MEDICAL TECHNOLOGISTS AND LABORATORY TECHNICIANS

EMPLOYMENT OPPORTUNITIES FOR WOMEN

Medical Series Bulletin No. 203–4 (1954)

UNITED STATES DEPARTMENT OF LABOR
James P. Mitchell, *Secretary*

WOMEN'S BUREAU
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This bulletin presents job information and training requirements for the MEDICAL TECHNOLOGIST and for a diversified group of MEDICAL LABORATORY TECHNICIAN occupations. It excludes such scientific medical specialists as the biochemist, hematologist, bacteriologist, serologist, and histopathologist, except for reference to show laboratory staff relationships, or as possible specializations for the medical technologist who takes additional academic training.

Among all medical laboratory occupations, the MEDICAL TECHNOLOGIST alone has been given definition and standardization in accordance with minimum requirements set by the Registry of Medical Technologists of the American Society of Clinical Pathologists, in cooperation with the American Medical Association.

MEDICAL TECHNICIAN and ASSISTANT TECHNICIAN jobs are loosely defined in practice but an effort is made in this report to group and describe them in broad outlines.

LABORATORY HELPERS and AIDES are classified as entry jobs which do not usually require experience.

EMPLOYMENT OPPORTUNITIES FOR WOMEN

MEDICAL SERIES

Physical Therapists. Bulletin 203–1, revised 1952.
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Medical X-Ray Technicians. Bulletin 203–8 (1954).

LETTER OF TRANSMITTAL

UNITED STATES DEPARTMENT OF LABOR,
WOMEN'S BUREAU,
Washington, June 4, 1954.

SIR: I have the honor to transmit a report on opportunities for women who are interested in employment and training leading toward careers in medical technology. An earlier Women's Bureau publication, Bulletin 203, number 4, dealing with medical laboratory technicians and issued in 1944, is superseded by this report.

Mildred S. Barber prepared this study under the supervision of Lillian V. Inke, Chief, Employment Opportunities Branch of the Research Division which is directed by Mary N. Hilton.

Respectfully submitted.

ALICE K. LEOPOLD, *Director.*

Hon. JAMES P. MITCHELL,
Secretary of Labor.

Acknowledgments . . .
are made to a number of persons and agencies for assistance in the preparation of this bulletin, including:

(1) The staff of the Pathology Service, United States Public Health Service Hospital, Baltimore, Md., as arranged through Dr. G. H. Hunt, Assistant Surgeon General and Associate Chief, Bureau of Medical Services, Washington, D. C., for their careful review of the manuscript.

(2) Medical, research, and administrative personnel at several other Federal agencies, especially the Armed Forces Institute of Pathology, the National Institutes of Health, and the Veterans Administration.

(3) Officers and staff of the Registry of Medical Technologists of the American Society of Clinical Pathologists; the American Society of Medical Technologists; and the American Medical Technologists; and especially to Dr. Lall G. Montgomery, Chairman, and Mrs. Ruth Drummond, Registrar, of the A. S. C. P. Registry for their technical review.

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(5) Pathologists, medical technologists, and medical technicians at some 20 hospitals, clinics, and laboratories, both private and governmental.

(6) For their courtesy in providing photographs, acknowledgment is made to the following:

Oscar B. Hunter Memorial Laboratory (figs. 3–B, 4–C, 5–B, 5–C).
Indiana University Medical Center (figs. 2–A, 2–C, 4–B).
Merck & Co., Inc. (fig. 6).
National Institutes of Health—
National Cancer Institute (figs. 2–B, 4–A, 5–A, 7).
National Institute of Arthritis and Metabolic Disease (fig. 1).
National Microbiological Institute (fig. 3–A).

CONTENTS

MEDICAL LABORATORY OCCUPATIONS: A PREVIEW

√ Among all trained medical laboratory workers, the majority, by far, are women.

√ About 9 out of every 10 registered medical technologists are women.

√ In 1954 there were 576 hospital schools (approved by the American Medical Association) in 48 States, the District of Columbia, Puerto Rico, Hawaii, and the Canal Zone which offered training courses for medical technologists.

√ About two-thirds of approved hospital schools charged no tuition in 1954, and about one-fourth paid students a small stipend during training.

√ There is no upper age limit for qualified trainee candidates, although most trainees enter hospital schools right from college science courses, and the majority are under 30.

√ Salaries for medical technologists and other trained laboratory personnel compare favorably with many jobs in teaching and social work which require as much, or more, training.

√ Employment opportunities for medical laboratory workers exceed the present number of qualified candidates and seem to be increasing year by year, both in diagnostic services and in research into disease.

√ Part-time work is common in medical laboratories: in 1952, about 10 percent of hospital technicians worked part time. This means that there are opportunities for women who wish to plan on combining careers with homemaking or who need to supplement income.

√ Medical technology is a field for the woman who finds rewards in work that provides services to people and is an essential part of the practice of medicine, with its exacting demands and high standards. At the same time, it is a vocational field which has limited contacts with patients and requires a good measure of scientific aptitude and manual dexterity.

√ In this generation and those to come, the race against time to prevent and control the major illnesses, such as cancer, poliomyelitis, multiple sclerosis, heart disease, lukemia, tuberculosis—and many others—can be considerably shortened by a continuing supply of trained medical technologists and technicians.

Figure 1.—Among the common clinical tests performed in the medical laboratory are those to determine blood type. This technician is typing an unknown sample of blood by mixing it with known serums and precipitins.

EMPLOYMENT OPPORTUNITIES FOR WOMEN AS MEDICAL TECHNOLOGISTS AND LABORATORY TECHNICIANS

I. THE MEDICAL LABORATORY AND ITS STAFF

Behind the Scenes With the Medical Team

Teamwork of the physician and nurse on behalf of the patient has been extended in recent years to include a number of specialized medical workers whose services may be tapped according to individual needs. A medical "team" for only one patient may consist of the attending physician and one or more specialized physicians, of a *professional nurse*, supplemented by or assisted by a *practical nurse* or *nurse aide*, and also of such specially trained medical personnel as an *occupational therapist*, a *physical therapist*, and an *X-ray technician*—all of whom become known to the patient, with whom direct contact is made.

