-B and AIDS, as well as violence from drug overdose victims or mentally unstable patients. The work is not only physically strenuous, but also stressful, involving life-or-death situations and suffering patients. Nonetheless, many people find the work exciting and challenging and enjoy the opportunity to help others.

EMTs and paramedics employed by fire departments work about 50 hours a week. Those employed by hospitals frequently work between 45 and 60 hours a week, and those in private ambulance services, between 45 and 50 hours. Some of these workers, especially those in police and fire departments, are on call for extended periods. Because emergency services function 24 hours a day, EMTs and paramedics have irregular working hours that add to job stress.

Employment

EMTs and paramedics held about 172,000 jobs in 2000. Most career EMTs and paramedics work in metropolitan areas. There are many more volunteer EMTs and paramedics, especially in smaller cities, towns, and rural areas. They volunteer for fire departments, emergency medical services (EMS), or hospitals and may respond to only a few calls for service per month, or may answer the majority

of calls, especially in smaller communities. EMTs and paramedics work closely with firefighters, who often are certified as EMTs as well and act as first responders.

Full- and part-time paid EMTs and paramedics were employed in a number of industries. About 4 out of 10 worked in local and suburban transportation, as employees of private ambulance services. About 3 out of 10 worked in local government for fire departments, public ambulance services and EMS. Another 2 out of 10 were found in hospitals, where they worked full time within the medical facility or responded to calls in ambulances or helicopters to transport critically ill or injured patients. The remainder worked in various industries providing emergency services.

Training, Other Qualifications, and Advancement

Formal training and certification is needed to become an EMT or paramedic. All 50 States possess a certification procedure. In 38 States and the District of Columbia, registration with the National Registry of Emergency Medical Technicians (NREMT) is required at some or all levels of certification. Other States administer their own certification examination or provide the option of taking the NREMT examination. To maintain certification, EMTs and paramedics must reregister, usually every 2 years. In order to re-register, an individual must be working as an EMT or paramedic and meet a continuing education requirement.

Training is offered at progressive levels: EMT-Basic, also known as EMT-1; EMT-Intermediate, or EMT-2 and EMT-3; and EMT-paramedic, or EMT-4. The EMT-Basic represents the first level of skills required to work in the emergency medical system. Coursework typically emphasizes emergency skills such as managing respiratory, trauma, and cardiac emergencies and patient assessment. Formal courses are often combined with time in an emergency room or ambulance. The program also provides instruction and practice in dealing with bleeding, fractures, airway obstruction, cardiac arrest, and emergency childbirth. Students learn to use and maintain common emergency equipment, such as backboards, suction devices, splints, oxygen delivery systems, and stretchers. Graduates of approved EMT basic training programs who pass a written and practical examination administered by the State certifying agency or the NREMT earn the title of Registered EMT-Basic. The course also is a prerequisite for EMT-Intermediate and EMT-Paramedic training.

EMT-Intermediate training requirements vary from State to State. Applicants can opt to receive training in EMT-Shock Trauma, where the caregiver learns to start intravenous fluids and give certain medications, or in EMT-Cardiac, which includes learning heart rhythms and administering advanced medications. Training commonly includes 35 to 55 hours of additional instruction beyond EMT-Basic coursework and covers patient assessment, as well as the use of advanced airway devices and intravenous fluids. Prerequisites for taking the EMT-Intermediate examination include registration as an EMT-Basic, required classroom work, and a specified amount of clinical experience.

The most advanced level of training for this occupation is EMT-Paramedic. At this level, the caregiver receives additional training in body function and more advanced skills. The Paramedic Technology program usually lasts up to 2 years and results in an associate degree in applied science. Such education prepares the graduate to take the NREMT examination and become certified as an EMT-Paramedic. Extensive related coursework and clinical and field experience is required. Due to the longer training requirement, almost all EMT-Paramedics are in paid positions. Refresher courses and continuing education are available for EMTs and paramedics at all levels.

EMTs and paramedics should be emotionally stable, have good dexterity, agility, and physical coordination, and be able to lift and

carry heavy loads. They also need good eyesight (corrective lenses may be used) with accurate color vision.

Advancement beyond the EMT-Paramedic level usually means leaving fieldwork. An EMT-Paramedic can become a supervisor, operations manager, administrative director, or executive director of emergency services. Some EMTs and paramedics become instructors, dispatchers, or physician assistants, while others move into sales or marketing of emergency medical equipment. A number of people become EMTs and paramedics to assess their interest in healthcare and then decide to return to school and become registered nurses, physicians, or other health workers.

Job Outlook

Employment of emergency medical technicians and paramedics is expected to grow faster than the average for all occupations through 2010. Population growth and urbanization will increase the demand for full-time paid EMTs and paramedics rather than for volunteers. In addition, a large segment of the population—the aging baby boomers—will further spur demand for EMT services, as they become more likely to have medical emergencies. There will still be demand for part-time, volunteer EMTs and paramedics in rural areas and smaller metropolitan areas. In addition to job growth, openings will occur because of replacement needs; some workers leave because of stressful working conditions, limited advancement potential, and the modest pay and benefits in the private sector.

Most opportunities for EMTs and paramedics are expected to arise in hospitals and private ambulance services. Competition will be greater for jobs in local government, including fire, police, and independent third service rescue squad departments, where salaries and benefits tend to be slightly better. Opportunities will be best for those who have advanced certifications, such as EMT-Intermediate and EMT-Paramedic, as clients and patients demand higher levels of care before arriving at the hospital.

