

Median annual earnings of cardiovascular technologists and technicians in 2000 were \$33,100 in offices and clinics of medical doctors and \$32,860 in hospitals.

Related Occupations

Cardiovascular technologists and technicians operate sophisticated equipment that helps physicians and other health practitioners 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, 4456 Corporation Ln., Suite 165, Virginia Beach, VA 23462. Internet:

<http://www.acp-online.org/index.html>

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

➤ Joint Review Committee on Education in Cardiovascular Technology, 3525 Ellicott Mills Dr., Suite N, Ellicott City, MD 21043-4547. Internet:

<http://www.sicp.com/jrc-cvt>

For information on vascular technology, contact:

➤ The Society of Vascular Technology, 4601 Presidents Dr., Suite 260, Lanham, MD 20706-4365. Internet: <http://www.svt.net.org>

For information on echocardiography, contact:

➤ American Society of Echocardiography, 4101 Lake Boone Trail, Suite 201, Raleigh, NC 27607. Internet: <http://www.asecho.org>

For information regarding registration and certification, contact:

➤ Cardiovascular Credentialing International, 4456 Corporation Ln., Suite 110, Virginia Beach, VA 23462. Internet: <http://www.cci-online.org>

➤ American Registry of Diagnostic Medical Sonographers, 600 Jefferson Plaza, Suite 360, Rockville, MD 20852-1150. Internet: <http://www.ardms.org>

Clinical Laboratory Technologists and Technicians

(O*NET 29-2011.00, 29-2012.00)

Significant Points

- Clinical laboratory technologists usually have a bachelor's degree with a major in medical technology or in one of the life sciences; clinical laboratory technicians need either an associate's degree or a certificate.
- Employment is expected to grow as fast as average as the volume of laboratory tests increases with population growth and the development of new types of tests.

Nature of the Work

Clinical laboratory testing plays a crucial role in the detection, diagnosis, and treatment of disease. Clinical laboratory technologists, also referred to as *clinical laboratory scientists* or *medical technologists*, and clinical laboratory technicians, also known as *medical technicians* or *medical laboratory technicians*, perform most of these tests.

Clinical laboratory personnel examine and analyze body fluids, tissues, and cells. They look for bacteria, parasites, and other microorganisms; analyze the chemical content of fluids; match blood for transfusions; and test for drug levels in the blood to show how a patient is responding to treatment. These technologists also prepare

specimens for examination, count cells, and look for abnormal cells. They use automated equipment and instruments capable of performing a number of tests simultaneously, as well as microscopes, cell counters, and other sophisticated laboratory equipment. Then, they analyze the results and relay them to physicians. With increasing automation and the use of computer technology, the work of technologists and technicians has become less hands-on and more analytical.

The complexity of tests performed, the level of judgment needed, and the amount of responsibility workers assume depend largely on the amount of education and experience they have.

Medical and clinical laboratory technologists generally have a bachelor's degree in medical technology or in one of the life sciences, or they have a combination of formal training and work experience. They perform complex chemical, biological, hematological, immunologic, microscopic, and bacteriological tests. Technologists microscopically examine blood, tissue, and other body substances. They make cultures of body fluid and tissue samples, to determine the presence of bacteria, fungi, parasites, or other microorganisms. They analyze samples for chemical content or reaction and determine blood glucose and cholesterol levels. They also type and cross match blood samples for transfusions.

Medical and clinical laboratory technologists evaluate test results, develop and modify procedures, and establish and monitor programs, to ensure the accuracy of tests. Some medical and clinical laboratory technologists supervise medical and clinical laboratory technicians.



Laboratory technologists and technicians examine and analyze body fluids, tissues, and cells.

Technologists in small laboratories perform many types of tests, whereas those in large laboratories generally specialize. Technologists who prepare specimens and analyze the chemical and hormonal contents of body fluids are *clinical chemistry technologists*. Those who examine and identify bacteria and other microorganisms are *microbiology technologists*. *Blood bank technologists*, or *immunohematology technologists*, collect, type, and prepare blood and its components for transfusions. *Immunology technologists* examine elements and responses of the human immune system to foreign bodies. *Cytotechnologists* prepare slides of body cells and microscopically examine these cells for abnormalities that may signal the beginning of a cancerous growth. *Molecular biology technologists* perform complex genetic testing on cell samples.

Medical and clinical laboratory technicians perform less complex tests and laboratory procedures than technologists. Technicians may prepare specimens and operate automated analyzers, for example, or they may perform manual tests following detailed instructions. Like technologists, they may work in several areas of the clinical laboratory or specialize in just one. *Histology technicians* cut and stain tissue specimens for microscopic examination by pathologists, and *phlebotomists* collect blood samples. They usually work under the supervision of medical and clinical laboratory technologists or laboratory managers.