Behind the scenes are a variety of medical laboratory personnel, who are key members of the team to aid in diagnosing and treating illness. As a group, they are known mainly as TECHNOLOGISTS or TECHNICIANS, although there are other workers among them whose duties will be explained.

Sometimes a laboratory worker is singled out and identified for the hospital patient because the physician has summoned her to assist in a task like taking a blood sample from the patient's arm or fingertip. A patient may also make the brief acquaintance of a laboratory technician or technologist when he is sent by his physician to a medical laboratory or clinic for tests of various kinds. Unlike the X-ray technician or nurse, however, laboratory personnel may never see patients whose body tissues and substances they examine carefully for signs of illness or disease.

Fact-Finders for the Physician

In the course of his examination of a patient, the physician's trained eye and the storehouse of experience and information he carries in his mind frequently lead him to accurate diagnosis of illness. On the other hand, the symptoms he can observe may not be

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sufficient to guide him to any conclusions. There are some diseases which cannot be diagnosed, and many which may not be identified with certainty, unless the deeply probing eye of the microscope is used, or the detective work of chemistry is applied to ferreting out information concerning the condition of certain body substances, or the presence of foreign or harmful substances in the body.

A number of physicians maintain limited laboratories in which they or their assistants make routine tests. But the tasks of conducting medical tests have become highly specialized and increasingly complex in the last 30 years. New and shorter methods, new equipment, and more accurate determinations of disease have been introduced into medical practice through the discoveries of research scientists. Practicing physicians are able neither to maintain complete laboratories nor to devote the special time required for all of the useful laboratory methods. Therefore, they must rely upon the medical laboratory of a hospital or clinic, or one conducted by a private physician who devotes himself to discovering and reporting upon the nature and condition of disease.

All of the trained medical laboratory staff are fact-finders for the physician. They are adept in tracking down the minute details of illness, especially those symptoms which cannot be observed by the naked eye. In addition, they carry on a continuous research for new facts and improved techniques.

Fifty Years Ago or So . . .

Hospitals at the beginning of the 1900's probably had less laboratory equipment than most physicians' offices of today. The microscope was in use, as well as methods of counting the cells in a tiny drop of blood and looking for bacteria, or other minute organisms, in blood or body tissue. Chemical tests were used for analyzing urine, and for discovering the presence of poisons in the body. Physicians and hospital internes, as part of their regular work, usually made the tests, many of which were simple and crude in comparison with methods in present use. As they got busier and the number of tests increased, physicians sometimes enlisted the help of hospital attendants or orderlies, who were at hand, to perform some of the routine tasks.

This is how the medical laboratory began: Some of the helpers were very skillful and gradually learned how to assist the doctors to a greater degree. Medical doctors began to see the advantage of setting up training courses for assistants to do laboratory work. In their offices and in hospitals, physicians began to devote some of their time to teaching laboratory methods to promising candidates. At first this was done on a small counter, with little more than a micro-

scope and some test tubes and jars. Later, as laboratory equipment became more elaborate and new tests and techniques were developed, separate quarters were needed.

Formal Recognition of the Medical Technologist in 1928

As the usefulness of laboratory personnel increased, questions of training and reliability of staff became of great importance to physicians. After the First World War, there was much discussion among members of the American Society of Clinical Pathologists and among the new group of laboratory workers themselves about the standards which should be set for medical laboratory occupations. It was not until 1928, however, that the A. S. C. P. created a registry to examine and certify MEDICAL TECHNOLOGISTS and assist them in finding suitable jobs. The same Registry of Medical Technologists of the American Society of Clinical Pathologists is in existence in 1954, although the occupation itself has gradually raised its standards through the years. In 1933, the MEDICAL TECHNOLOGISTS certified by the Registry organized a society of their own called "The American Society of Clinical Laboratory Technicians"; in 1936 the name was changed to "The American Society of Medical Technologists" (A. S. M. T.).

Technicians and Technologists—What's in a Name?

A most difficult subject to explain is the meaning of medical laboratory job titles and their usage among a variety of employers. The same job title frequently is used to describe different jobs. All of the medical laboratory workers perform useful and essential services, but some of the laboratory jobs have been more exactly defined than others. Furthermore, in occupations that are relatively new, as in the medical laboratory field, it is to be expected that occupational changes are taking place and will continue to take place for some time to come, so that the exact definitions of today—where they exist—may be obsolete tomorrow.

There is still another point to keep in mind when thinking about occupational titles: general terms or alternate titles for the same jobs are in common use, and the title of a job does not necessarily describe it. For common usage, a general title may be descriptive enough. For anyone who is seeking information about the requirements and training for jobs, it is important to be exact.

As previously noted, the occupation known as MEDICAL TECHNOLOGISTS was first defined in 1928, and still exists. In accord with the terms of the Registry affiliated with A. S. C. P., an exact set of training-and-job specifications is established, and the official title "Medical Technologist (American Society of Clinical Pathologists)" may be used only by those certified by the Registry. On the job,

the "M. T. (A. S. C. P.)" may be called a "laboratory technician" or a "medical technician," or by some other title if she becomes a specialist in one phase of the work.

In recent years, another group of medical laboratory workers has begun to use the title of "medical technologist." They, too, have established an organization, "The American Medical Technologists," for certifying their members, and seek full professional recognition. Although there is no connection between them and the AMA affiliates, they have a legal right to use the title "M. T.," which stands for Medical Technologist. (The standards for both M. T. (A. S. C. P.) affiliates and A. M. T. members are set forth in appendix 3.)

Although medical technologist as a job title was distinguished from a number of loosely classified laboratory jobs in 1928, distinctions between titles sometimes disappear in common usage, and two or three different kinds of medical laboratory workers (some of higher, and some of lesser qualifications) may be called "medical technicians." Among professional groups, however, the term TECHNOLOGIST is understood to carry definite requirements which are somewhat more demanding than the qualifications for workers designated as TECHNICIANS (*i. e.*, laboratory technicians, clinical laboratory technicians, or medical technicians). It should be kept in mind, however, that titles are likely to be misleading and that job definitions have not been standardized for all medical laboratory jobs.

