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# Cardiovascular Technologists and Technicians

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## Significant Points

- Employment is expected to grow much faster than average; technologists and technicians trained to perform certain procedures will be in particular demand.
- About 3 out of 4 jobs are in hospitals.
- The vast majority of workers complete a 2-year junior or community college program.

## Nature of the Work

Cardiovascular technologists and technicians assist physicians in diagnosing and treating cardiac (heart) and peripheral vascular (blood vessel) ailments.

Cardiovascular technologists and technicians schedule appointments perform ultrasound or cardiovascular procedures, review doctors' interpretations and patient files, and monitor patients' heart rates. They also operate and care for testing equipment, explain test procedures, and compare findings to a standard to identify problems. Other day-to-day activities vary significantly between specialties.

Cardiovascular technologists may specialize in any of three areas of practice: invasive cardiology, echocardiography, or vascular technology.

**Invasive cardiology.** Cardiovascular technologists specializing in invasive procedures are called *cardiology technologists*. They assist physicians with cardiac catheterization procedures in which a small tube, or catheter, is threaded through a patient's artery from a spot on the patient's groin to the heart. The procedure can determine whether a blockage exists in the blood vessels that supply the heart muscle. The procedure also can help to diagnose other problems. Part of the procedure may involve balloon angioplasty, which can be used to treat blockages of blood vessels or heart valves without the need for heart surgery. Cardiology technologists assist physicians as they insert a catheter with a balloon on the end to the point of the obstruction. Another procedure using the catheter is electrophysiology test, which help locate the specific areas of heart tissue that give rise to the abnormal electrical impulses that cause arrhythmias.

Technologists prepare patients for cardiac catheterization by first positioning them on an examining table and then shaving, cleaning, and administering anesthesia to the top of their leg near the groin. During the procedures, they monitor patients' blood pressure and heart rate with EKG equipment and notify the physician if something appears to be wrong. Technologists also may prepare and monitor patients during open-heart surgery and during the insertion of pacemakers and stents that open up blockages in arteries to the heart and major blood vessels.

**Noninvasive technology.** Technologists who specialize in vascular technology or echocardiography perform noninvasive tests using. Tests are called "noninvasive" if they do not require the insertion of probes or other instruments into the

patient's body. For example, procedures such as Doppler ultrasound transmit high-frequency sound waves into areas of the patient's body and then processes reflected echoes of the sound waves to form an image. Technologists view the ultrasound image on a screen and may record the image on videotape or photograph it for interpretation and diagnosis by a physician. As the technologist uses the instrument to perform scans and record images, technologists check the image on the screen for subtle differences between healthy and diseased areas, decide which images to include in the report to the physician, and judge whether the images are satisfactory for diagnostic purposes. They also explain the procedure to patients, record any additional medical history the patient relates, select appropriate equipment settings, and change the patient's position as necessary. (See the statement on diagnostic medical sonographers elsewhere in the *Handbook* to learn more about other sonographers.)

**Vascular technology.** Technicians who assist physicians in the diagnosis of disorders affecting the circulation are known as *vascular technologists* or *vascular sonographers*. Vascular technologists complete patients' medical history, evaluate pulses and assess blood flow in arteries and veins by listening to the vascular flow sounds for abnormalities, and assure the appropriate vascular test has been ordered. Then they perform a noninvasive procedure using ultrasound instruments to record vascular information such as vascular blood flow, blood pressure, oxygen saturation, cerebral circulation, peripheral circulation, and abdominal circulation. Many of these tests are performed during or immediately after surgery. Vascular technologists then provide a summary of findings to the physician to aid in patient diagnosis and management.

**Echocardiography.** This area of practice includes giving electrocardiograms (EKGs) and sonograms of the heart. Cardiovascular technicians who specialize in EKGs, stress testing, and those who perform Holter monitor procedures are known as cardiographic or *electrocardiograph* (or *EKG*) technicians.

To take a basic EKG, which traces electrical impulses transmitted by the heart, technicians attach electrodes to the patient's chest, arms, and legs, and then manipulate switches on an EKG machine to obtain a reading. An EKG is printed out for interpretation by the physician. This test is done before most kinds of surgery or as part of a routine physical examination, especially on persons who have reached middle age or who have a history of cardiovascular problems.

EKG technicians with advanced training perform Holter monitor and stress testing. For Holter monitoring, technicians place electrodes on the patient's chest and attach a portable EKG monitor to the patient's belt. Following 24 or more hours of normal activity by the patient, the technician removes a tape from the monitor and places it in a scanner. After checking the quality of the recorded impulses on an electronic screen, the technician usually prints the information from the tape for analysis by a physician. Physicians use the output from the scanner to diagnose heart ailments, such as heart rhythm abnormalities or problems with pacemakers.

