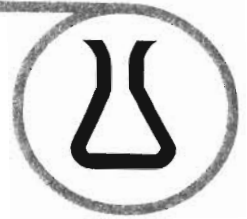


# Biomedical Equipment Technicians



(Biomedical Equipment Technicians)

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**Occupational Brief Title Codes:**

- D.O.T.: 019.261-010
- G.O.E.: 02.04.02
- S.O.C.: 49-9062
- O\*NET™ 3.1: 49-9062.00
- N.A.I.C.S.: 621999
- H.O.C.: RIE

**Work Classification Based Related**
**D.O.T. Occupations:**

- Biomedical Engineers
- Calibration Laboratory Technicians
- Fire Protection Engineering Technicians
- Materials Engineers
- Optical Engineers
- Packaging Engineers

**Interests Based Related**
**G.O.E. Occupations:**

- Aerospace Physiological Technicians
- Biological Aides
- Cytotechnologists
- Food Testers
- Laboratory Technicians
- Medical Technologists

**Skills Based Related**
**O\*NET Occupations:**

- Camera and Photographic Equipment Repairers
- Model Makers, Metal and Plastic
- Motorcycle Mechanics
- Office Machine and Cash Register Servicers

**Noteworthy Quote:**

*"Biomedical equipment technicians (BMETs) are a critical, but often under-recognized, component of our healthcare system. Every day brings new challenges and new opportunities as medical equipment technology continues to advance. Being the resident expert on this high-tech equipment leaves you with a great sense of job satisfaction at the end of the day, knowing that you make a real difference in the quality of healthcare that patients receive."*

—Roger A. Bowles, M.S.,  
CBET, Master Instructor-Biomedical  
Equipment Technology, Texas State  
Technical College, Waco, Texas

**Biomedical equipment technicians** (bio'med-i-cal 'equip-ment tech'ni-cians) evaluate, inspect, install, maintain and repair the technology used in health care delivery. They guide medical staff in the proper operation of the equipment and participate in manufacturer training. Technological areas include patient monitors, imaging devices, surgical equipment, bodily fluid analyzers, and respiratory support instrumentation.

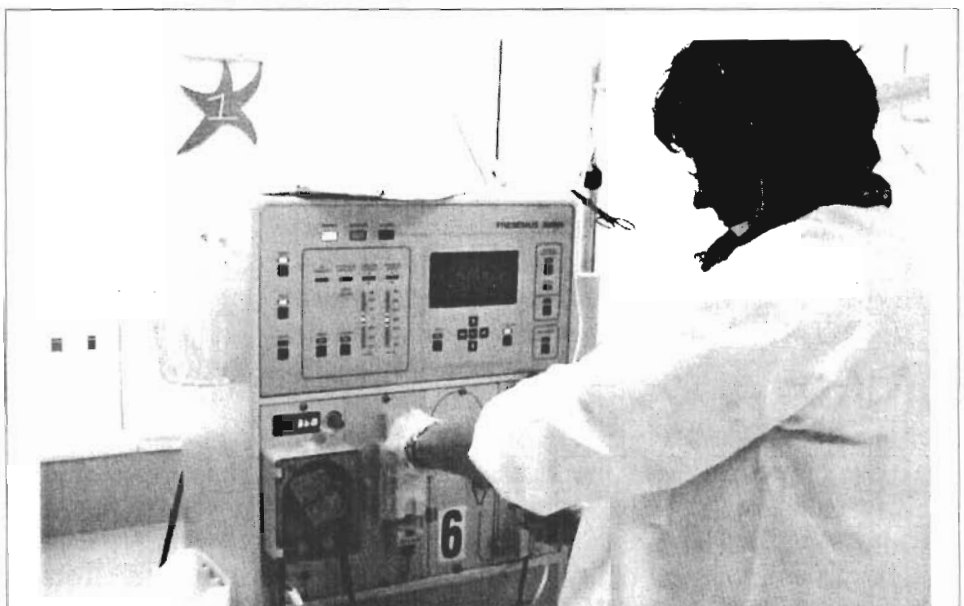
**Work Performed**

Biomedical equipment technicians maintain biomedical equipment for use by physicians, nurses, and medical personnel who monitor and treat patients, and for scientists or engineers who conduct research on illnesses and diseases.

Some examples of the equipment may include physiological monitors, electrocardiographs, blood gas analyzers, X-ray units, and anesthesia apparatus. Technicians service pacemakers, ventilators, sterilizers, physical therapy equipment, defibrillators, and electrosurgery units. Some technicians also service patient-care computers and other technical equipment.

When new equipment arrives, technicians check the device against the purchase order. They verify its performance before they install it or release it for use by the staff. If the manufacturer installs the equipment, the technicians may be responsible for checking the installation to see that it is correct.