Laboratory Staffing Patterns

The physician directly responsible for all of the clinical laboratory work is known as a PATHOLOGIST or, sometimes, CLINICAL PATHOLOGIST. He is a doctor of medicine who has specialized in the nature and causes of disease, and is, in a sense, a sort of medical Sherlock Holmes. On his staff are sleuths with specialized training in tracking down various kinds of diseases of the blood, the tissues, and the organs of the body, or in carrying out research on medical problems and developing improved methods for tests.

Depending upon the size of the medical laboratory and its capacity to carry out certain types of tests and research, a great variety of staffing patterns are found. These factors have a direct bearing upon the job duties and requirements for individual laboratory employees. In a small unit, for example, the pathologist may perform some of the tests, assisted by a medical technologist or a laboratory technician; or he may interpret and report upon the tests carried out by an assistant. As the unit grows in size, there is an accompanying breakdown and distribution of tasks, as well as an increase in the number of personnel, and a medical technologist may become a chief, in charge of other technologists.

A. Flocculation tests can be used for syphilis and tuberculosis. The medical technologist and her assistant treat serums taken from patient with biochemical substances. If the result is a precipitate, the presence of disease is indicated.

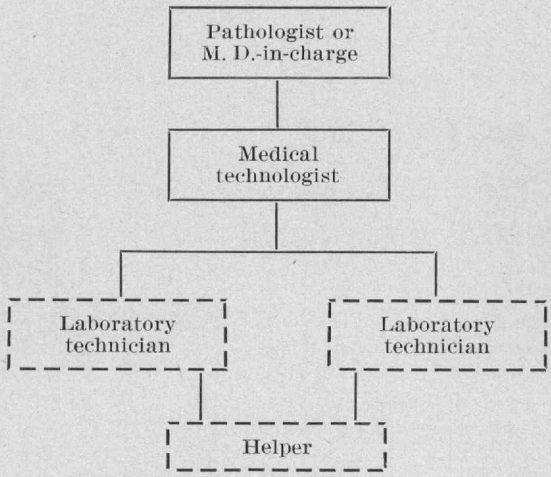
B. Paper chromotography method is sometimes used to test for unknown substances in specimens and samples. A drop of the specimen is placed on a specially prepared paper strip, and if a certain color develops, the substance may be identified.

C. Microscopes are used extensively in the medical laboratory to examine tissues, note cell structures, detect the presence of parasites or bacteria, and, very commonly, to count blood cells, as this medical technician is doing.

Figure 2. Hundreds of tests to determine disease must be learned by medical technologists.

A small laboratory staff may be shown, on a diagram, to look like this:

CHART NO. 1



The dotted-line boxes in the diagram indicate that the number of assistants reporting to the medical technologist may vary. If all positions are filled, there will be four levels of work, including the helper, who divides time between two technicians.

In considerable contrast, a large laboratory staffing pattern, where many more specialized scientific personnel are likely to be found, is shown on the opposite page.

It should be noted that the technicians who assist in bacteriology, biochemistry, serology, hematology, and histopathology, on chart No. 2, may fit any one of the following occupational categories, depending upon the requirements of the particular job:

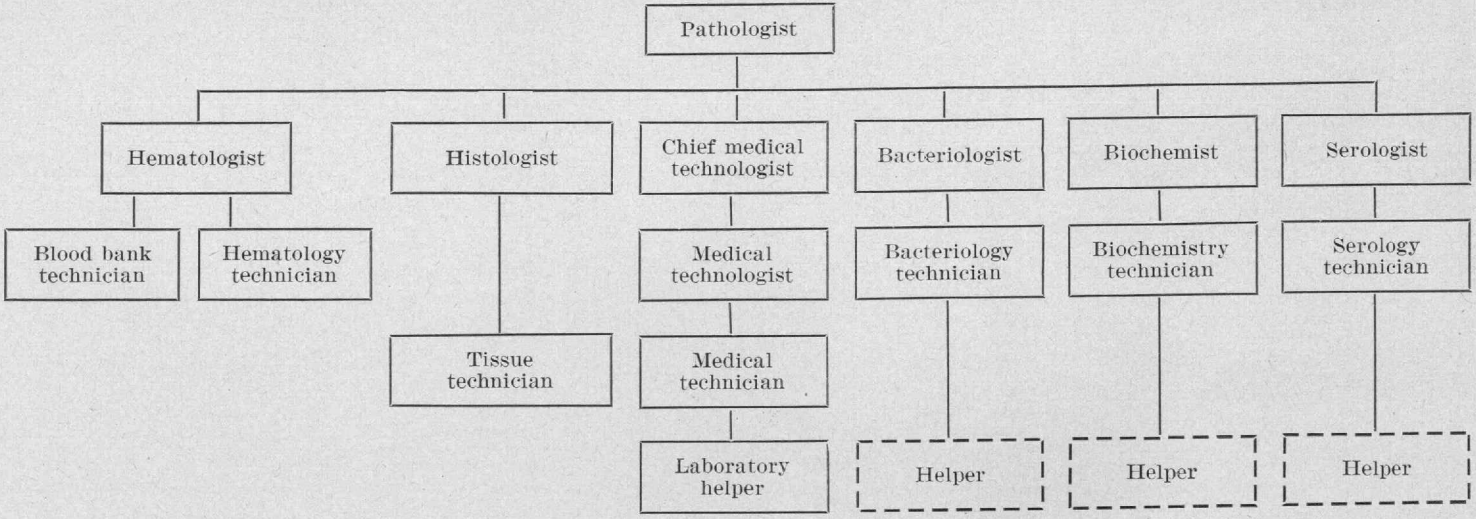
(*a*) Medical technologist (registered).