Working Conditions

Hours and other working conditions of clinical laboratory technologists and technicians vary, according to the size and type of employment setting. In large hospitals or in independent laboratories that operate continuously, personnel usually work the day, evening, or night shift and may work weekends and holidays. Laboratory personnel in small facilities may work on rotating shifts, rather than on a regular shift. In some facilities, laboratory personnel are on call several nights a week or on weekends, in case of an emergency.

Clinical laboratory personnel are trained to work with infectious specimens. When proper methods of infection control and sterilization are followed, few hazards exist. Protective masks, gloves, and goggles are often necessary to ensure the safety of laboratory personnel.

Laboratories usually are well-lighted and clean; however, specimens, solutions, and reagents used in the laboratory sometimes produce fumes. Laboratory workers may spend a great deal of time on their feet.

Employment

Clinical laboratory technologists and technicians held about 295,000 jobs in 2000. About half worked in hospitals. Most of the remaining jobs were found in medical laboratories or offices and clinics of physicians. A small number were in blood banks, research and testing laboratories, and in the Federal Government—at U.S. Department of Veterans Affairs hospitals and U.S. Public Health Service facilities.

Training, Other Qualifications, and Advancement

The usual requirement for an entry-level position as a medical or clinical laboratory technologist is a bachelor's degree with a major in medical technology or in one of the life sciences. Universities and hospitals offer medical technology programs. It also is possible to qualify through a combination of education, on-the-job, and specialized training.

Bachelor's degree programs in medical technology include courses in chemistry, biological sciences, microbiology, mathematics, statistics, and specialized courses devoted to knowledge and skills used in the clinical laboratory. Many programs also offer or require courses in management, business, and computer applications. The Clinical

Laboratory Improvement Act (CLIA) requires technologists who perform certain highly complex tests to have at least an associate's degree.

Medical and clinical laboratory technicians generally have either an associate's degree from a community or junior college or a certificate from a hospital, vocational or technical school, or from one of the U.S. Armed Forces. A few technicians learn their skills on the job.

The National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) fully accredits 503 programs for medical and clinical laboratory technologists, medical and clinical laboratory technicians, histologic technologists and technicians, and pathologists' assistants. NAACLS also approves 70 programs in phlebotomy, cytogenetic technology, molecular biology, and clinical assisting. Other nationally recognized accrediting agencies include the Commission on Accreditation of Allied Health Education Programs (CAAHEP) and the Accrediting Bureau of Health Education Schools (ABHES).

Some States require laboratory personnel to be licensed or registered. Information on licensure is available from State departments of health or boards of occupational licensing. Certification is a voluntary process by which a nongovernmental organization, such as a professional society or certifying agency, grants recognition to an individual whose professional competence meets prescribed standards. Widely accepted by employers in the health industry, certification is a prerequisite for most jobs and often is necessary for advancement. Agencies certifying medical and clinical laboratory technologists and technicians include the Board of Registry of the American Society for Clinical Pathology, the American Medical Technologists, the National Credentialing Agency for Laboratory Personnel, and the Board of Registry of the American Association of Bioanalysts. These agencies have different requirements for certification and different organizational sponsors.

Clinical laboratory personnel need good analytical judgment and the ability to work under pressure. Close attention to detail is essential, because small differences or changes in test substances or numerical readouts can be crucial for patient care. Manual dexterity and normal color vision are highly desirable. With the widespread use of automated laboratory equipment, computer skills are important. In addition, technologists in particular are expected to be good at problem solving.

Technologists may advance to supervisory positions in laboratory work or become chief medical or clinical laboratory technologists or laboratory managers in hospitals. Manufacturers of home diagnostic testing kits and laboratory equipment and supplies seek experienced technologists to work in product development, marketing, and sales. Graduate education in medical technology, one of the biological sciences, chemistry, management, or education usually speeds advancement. A doctorate is needed to become a laboratory director. However, federal regulation allows directors of moderate complexity laboratories to have either a master's degree or a bachelor's degree combined with the appropriate amount of training and experience. Technicians can become technologists through additional education and experience.

Job Outlook

Employment of clinical laboratory workers is expected to grow about as fast as the average for all occupations through the year 2010, as the volume of laboratory tests increases with population growth and the development of new types of tests.

Technological advances will continue to have two opposing effects on employment through 2010. New, increasingly powerful diagnostic tests will encourage additional testing and spur employment. On the other hand, research and development efforts targeted

at simplifying routine testing procedures may enhance the ability of nonlaboratory personnel, physicians and patients, in particular, to perform tests now done in laboratories.

Although significant, growth will not be the only source of opportunities. As in most occupations, many openings will result from the need to replace workers who transfer to other occupations, retire, or stop working for some other reason.