Preventative maintenance is an important part of the biomedical equipment technicians' work. Technicians use technical manuals and manufacturer's training to set up schedules and routinely check all equipment to verify proper performance and calibrate if necessary. This routine saves costly repairs and reduces downtime.



*Biomedical equipment technicians evaluate, inspect, maintain, repair, and install biomedical equipment and instruments.*

*Photo by CGP Staff*

When equipment does not function, biomedical equipment technicians must determine the problem. They use measuring devices and computerized analyzers, as well as their own troubleshooting skills. They may take the equipment apart to examine the parts more closely. They may repair or replace the parts. Components may be both electrical and mechanical and can include integrated circuits, switches, transformers, tubing, bellows, motors, or circuit boards.

If a machine or equipment requires repair by the manufacturer or an outside service organization, technicians may contact and work with this vendor. When a manufacturer's service representative comes to the hospital to work on equipment, technicians may schedule and oversee the work.

Technicians routinely safety-test medical equipment to insure the safety of the patients and staff from electrical or mechanical hazards. They confer with medical staff to be sure the equipment works properly and safely. All equipment for patient care must conform to strict safety standards.

Technicians may educate the hospital staff or researchers on how to operate clinical equipment. They explain how units work, the conditions under which certain instruments may be used, and how to solve small operating problems. They may show them how to monitor and maintain the equipment. They may explain codes and rulings on the use of biomedical equipment. These technicians also may help physicians, nurses, and researchers carry out clinical procedures and experiments. The ability of biomedical technicians to communicate effectively with hospital personnel is extremely important.

Under the direction of the medical staff and perhaps a clinical engineer, biomedical equipment technicians may upgrade equipment. They may add or change parts to meet special requirements for diagnosis or treatment. Biomedical equipment technicians may be specialists who repair only one kind of equipment, such as X-ray machines, lasers, anesthesia machines, patient-monitoring devices, or other biotechnical instrumentation.

Biomedical equipment technicians maintain inventories of all the instruments in the hospital, their location, their condition, and who operates them. They reorder parts and units, see that medical staff can get instruments they need in an emergency, and replace or restore unsafe instruments.

Some technicians work for manufacturers of biomedical equipment. They visit different hospitals or research centers to install, adjust, or repair equipment. They keep records of service calls, expenses, and technical data about each unit. They may train and support the equipment users at these locations.

### **Working Conditions**

Most biomedical equipment technicians have pleasant working conditions. They work indoors in well-lighted,

clean, comfortable, air-conditioned settings. Their surroundings may vary with their assignments. One day they may work in a treatment room with patients and staff. On another day they may confer with engineers, administrators, or other staff members. They may spend some days at a workbench repairing equipment.

Those who work for industry travel to places that use the products of their company in order to repair or maintain the equipment. Now and then they may have to travel some distance, and may be away from home overnight or longer.

### **Hours and Earnings**

The workweek for technicians is eight hours a day, five days a week. They may work longer hours in an emergency, or they may be on-call for emergencies during their off hours. They may work rotating shifts, which include weekends and holidays. Most, however, work a day shift at a hospital, which is 7 am to 3:30 pm weekdays.

According to the Bureau of Labor statistics, biomedical equipment technicians earned about \$17.00 an hour in the year 2000. Like many occupations, wages vary depending on geographic location, employer, and years of experience.

Most employers offer paid holidays and vacations and other benefits. They may include life and health insurance, medical and dental insurance, sick pay, pensions, stock options, continuing education, and a company car.

### **Education and Training**

This occupation does not require a four-year college degree. It may be difficult, however, to obtain employment with no degree. Many prepare for this work with a two-year associate degree. Students study electronics courses, and also take studies in anatomy, biology, chemistry, physics, and physiology. A biomedical engineering technology curriculum for the first year may include DC and AC circuit analysis, algebra and trigonometry, technical math semiconductor theory, electromechanical fluid devices, a social science elective, and career communications. Second-year studies may consist of biomedical instrumentation, analog circuits, digital circuits, patient technology and health care delivery systems, circuit application and troubleshooting, microprocessors, and oral communications. Students also participate in hospital internships at field sites.

Technicians need continuing education to maintain their skills. The advances in technology come so quickly that the literature cannot keep up with the technology. Those who earn a degree in biomedical equipment technology often get special training from equipment manufacturers.

High school students should take courses that prepare them for admission to a two-year or a four-year college

offering a major in biomedical equipment technology. Useful subjects include mathematics through trigonometry, biology, physics, chemistry, and computer programming. Shop courses that deal with tools and equipment are helpful. English helps develop speaking and writing skills.