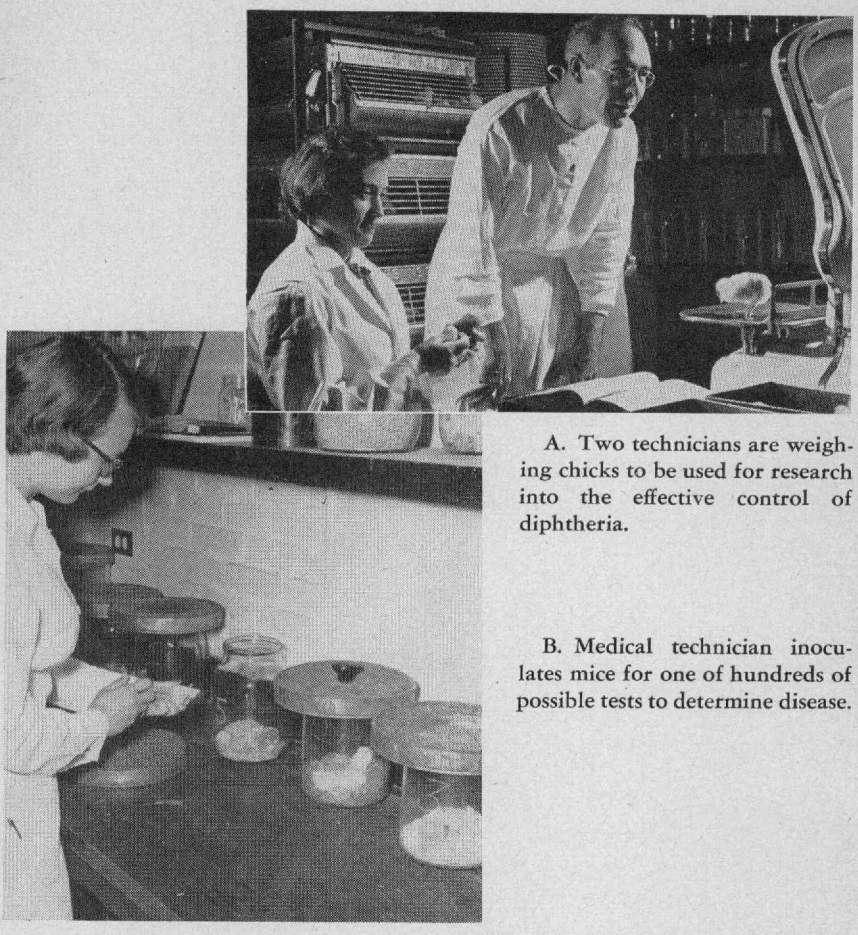
(*b*) College graduate with a bachelor of science degree in biology, biochemistry, or bacteriology.

(*c*) Medical technician with 2 years of accredited college work in biological science or chemistry, and 1 year of special experience in a medical laboratory.

Generally, the medical technologist is required to have an extensive knowledge of tests and test methods in *all* of the special fields mentioned.

CHART NO. 2


Pathologist
Hematologist
Histologist
Chief medical technologist
Bacteriologist
Biochemist
Serologist
Blood bank technician
Hematology technician
Tissue technician
Medical technologist
Medical technician
Laboratory helper
Bacteriology technician
Biochemistry technician
Serology technician
Helper
Helper
Helper



A. Two technicians are weighing chicks to be used for research into the effective control of diphtheria.

B. Medical technician inoculates mice for one of hundreds of possible tests to determine disease.

Figure 3.—Animals are examined and studied in the laboratory both for medical tests and research into disease.

The bacteriologist, hematologist, serologist, or biochemist is usually well qualified in theory, in his own special field, in order to carry out research, and is usually not required to make tests in any other field. In fact, this group of personnel may seldom perform tests in relation to the direct diagnosis or treatment of patients. They may work on long-term research projects and otherwise be called upon as consultants on current problems. Generally, a master's degree or a doctoral degree in one of the sciences is required for this kind of specialization. Some medical technologists have moved into these scientific research fields through special training and experience.

Laboratory technicians are not generally required to have as much training as the medical technologist. They may be employed to assist the medical technologist or any of the scientific specialists. Under the guidance of a technologist, a technician may obtain experience on several test methods, and under a specialist, an intensive knowledge in one field. On the other hand, a medical technologist who has specialized in a single field, such as hematology, may assist another specialist or the clinical pathologist himself.

In addition to the laboratory technicians there may be some specialized technicians to perform a limited number of routine tests, and also assistants and helpers who do a great deal of the manual work in cleaning equipment, making simple solutions, labeling materials, keeping up supplies and lending a hand in various ways.

On the other hand, the tissue technician or histologic technician is usually trained on the job to perform the sole task of mounting and staining tissue on the glass slide which is to be examined under the microscope by the histopathologist. Again, it is emphasized that the title "technician" is not, in itself, descriptive.

More details concerning job definitions and training requirements are discussed in the sections following. Diagrams and staffing patterns have been considered at this point to lay the foundation for understanding a group of jobs which are often closely interrelated, in a field where standards are likely to change from time to time—and place to place.

With reference to standards, some recommendations have been made by professional groups for the clearer definition of medical laboratory jobs. (See p. 23.)

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II. THE MEDICAL TECHNOLOGIST

Versatility Comes First in Job Demands

In order to qualify as a medical technologist the student learns to perform hundreds of medical tests which involve minute and accurate examination of body tissues, fluids, and by-products. Underpinning this wide range of medical testing methods there must be a working knowledge of anatomy, biological chemistry, bacteriology, and good grounding in mathematics and physics. The tests themselves require, in addition, a great deal of information about a variety of scientific laboratory equipment and skills in the step-by-step application of the methods of chemistry, microscopy, preparing bacterial culture media, separating and measuring blood content, and many other procedures which are used only in the medical laboratory.

Occasionally, the medical technologist may be required to make tests outside the laboratory, with the patient. Usually she learns how to operate basal metabolism equipment, the electrocardiograph, and the electroencephalograph.

It is standard practice in many large hospitals and clinics to have a nurse or physician-intern obtain samples of most body substances; tissue specimens are taken only by the surgeon, except possibly for post-mortem cases, when the physician-intern may assist. In some hospitals the medical technologist may take blood samples as a regular procedure, or she may be called upon to take a sample, or assist, on other occasions. For this purpose the technologist learns how to use a hypodermic needle and syringe skillfully with patients. She may also handle the inoculation of laboratory animals which are used for a number of tests.

Specialization May Follow

A versatile technologist is needed in the small laboratory. As the laboratory services expand, or as the technologist moves into the employment of a clinical pathologist with a crew of specialists, she may find herself assigned to a narrower range of tests. For example, she may work, for a time, almost exclusively in hematology and specialize in blood counts, blood typing, measure of coagulation rates, analysis of blood content, and tests for sedimentation and volume. Or she may perform a combination of these tasks with work in another field, such as the microscopic examination of blood or spinal-fluid samples for parasites which cause disease.