Earnings

Median annual earnings of medical and clinical laboratory technologists were \$40,510 in 2000. The middle 50 percent earned between \$34,220 and \$47,460. The lowest 10 percent earned less than \$29,240, and the highest 10 percent earned more than \$55,560. Median annual earnings in the industries employing the largest numbers of medical and clinical laboratory technologists in 2000 were as follows:

| | |
|--|----------|
| Hospitals | \$40,840 |
| Medical and dental laboratories | 39,780 |
| Offices and clinics of medical doctors | 38,850 |

Median annual earnings of medical and clinical laboratory technicians were \$27,540 in 2000. The middle 50 percent earned between \$22,260 and \$34,320. The lowest 10 percent earned less than \$18,550, and the highest 10 percent earned more than \$42,370. Median annual earnings in the industries employing the largest numbers of medical and clinical laboratory technicians in 2000 were as follows:

| | |
|---|----------|
| Hospitals | \$28,860 |
| Colleges and universities | 27,810 |
| Offices and clinics of medical doctors | 27,180 |
| Medical and dental laboratories | 25,250 |
| Health and allied health services, not elsewhere classified | 24,370 |

According to the American Society for Clinical Pathology, median hourly pay of staff clinical laboratory technologists and technicians in 2000 varied by specialty as follows:

| | <i>Beginning</i> | <i>Average</i> | <i>Top</i> |
|-------------------------------------|------------------|----------------|------------|
| Cytotechnologist | \$16.70 | \$21.30 | \$24.00 |
| Histotechnologist | 13.90 | 18.00 | 19.90 |
| Medical technologist | 14.00 | 17.90 | 20.50 |
| Histologic technician | 12.00 | 15.30 | 17.30 |
| Medical laboratory technician | 11.40 | 14.00 | 16.30 |
| Phlebotomist | 8.10 | 9.90 | 11.80 |

Related Occupations

Clinical laboratory technologists and technicians analyze body fluids, tissue, and other substances using a variety of tests. Similar or related procedures are performed by chemists and material scientists, science technicians, and veterinary technologists, technicians, and assistants.

Sources of Additional Information

For a list of accredited and approved educational programs for clinical laboratory personnel, contact:

➤ National Accrediting Agency for Clinical Laboratory Sciences, 8410 W. Bryn Mawr Ave., Suite 670, Chicago, IL 60631. Internet: <http://www.naacls.org>

Information on certification is available from:

➤ American Association of Bioanalysts, 917 Locust St., Suite 1100, St. Louis, MO 63101. Internet: <http://www.aab.org>

➤ American Medical Technologists, 710 Higgins Rd., Park Ridge, IL 60068. Internet: <http://www.amt1.com>

➤ American Society for Clinical Pathology, Board of Registry, 2100 West Harrison St., Chicago, IL 60612. Internet: <http://www.ascp.org/bor>

➤ National Credentialing Agency for Laboratory Personnel, P.O. Box 15945-289, Lenexa, KS 66285-5935. Internet: <http://www.nca-info.org>

Additional career information is available from:

➤ American Association of Blood Banks, 8101 Glenbrook Rd., Bethesda, MD 20814-2749. Internet: <http://www.aabb.org>

➤ American Society for Clinical Laboratory Science, 7910 Woodmont Ave., Suite 530, Bethesda, MD 20814. Internet: <http://www.ascls.org>

➤ American Society for Clinical Pathology, 2100 West Harrison St., Chicago, IL 60612. Internet: <http://www.ascp.org>

Dental Hygienists

(O*NET 29-2021.00)

Significant Points

- Dental hygienists are projected to be one of the 30 fastest growing occupations.
- Population growth and greater retention of natural teeth will stimulate demand for dental hygienists.
- Opportunities for part-time work and flexible schedules are common.

Nature of the Work

Dental hygienists remove soft and hard deposits from teeth, teach patients how to practice good oral hygiene, and provide other preventive dental care. Hygienists examine patients' teeth and gums, recording the presence of diseases or abnormalities. They remove calculus, stains, and plaque from teeth; take and develop dental x rays; and apply cavity-preventive agents such as fluorides and pit and fissure sealants. In some States, hygienists administer anesthetics; place and carve filling materials, temporary fillings, and periodontal dressings; remove sutures; perform root-planing as a periodontal therapy; and smooth and polish metal restorations. Although hygienists may not diagnose diseases, they can prepare clinical and laboratory diagnostic tests for the dentist to interpret. Hygienists sometimes work chairside with the dentist during treatment.

Dental hygienists also help patients develop and maintain good oral health. For example, they may explain the relationship between diet and oral health, or even the link between oral health and such serious conditions as heart disease and stroke. They also inform patients how to select toothbrushes and show them how to brush and floss their teeth.

Dental hygienists use hand and rotary instruments and ultrasonics to clean and polish teeth, x-ray machines to take dental pictures,



Hygienists clean and examine teeth and gums, noting the presence of diseases or abnormalities.