Earnings

Earnings of EMTs and paramedics depend on the employment setting and geographic location as well as the individual's training and experience. Median annual earnings of EMTs and paramedics were \$22,460 in 2000. The middle 50 percent earned between \$17,930 and \$29,270. The lowest 10 percent earned less than \$14,660, and the highest 10 percent earned more than \$37,760. Median annual earnings in the industries employing the largest numbers of EMTs and paramedics in 2000 were:

Local government	\$24,800
Hospitals	23,590
Local and suburban transportation	20,950

Those in emergency medical services who are part of fire or police departments receive the same benefits as firefighters or police officers. For example, many are covered by pension plans that provide retirement at half pay after 20 or 25 years of service or if disabled in the line of duty.

Related Occupations

Other workers in occupations that require quick and level-headed reactions to life-or-death situations are air traffic controllers, firefighting occupations, physician assistants, police and detectives, and registered nurses.

Sources of Additional Information

General information about emergency medical technicians and paramedics is available from:

- National Association of Emergency Medical Technicians, 408 Monroe St., Clinton, MS 39056. Internet: <http://www.naemt.org>

- ▶ National Registry of Emergency Medical Technicians, P.O. Box 29233, Columbus, OH 43229. Internet: <http://www.nremt.org>
- ▶ National Highway Transportation Safety Administration, EMS Division, 400 7th St. SW., NTS-14, Washington, DC. Internet: <http://www.nhtsa.dot.gov/people/injury/ems>

Licensed Practical and Licensed Vocational Nurses

(O*NET 29-2061.00)

Significant Points

- Training lasting about 1 year is available in about 1,100 State-approved programs, mostly in vocational or technical schools.
- Nursing homes will offer the most new jobs.
- Job seekers in hospitals may face competition as the number of hospital jobs for LPNs declines.

Nature of the Work

Licensed practical nurses (LPNs), or licensed vocational nurses (LVNs) as they are called in Texas and California, care for the sick, injured, convalescent, and disabled under the direction of physicians and registered nurses. (The work of *physicians and surgeons* and *registered nurses* is described elsewhere in the *Handbook*.)

Most LPNs provide basic bedside care. They take vital signs such as temperature, blood pressure, pulse, and respiration. They also treat bedsores, prepare and give injections and enemas, apply dressings, give alcohol rubs and massages, apply ice packs and hot water bottles, and monitor catheters. LPNs observe patients and report adverse reactions to medications or treatments. They collect samples for testing, perform routine laboratory tests, feed patients, and record food and fluid intake and output. They help patients with bathing, dressing, and personal hygiene, keep them comfortable, and care for their emotional needs. In States where the law allows, they may administer prescribed medicines or start intravenous fluids. Some LPNs help deliver, care for, and feed infants. Experienced LPNs may supervise nursing assistants and aides.

LPNs in nursing homes provide routine bedside care, help evaluate residents' needs, develop care plans, and supervise the care provided by nursing aides. In doctors' offices and clinics, they also



Licensed practical and licensed vocational nurses take vital signs such as temperature, blood pressure, pulse, and respiration.

may make appointments, keep records, and perform other clerical duties. LPNs who work in private homes also may prepare meals and teach family members simple nursing tasks.

Working Conditions

Most licensed practical nurses in hospitals and nursing homes work a 40-hour week, but because patients need around-the-clock care, some work nights, weekends, and holidays. They often stand for long periods and help patients move in bed, stand, or walk.

LPNs may face hazards from caustic chemicals, radiation, and infectious diseases such as hepatitis. They are subject to back injuries when moving patients and shock from electrical equipment. They often must deal with the stress of heavy workloads. In addition, the patients they care for may be confused, irrational, agitated, or uncooperative.

Employment

Licensed practical nurses held about 700,000 jobs in 2000. Twenty-nine percent of LPNs worked in nursing homes, 28 percent worked in hospitals, and 14 percent in physicians' offices and clinics. Others worked for home healthcare services, residential care facilities, schools, temporary help agencies, or government agencies; about 1 in 5 worked part time.

Training, Other Qualifications, and Advancement

All States and the District of Columbia require LPNs to pass a licensing examination after completing a State-approved practical nursing program. A high school diploma, or equivalent, usually is required for entry, although some programs accept candidates without a diploma or are designed as part of a high school curriculum.

In 2000, approximately 1,100 State-approved programs provided practical nursing training. Almost 6 out of 10 students were enrolled in technical or vocational schools, while 3 out of 10 were in community and junior colleges. Others were in high schools, hospitals, and colleges and universities.

Most practical nursing programs last about 1 year and include both classroom study and supervised clinical practice (patient care). Classroom study covers basic nursing concepts and patient-care related subjects, including anatomy, physiology, medical-surgical nursing, pediatrics, obstetrics, psychiatric nursing, administration of drugs, nutrition, and first aid. Clinical practice usually is in a hospital, but sometimes includes other settings.

LPNs should have a caring, sympathetic nature. They should be emotionally stable because work with the sick and injured can be stressful. They also should have keen observational, decision making, and communication skills. As part of a healthcare team, they must be able to follow orders and work under close supervision.

Job Outlook

Employment of LPNs is expected to grow about as fast as the average for all occupations through 2010 in response to the long-term care needs of a rapidly growing elderly population and the general growth of healthcare. Replacement needs will be a major source of job openings, as many workers leave the occupation permanently.

Employment of LPNs in nursing homes is expected to grow faster than the average. Nursing homes will offer the most new jobs for LPNs as the number of aged and disabled persons in need of long-term care rises. In addition to caring for the aged and disabled, nursing homes will be called on to care for the increasing number of patients who have been discharged from the hospital but who have not recovered enough to return home.

LPNs seeking positions in hospitals may face competition, as the number of hospital jobs for LPNs declines. An increasing proportion of sophisticated procedures, which once were performed