There is, of course, significant interrelationship between the hundreds of tests of different body substances. The clinical pathologist and the attending physician are expected to interpret the findings of any one test, or group of tests, and draw conclusions. But they depend upon the accurate work of the technologist, and often upon her judgment in checking and double-checking results. The broader foundation a specialist has, the greater is her value, even in a narrow field.

Reference is made to appendix 1 for details of the work performed by a medical technologist.

Service Supersedes Research

Although the medical technologist may follow a career pattern which leads eventually to medical research, her job is essentially one of providing scientific services in answer to immediate needs. She is trained to carry out the instructions of the physician who wants to know the cause or character of an illness, or the cause of death, if a post-mortem diagnosis is requested. There are emergencies in which as many facts as possible must be ascertained in a very short time to save a life or prevent serious complications. This is not to underestimate the significance of research: as a matter of fact, the accumulated medical test data on current problems often become part of, or lead to, a research project. The medical technologist may also spend a part of her laboratory time on research, or in the improvement of techniques. But the medical technologist job was established, first of all, to provide laboratory services to the physician.

In Order to Qualify

Career preparation of the medical technologist begins with high-school science courses. Because all schools for medical technologists that are approved by the Council on Medical Education and Hospitals of the American Medical Association have set forth a requirement of 2 years or more of college, the student who wishes to qualify for A. S. C. P. approved registration will need to prepare for college entrance.

In the education of medical technologists there is a noticeable trend toward higher academic prerequisites, which is hardly surprising, in view of the versatility demanded by the job and the new developments in medical science.

There are a number of privately conducted laboratory technician schools which accept high-school graduation or the equivalent, but these schools do not prepare the student for employment which requires registration of the medical technologist through the American Society of Clinical Pathologists.

Generally speaking, 4 years of college-level training is needed to

qualify a medical technologist for the M. T. (A. S. C. P.) title and certification, but a choice is possible between two educational plans:

(1) 2 years of accredited college work followed by a course in an approved hospital school for medical technology of 12 (minimum) or 24 months; or
(2) 4 years in a college which combines an approved hospital-school course with academic education, and which leads to a bachelor of science degree in medical technology.

Some educators in the field of medical technology predict that the M. T. (A. S. C. P.) registration will eventually require the second plan of a straight 4-year college course leading to a bachelor of science degree for all candidates. If this occurs, a plan will undoubtedly be devised to protect the professional status of medical technologists who previously met the requirements for registration and who have been successfully employed.

Required College Courses for M. T. (A. S. C. P.) Registration

The Council on Medical Education and Hospitals of the American Medical Association provides the following standards for the minimum 2 years of college work required for a student's acceptance by an approved hospital school.

The required college work must be done in a college or university approved by a recognized accrediting association and must consist of at least 60 semester hours (or 90 quarter hours) which include the following courses:

(1) 12 semester hours (or 18 quarter hours) of biology, which may be taken in general biology, bacteriology, parasitology, physiology, anatomy, histology, embryology, and zoology;
(2) 6 semester hours (or 9 quarter hours), including lectures and laboratory, of general inorganic chemistry; and
(3) 3 semester hours (or 4 quarter hours), including lectures and laboratory, of quantitative analysis, organic chemistry, or biochemistry.

The remaining 39 semester hours (or 59 quarter hours) which are required for the minimum 2-year course may be taken in other college courses such as mathematics, physics, English, and psychology, depending upon the requirements of the individual college or university. (The first two subjects and typing are highly recommended by the Registry of Medical Technologists.) These additional studies, beyond the required courses in biology and chemistry, will be helpful to the student in her chosen career and in extending her understanding of people, including patients. Furthermore, they should serve to broaden her interests and opportunities for exchanging ideas and experiences with others.

Some Facts About Hospital Schools

In February 1954, there were 576 approved hospital schools for medical technologists located in 48 States, the District of Columbia, Puerto Rico, Hawaii, and the Canal Zone. (See appendix 5.) Three-fourths of the 537 schools on which detailed information was provided for the year 1953 accepted 2 years of college for entrance. Of the remaining 124 schools, 1 required 2½ years, 83 required 3 years, and 40 required a college degree.

Length of training in the schools ranged from 12 to 24 months, but 12 months was by far the most common. Only 83 schools (15 percent of the total) specified more than 12 months' training. The enrollment capacity of the 537 schools reporting was just under 4,100, an average of 7 or 8 students per school. A majority of the schools accommodated fewer than 10 students; the largest had a student capacity of 60.

Cost of Training

If a student can provide her own maintenance she can obtain a tuition-free education in medical technology in many approved hospital schools. About two-thirds (369) of the 531 approved schools that reported in regard to fees for 1953 charged no tuition, and an additional 88 charged only $20 to $100 for the complete course. Among the remaining schools, 50 specified tuitions ranging from $105 to $425, and 24 provided for the regular tuition fee of the affiliated university.

Students in hospital schools are required to wear uniforms, which are usually paid for by the student herself; however, laundering of the uniform may be provided by the hospital. Board and room and other personal expenses, also, are usually paid for by the student, but routine medical care may be provided by the hospital. In addition, some schools charge a small breakage fee in connection with the required laboratory work. On the other hand, about 25 percent of the 531 schools paid some sort of stipend to students. Some scholarship assistance is available, both locally and nationally. Hospital schools and the Registry of Medical Technologists usually keep current information on this type of aid.

Many private commercial schools offer both day-time and evening courses in medical technology, with the day-time course lasting about 12 months and the evening course about 24 months. The cost of training in these schools varies widely; for example, an examination of the catalogs of four schools in four cities in 1953 showed a tuition range from $380 to $500. Charges in addition to tuition (such as for application fees, laboratory fees, books, breakage, diploma, locker, and health service) at these schools ranged from about $53 to $337.

Thus, the total cost for 1 year of training in medical technology at the four private commercial schools examined ranged from $433 to $837. Students were required to purchase and wear uniforms and were responsible for all their personal expenses and for board, room, medical care, and laundry.

Inquiries May Be Addressed . . .

A list of AMA-approved schools is given in appendix 5. Inquiries about their college affiliations and general requirements should be addressed to the Registry of Medical Technologists, 700 South Council Street, Muncie, Ind.