For a treadmill stress test, EKG technicians document the patient's medical history, explain the procedure, connect the patient to an EKG monitor, and obtain a baseline reading and resting blood pressure. Next, they monitor the heart's performance while the patient is walking on a treadmill, gradually in-

creasing the treadmill's speed to observe the effect of increased exertion. Like vascular technologists and cardiac sonographers, cardiographic technicians who perform EKG, Holter monitor, and stress tests are known as "noninvasive" technicians.

Technologists who use ultrasound to examine the heart chambers, valves, and vessels are referred to as *cardiac sonographers*, or *echocardiographers*. They use ultrasound instrumentation to create images called echocardiograms. An echocardiogram may be performed while the patient is either resting or physically active. Technologists may administer medication to physically active patients to assess their heart function. Cardiac sonographers also may assist physicians who perform transesophageal echocardiography, which involves placing a tube in the patient's esophagus to obtain ultrasound images.

**Work environment.** Cardiovascular technologists and technicians spend a lot of time walking and standing. Heavy lifting may be involved to move equipment or transfer patients. These workers wear heavy protective aprons while conducting some procedures. Those who work in catheterization laboratories may face stressful working conditions because they are in close contact with patients with serious heart ailments. For example, some patients may encounter complications that have life-or-death implications.

Some cardiovascular technologists and technicians may have the potential for radiation exposure, which is kept to a minimum by strict adherence to radiation safety guidelines. In addition, those who use sonography can be at an increased risk for musculoskeletal disorders such as carpal tunnel syndrome, neck and back strain, and eye strain. However, greater use of ergonomic equipment and an increasing awareness will continue to minimize such risks.

Technologists and technicians generally work a 5-day, 40-hour week that may include weekends. Those in catheterization



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laboratories tend to work longer hours and may work evenings. They also may be on call during the night and on weekends.

### Training, Other Qualifications, and Advancement

The most common level of education completed by cardiovascular technologists and technicians is an associate degree. Certification, although not required in all cases, is available.

**Education and training.** Although a few cardiovascular technologists, vascular technologists, and cardiac sonographers are currently trained on the job, most receive training in 2- to 4-year programs. The majority of technologists complete a 2-year junior or community college program, but 4-year programs are increasingly available. The first year is dedicated to core courses and is followed by a year of specialized instruction in either invasive, noninvasive cardiovascular, or noninvasive vascular technology. Those who are qualified in an allied health profession need to complete only the year of specialized instruction.

The Joint Review Committee on Education in Cardiovascular Technology reviews education programs seeking accreditation. The Commission on Accreditation of Allied Health Professions (CAAHEP) accredits these education programs; as of 2006, there were 31 programs accredited in cardiovascular technology in the United States. Similarly, those who want to study echocardiography or vascular sonography may also attend CAAHEP accredited programs in diagnostic medical sonography. In 2006, there were 147 diagnostic medical sonography programs accredited by CAAHEP. Those who attend these accredited programs are eligible to obtain professional certification.

Unlike most other cardiovascular technologists and technicians, most EKG technicians are trained on the job by an EKG supervisor or a cardiologist. On-the-job training usually lasts about 8 to 16 weeks. Most employers prefer to train people already in the health care field—nursing aides, for example. Some EKG technicians are students enrolled in 2-year programs to become technologists, working part time to gain experience and make contact with employers. One-year certification programs exist for basic EKGs, Holter monitoring, and stress testing.

**Licensure and certification.** Some States require workers in this occupation to be licensed. For information on a particular State, contact that State's medical board. Certification is available from two organizations: Cardiovascular Credentialing International (CCI) and the American Registry of Diagnostic Medical Sonographers (ARDMS). The CCI offers four certifications—Certified Cardiographic Technician (CCT), Registered Cardiac Sonographer (RCS), Registered Vascular Specialist (RVS), and Registered Cardiovascular Invasive Specialist (RCIS). The ARDMS offers Registered Diagnostic Cardiac Sonographer (RDCS) and Registered Vascular Technologist (RVT) credentials. Some States require certification as part of licensure. In other States, certification is not required but many employers prefer it.

**Other qualifications.** Cardiovascular technologists and technicians must be reliable, have mechanical aptitude, and be able to follow detailed instructions. A pleasant, relaxed manner for putting patients at ease is an asset. They must be articulate as they must communicate technically with physicians and also explain procedures simply to patients.