### **Certification and Professional Societies**

The Board of Examiners for Biomedical Equipment Technicians, operating under the direction of the International Certification Commission for Clinical Engineering and Biomedical Equipment Technology, offers a certification program for biomedical equipment technicians. Candidates may earn certification as a certified biomedical equipment technician (CBET) after successfully passing a national examination and meeting the education and experience requirements. Certification for biomedical equipment technicians is voluntary, but it may lead to higher earnings, especially for beginners in the field.

Two specialty certifications are available in addition to the CBET for general biomedical equipment technicians. These are the Certified Laboratory Equipment Specialist (CLES) and the Certified Radiologic Equipment Specialist (CRES).

### **Personal Qualifications**

Biomedical equipment technicians should enjoy mechanical, electrical, and electronic work. They should be precise and accurate in their work. Technicians should be able to handle the stress that occurs in an emergency. They should be patient, sensitive, and tactful with others who may be upset.

Communication skills are as vital in this field as technical skills. Technicians must be able to describe or explain breakdowns both orally and in writing to manufacturers. For the hospital staff, they often write instructions on how to operate the equipment. They may give talks to staff members on the use of technology.

Technicians who have occasion to meet patients in the course of treatment should not be sensitive to the sight of blood or of critically ill patients. They should have a good bedside manner.

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**

Most biomedical equipment technicians work in hospitals. Usually they work in the department of clinical or biomedical engineering. According to recent polls, it is estimated that the ratio of biomedical equipment technicians to patients is one technician for every 100 patient bed.

Other technicians work for medical research centers, biomedical equipment manufacturers, health care centers, and medical supply firms.

Technicians may work anywhere in the United States. Most jobs are in big city hospitals and clinics with large budgets for biomedical equipment. Some smaller hospitals, however, rely on technicians who work for biomedical equipment manufacturers, distributors, shared service companies, or independent service organizations.

Technicians also work for research institutions that use biomedical equipment. Others work for corporations involved in the medical industry and in industrial laboratories.

Biomedical equipment technicians serve in the Armed Forces. Others work for federal, state, or local governments in Veterans Administration hospitals or public health services.

### **Employment Outlook**

The use of electronic equipment to diagnose, treat, and monitor patients, as well as in research, continues to increase. Advances in technology will affect health care even more in the future. Hospitals and other medical centers that use this equipment will need skilled technicians to install and maintain it.

The increased use of computers, microprocessors, and other electronic devices will also require technicians to maintain and repair them. The employment outlook for biomedical equipment technicians will continue to improve through the year 2010 and beyond. Technicians with the best academic credentials and work experience will be most in demand.

### **Entry Methods**

Graduates of two-year or four-year colleges may find employment through the school placement office. They may apply at hospitals, medical centers, or other places that use or manufacture biomedical equipment. Some firms that offer equipment maintenance, independent service organizations, or rental may hire these technicians. The Yellow Pages of telephone books may list these employers under "Hospital Equipment and Supplies" or under "Physicians & Surgeons Equipment & Supplies." Medical journals may feature lists of openings for medical personnel. The classified sections of newspapers and the Internet also list job openings for technicians.

Many states have associations for technicians and corporations involved in technology for patient care. These associations often have meetings which offer applicants excellent networking opportunities and announcement of vacancies.

### **Advancement**

Experienced technicians work independently in repair and maintenance programs. They may do skilled work

under supervision. The most advanced biomedical technicians perform skilled work with little supervision. They may also instruct and oversee less experienced technicians. Supervisors may manage projects and may report to a department head or the hospital administration.

In order to advance, most technicians specialize within a limited area of instrumentation. To do this, technicians obtain specialized manufacturer training and increase their departmental responsibilities. Some technicians may choose to work in a different hospital in order to continue to advance in a specialty that interests them. Those who get more education may become biomedical or clinical engineers. These experts may assist in management and research. They may design equipment such as life-support systems, artificial organs, pacemakers, or ultrasonic imaging devices. They may also become clinical engineers who may supervise technicians.

Prospects for advancement in industry are better. Technicians may start as field service trainees, advance to become field service technicians, and then become area or account managers. In these jobs they work independently and keep users of the equipment in touch with the company sales force. They may also give new technicians on-the-job training.

Area or account managers may become regional or national service managers. They direct or manage technicians and other staff, and they may be in charge of small, remote service centers. They organize and direct work assignments, give on-the-job training, and develop customer relations.

#### For Further Research

**Hanley & Belfus, Inc.**, 210 South Thirteenth Street, Philadelphia, PA 19107.

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Six times a year. Subscription \$60.00 a year.

**Upstream Press, Inc.** PO Box 1128, Glen Rose, Texas 76043. Web Site: [www.upstreampress.com](http://www.upstreampress.com)

*Critical Careers: A Guide to Opportunities in Medical Equipment Service.* By Roger A. Bowles.

#### Acknowledgments

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

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