No list of privately operated schools is available. One or more such schools will be found in most large cities. Inquiries may be addressed to the American Medical Technologists, Post Office Box 88, Easthampton, Mass.

III. MEDICAL LABORATORY TECHNICIANS

In Support of Research and Service

A rather wide range of medical laboratory technician jobs has developed out of the need for medical service and research workers to assist at varying levels of technical skill and responsibility. Some of the medical technician jobs are essentially routine to handle the volume of work in large establishments. They are none the less significant, and tend to produce refinements and increasing precision in medical testing methods and reduce the time demanded by long-term research projects.

As noted earlier, the term "medical laboratory technician" is a general designation which may be applied to a scientific specialist with advanced academic training or to a technician who has learned to perform one or more medical tests through training on the job. Nevertheless, some standardization has begun to develop in laboratory technician jobs.

A Word to the Student

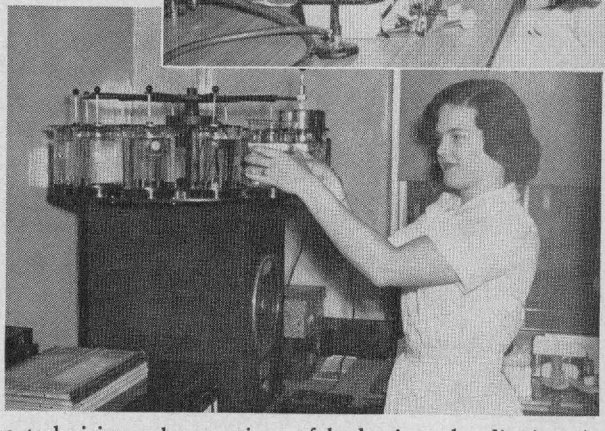
An effort is made here to present some broad definitions of representative jobs as a guide to the student seeking career information in this field. A fuller explanation of terms can be found in a medical dictionary. For the student who wishes to probe further into the subject of medical tests and techniques, and who has some background in biological science and chemistry, one of several basic textbooks in clinical laboratory procedures may be consulted. (See Bibliography.)

Representative Jobs—Thumbnail Definitions

A Bacteriology Technician's chief duties are to isolate and identify bacteria and other micro-organisms in all types of body substances and by-products. She may also be assigned to analyze water or food products for bacteria, and work either in medical services or research. A great part of the bacteriology technician's time may be spent at such tasks as preparing culture media (vegetable or animal substances favorable to the growth of micro-organisms) and producing various "families" of bacteria under controlled conditions, so that they can be studied. Another set of tasks may involve the care and treatment of laboratory animals for bacterial research. She may be required from time to time to work on projects leading to the

A. Technician embeds a piece of tissue in liquid paraffin. When the paraffin solidifies the tissue is ready for cutting to make microscopic sections.

B. Sometimes tissue is solidified by a freezing process and then cut by a technician who runs it through a special machine which produces ribbon-like sections.



C. Tissue technician colors sections of body tissue by dipping them in a series of chemical stains so that their structure and composition may be viewed under the microscope.

Figure 4.—Steps taken in the preparation and examination of body tissue are classified as *histologic technique.*

development and use of antibiotic medicines and new discoveries about the nature and treatment of bacterial diseases.

The bacteriology technician works under the supervision of the bacteriologist (especially in research) or under a chief medical technologist (in services), and uses standard procedures for determining results. When test findings do not fall into recognized patterns, she consults with the supervisor.

Qualifications are usually specified for this job as: a minimum of 2 years of accredited college science courses, particularly general chemistry and biology, and 1 year of training in an acceptable school for medical technicians, including courses in bacteriology, or 1 year of experience in bacteriology techniques in a medical laboratory which meets the employer's standards. The bachelor of science degree with a bacteriology major may be accepted without additional experience or training, but some employers require special training beyond the B. S. degree.

A Biochemistry Technician makes qualitative and quantitative chemical analyses of body fluids such as blood, urine, spinal fluid, and gastric juices for the purpose of diagnosing disease, or in research into the cause and treatment of disease. She applies her knowledge, obtained during training, of a wide variety of standardized chemical tests and reactions. Included in the job may be such assignments as: Making tests for determining the content and purity of other substances such as food products and water; inoculating test animals and checking results; skillful use of scientific equipment like the spectrograph, photelometer, and microscope.

Education requirements for biochemistry technicians usually specify a minimum of 2 years of accredited college work, including courses in qualitative and quantitative chemistry, and 1 year of training in an approved school for medical technicians, including courses in medical chemistry, or 1 year of experience in biochemistry in an acceptable medical laboratory. A bachelor of science degree with a major in chemistry is preferred.

The biochemistry technician is generally supervised by a biochemist.

A Hematology Technician prepares blood specimens sent to the laboratory for study and testing, but she may also be required to take blood samples from patients. Determination of the structure, content, volume, and properties of blood (such as type, coagulation time, and sedimentation rate) and checking for parasites are all part of the regular duties. Bone-marrow specimens are examined under the microscope because of an important relationship between bone marrow and blood-cell formation.

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This job is generally a part of medical services and the technician may be supervised by either a medical technologist or a hematologist.

Employers usually require a minimum of 2 years of accredited college courses, including chemistry and biology, and 1 year of experience in hematology techniques, or 1 year of training in an approved school for medical technicians. Some employers prefer to hire a hematology technician who has a bachelor of science degree in biology and provide on-the-job training in hematology methods.

A Blood-Bank Technician maintains the hospital or clinic blood bank, usually under the general supervision of a hematologist or medical technologist. Her duties include routine check of pulse, temperature and blood pressure of patients; drawing blood from donors by hypodermic needle and syringe; performing tests to determine blood type; maintaining proper conditions for preserving blood from donors; processing blood plasma for future use; keeping detailed records; scheduling appointments for donors. She may also assist with transfusions.

This job requires at least 2 years of accredited college science courses and 1 year of specialized training and experience in blood-bank techniques in a recognized hospital laboratory school. According to the extent of responsibility demanded by a particular job, additional academic training and experience requirements are often specified.