**Projections data from the National Employment Matrix**

Occupational Title	SOC Code	Employment, 2006	Projected employment, 2016	Change, 2006-2016	
				Number	Percent
Cardiovascular technologists and technicians.....	29-2031	45,000	57,000	12,000	26

NOTE: Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook*.

**Advancement.** Technologists and technicians can advance to higher levels of the profession as many institutions structure the occupation with multiple levels, each having an increasing amount of responsibility. Technologists and technicians also can advance into supervisory or management positions. Other common possibilities include working in an educational setting or conducting laboratory work.

**Employment**

Cardiovascular technologists and technicians held about 45,000 jobs in 2006. About 3 out of 4 jobs were in hospitals (public and private), primarily in cardiology departments. The remaining jobs were mostly in offices of physicians, including cardiologists, or in medical and diagnostic laboratories, including diagnostic imaging centers.

**Job Outlook**

Employment is expected to grow much faster than average; technologists and technicians trained to perform certain procedures will be in particular demand.

**Employment change.** Employment of cardiovascular technologists and technicians is expected to increase by 26 percent through the year 2016, much faster than the average for all occupations. Growth will occur as the population ages, because older people have a higher incidence of heart disease and other complications of the heart and vascular system. Procedures such as ultrasound are being performed more often as a replacement for more expensive and more invasive procedures. Due to advances in medicine and greater public awareness, signs of vascular disease can be detected earlier, creating demand for cardiovascular technologists and technicians to perform various procedures.

Employment of vascular technologists and echocardiographers will grow as advances in vascular technology and sonography reduce the need for more costly and invasive procedures. Electrophysiology is also becoming a rapidly growing specialty. However, fewer EKG technicians will be needed, as hospitals train nursing aides and others to perform basic EKG procedures. Individuals trained in Holter monitoring and stress testing are expected to have more favorable job prospects than those who can perform only a basic EKG.

Medicaid has relaxed some of the rules governing reimbursement for vascular exams, which is resulting in vascular studies becoming a more routine practice. As a result of increased use of these procedures, individuals with training in vascular studies should have more favorable employment opportunities.

**Job prospects.** Some additional job openings for cardiovascular technologists and technicians will arise from replacement needs as individuals transfer to other jobs or leave the labor force. Although growing awareness of musculoskeletal disorders has made prevention easier, some cardiovascular technolo-

gists and technicians have been forced to leave the occupation early because of this disorder.

It is not uncommon for cardiovascular technologists and technicians to move between the specialties within the occupation by obtaining certification in more than one specialty.

**Earnings**

Median annual earnings of cardiovascular technologists and technicians were \$42,300 in May 2006. The middle 50 percent earned between \$29,900 and \$55,670. The lowest 10 percent earned less than \$23,670, and the highest 10 percent earned more than \$67,410. Median annual earnings of cardiovascular technologists and technicians in 2006 were \$41,960 in offices of physicians and \$41,950 in general medical and surgical hospitals.

**Related Occupations**

Cardiovascular technologists and technicians operate sophisticated equipment that helps physicians and other health practitioners to diagnose and treat patients. So do diagnostic medical sonographers, nuclear medicine technologists, radiation therapists, radiologic technologists and technicians, and respiratory therapists.

**Sources of Additional Information**

For general information about a career in cardiovascular technology, contact:

► Alliance of Cardiovascular Professionals, Thalia Landing Offices, Bldg. 2, 4356 Bonney Rd., Suite 103, Virginia Beach, VA 23452-1200. Internet: <http://www.acp-online.org>

For a list of accredited programs in cardiovascular technology, contact:

► Committee on Accreditation for Allied Health Education Programs, 1361 Park St, Clearwater, FL 33756.

Internet: <http://www.caahep.org>

► Society for Vascular Ultrasound, 4601 Presidents Dr., Suite 260, Lanham, MD 20706-4381.

Internet: <http://www.svunet.org>

For information on echocardiography, contact:

► American Society of Echocardiography, 1500 Sunday Dr., Suite 102, Raleigh, NC 27607.

Internet: <http://www.asecho.org>

For information regarding registration and certification, contact:

► Cardiovascular Credentialing International, 1500 Sunday Dr., Suite 102, Raleigh, NC 27607.

Internet: <http://www.cci-online.org>

► American Registry of Diagnostic Medical Sonographers, 51 Monroe St., Plaza East ONE., Rockville, MD 20850-2400.

Internet: <http://www.ardms.org>