A Serology Technician works under the supervision of a medical technologist, serologist, or bacteriologist. She applies standard procedures to assist in preparing serums, vaccines and other agents for use in medical tests and for treatment of patients with bacterial disease, allergies, virus infections, or toxic conditions which result from contact with infected animals or insects. In the medical service field, the serologist should know how to make the common tests for determining syphilis, tuberculosis, typhoid fever, pneumonia, and streptococcus infection. On some jobs, the entire work assignment may be related to the preparation of vaccines or antitoxins; or it may be in research on immunization. On other jobs, a majority of time is spent in services to patients.

A bachelor of science degree in biology is the preferred minimum requirement for the job, although some employers will accept a combination of 2 years of college science courses and 1 year of special experience in an acceptable laboratory.

A Tissue Technician (sometimes called a histologic technician), prepares tissue specimens for microscopic examination by the specialist (pathologist or histopathologist), under his supervision, or directly under a medical technologist, who checks the work. The duties involve standard procedures for trimming, staining, and affixing the specimens on a glass slide, and labeling them.

Hospital laboratories will accept and train high-school graduates for this job if they have successfully completed courses in chemistry, biology, or physics. To become a proficient tissue technician, however, at least 1 year of training on the job is required. During the training period, the candidate may work as a laboratory assistant and perform other duties, in addition.

Entry Jobs—Laboratory Assistants and Helpers

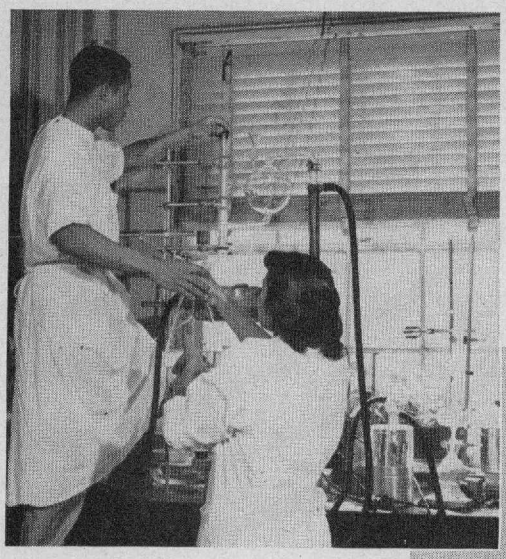
Although some college training is recommended for most technician jobs, it is possible to break any of these jobs down into duties which inexperienced, but scientifically alert and manually skillful, high-school graduates can perform. Beginning jobs as laboratory assistants, helpers, and aides generally require high-school science courses, particularly in biology, chemistry, and mathematics.

Advancement on the job is very limited, however, unless the laboratory assistant obtains further academic training at the college level. Assistants may become adept at making some of the routine tests or in preparing materials to be tested, but today's medical laboratory, with its great responsibilities toward patients and its increasing scientific complexity, requires technicians with more theory and information than high-school courses provide. Without additional education, the high-school graduate cannot expect to advance beyond the job of assistant to a medical technician, a job which is most likely to be found in large laboratories with a number of specialized personnel.

Laboratory helper jobs are distinguished from assistant jobs mainly by the number of routine physical or manual tasks which they require. "Helpers" and "assistants" are loosely used terms; other titles, such as "aides" are also used in a general way for a great many entry jobs for which no experience is needed.

A helper or an aide may be a "chief bottle washer"—in charge of keeping test tubes and other containers clean. Or a helper may keep supplies in order, run errands, sterilize equipment, and prepare solutions. A beginning job of this kind will serve as introduction to the medical laboratory, and may arouse a career interest in the young woman who has not decided upon a vocation. Meanwhile the job itself will help to keep the medical team functioning so that prevention and treatment hold a wide margin over disease.

Further details on the jobs described in this section may be found in the United States Department of Labor's *Job Descriptions and Organizational Analysis for Hospitals and Related Health Services.*



A. Distillation apparatus is assembled by two technicians. This is used for many specimens to separate the chemical contents by distilling.

B. Van Slyke apparatus is used by a technician to analyze nitrogen content of a body specimen by reducing it to a gaseous substance.

C. Chemical analysis is sometimes made by using a spectrophotometer (or flame photometer) by which the technologist can determine the presence of certain elements by subjecting a sample to measurements of light intensity.

Figure 5.—Medical technologists and technicians become expert in the use of many kinds of apparatus, of which three are shown here.

IV. OPPORTUNITIES

Accent on Women Workers

From the very beginning, women were widely accepted in medical laboratory jobs. Most recent figures reported by the Registry of Medical Technologists (as of January 1954) indicate that about 90 percent of the 18,000 registered technologists are women. However, the number of men in the field has been increasing since World War II. Only 4 percent of the medical technologists certified as a result of the fall 1947 examination were men, but 14 percent of those registered in the spring of 1951 were men.

Although the proportion of women among all medical technicians is not known, and may not be quite so high as among registered technologists, there is no doubt that women predominate in the field. In the 1950 decennial census, medical technologists and technicians were classified, along with X-ray and dental technicians, in a group of 78,000 called "medical and dental technicians," of whom nearly 60 percent were women. If dental technicians could be separated from the combined group, the percentage of women would be higher for the remaining occupations, as a majority of dental technicians are known to be men. A rough guess is that about three out of four of all medical laboratory technicians are women.

Estimates from a variety of sources, including the Registry of Medical Technologists and the President's Commission on Health Needs of the Nation, placed the total number of medical laboratory technicians at about 30,000 in 1950–51. About 2,000 new medical technologists have been graduated from approved schools annually since that time.

More Jobs Than Qualified Candidates

Prospects for employment of medical laboratory workers now, and for some time ahead, are better than good: there is an urgent need for medical technologists and technicians.

The National Committee for Careers in Medical Technology (organized under the sponsorship of the American Society of Medical Technologists, American Society of Clinical Pathologists, and the College of American Pathologists) began a Nation-wide campaign in 1954 to recruit young people into medical technology and medical technician jobs. Among the first financial backers of this recruitment drive were the American Cancer Society and the National Cancer

Institute. Health groups with research programs for treatment of tuberculosis, poliomyelitis, leukemia and other diseases are expected to lend active support and some financial assistance to the campaign. Plans for drawing new workers into medical laboratory vocations include the establishment of scholarship aid to promising students.

Estimates of the number of medical laboratory workers needed are made from time to time, but it is not possible to obtain accurate predictions about future supply and demand. Spokesmen for the National Committee for Careers in Medical Technology have suggested a goal of 50,000 trained medical technologists to be employed by 1960. This would mean 20,000 more employed medical technicians (including technologists) than were estimated for 1950. Other sources estimate a need for 45,000 employed medical technologists by 1960.

Unfilled hospital positions for laboratory technicians (including medical technologists) were estimated at more than 3,700 in February 1952 by the American Hospital Association. This meant that about 15 percent of hospital laboratory technician jobs were vacant, largely because of a shortage of trained workers, according to the AHA survey.

Additional evidence of the shortage of skilled medical technicians is shown by the number of unfilled job orders in the files of State Employment Service offices each year since 1950. No reliable totals are available for these years, but the demand was such that many local employers sought applicants in neighboring States and in other parts of the country, through the national Employment Service system of job clearance.

One of the chief difficulties in making realistic estimates of the need for medical laboratory personnel lies in the problem of job classification. Although the key job of medical technologist was defined and standardized over 25 years ago, most of the other laboratory jobs differ in their requirements from place to place. (See the discussion on staffing patterns and job titles in Section I.) Hospital and clinic employers everywhere are dealing continuously with the problem of dividing job responsibilities among their personnel in the best possible ways to meet their own work load. Their staffing patterns and their standards differ. Furthermore, they have been forced to employ untrained or partly trained technicians and give them training on the job in one or two clinical tests. Meanwhile, the increase in routine jobs has created a corresponding need for more supervisory staff at higher levels of work, and many trained medical technologists have been placed in positions of considerable responsibility. As a result, the standards for training of medical technologists have tended to advance.

At present, because of expanding medical services and a shortage of qualified workers, it is understandable that surveyors and census takers have had to combine a number of jobs, requiring different kinds of training, into broad groups. If some additional standards for division of function among all medical laboratory workers can be set in the next few years, a much clearer estimate of needs and better plans for developing trained workers may be achieved.

Looking Ahead—Job Requirements and Training

Students preparing now for medical laboratory occupations will be interested in the recommendations made, in a recent issue of the AMERICAN JOURNAL OF MEDICAL TECHNOLOGY, for the establishment of four classifications of laboratory personnel:

Classification	*Suggested education and training*
Laboratory Aide (L. A.)_____	(*a*) High-school diploma. (*b*) Some theoretical scientific background through night extension courses at a university, or lectures by A. S. C. P. registered M. T.'s in a hospital school. (*c*) One year's training course in a hospital where one or more M. T.'s (A. S. C. P.) are working in the laboratory.
Laboratory Technician (L. T.)__	Two years of college and 1 year in an approved M. T. school. (Present A. S. C. P. Registry minimum requirements.)
Medical Technologist (M. T.)__	Three or 4 years of college with 1 year (at least) in an approved training school. Nothing less than B. A. or B. S. degree. (Present standards of many schools.)
Medical Technologist-Specialist (M. T. S.)	Advanced degrees in any of the special fields such as chemistry, bacteriology, etc., with training in medical technology.

Before any steps are taken to standardize jobs, a great deal of discussion and planning will necessarily take place among the professional groups concerned. It is likely that changes will be made gradually, but a reasonable guess is that standards for the medical technologist occupation will be among the first to be revised, with the bachelor of science or bachelor of arts degree as a minimum requirement.

Questions of this kind are of considerable importance to the student in terms of future opportunities: those who obtain training which exceeds present minimum requirements should be able to meet future competition better than if they aim toward satisfying only today's minimum standards.

Numerous employers of laboratory personnel, as well as those concerned with the Nation's health, have emphasized that the shortage

of medical laboratory staff is one of *quality*, as well as *quantity*. Fewer than 14,000 of the total estimated 30,000 medical technicians in 1950 were registered medical technologists, according to the President's Commission on Health Needs of the Nation. Doubtless some of the non-registered technicians can meet minimum qualifications for registration, but a majority have entered the medical laboratory field by securing only sufficient training to equip them for relatively routine jobs. As a result, some employers have expressed the opinion that many of today's technicians, particularly those who have acquired their skills solely on the job, without the benefit of college-level training in the sciences, are severely limited in possibilities for advancement to supervisory or specialized positions. Opportunities for advancement are plentiful, but the better-paying jobs go to candidates who are fully trained.

Openings for Mature Women

Some approved hospital schools do not accept women who are over 30 years of age, but several of those questioned on age limitations in 1954 indicated that they impose no upper age limit on a prospective trainee, provided she has the necessary qualifications. One hospital school had graduated students as old as 50 years, but all schools indicated that most applicants come directly from college and few are older than 25 or 27 years of age. It would appear, therefore, that women over 30, with at least 2 years of college training in the required subjects, can and do find opportunities for training in some approved hospital schools.

Because of severe shortages in medical laboratory personnel, both in number and in quality, few barriers to employment of older women exist, particularly if such women are fully qualified, have secured their training in recognized institutions, and have had laboratory experience. Many older women are currently employed as medical technologists in positions of responsibility, and the Registry of Medical Technologists of the American Society of Clinical Pathologists imposes no age limits on registration.

Hospitals Lead in Employment

Although medical technologists and technicians may be found working for a variety of employers, such as public health laboratories, private laboratories, clinics, and doctor's offices, the majority work in hospital laboratories. Recent data from the American Hospital Association and the American Medical Association indicate that some 24,000 were employed in hospitals in 1952. (See table 1.)

TABLE 1.—MEDICAL TECHNICIANS IN HOSPITALS IN CONTINENTAL UNITED STATES: 1952

Employer control	Total			Medical technicians employed—	
	Number	Percent distribution	Percent distribution by type of control	Full time	Part time
Total	[1] 23, 822	100	----------	21, 373	2, 449
Total governmental	8, 046	[2] 34	[2] 100	7, 586	460
Federal	3, 235	14	40	3, 200	35
State	1, 607	7	20	1, 482	125
County	1, 331	6	17	1, 174	157
City	1, 579	7	20	1, 467	112
City–county	294	1	4	263	31
Total nongovernmental	15, 776	[2] 66	100	13, 787	1, 989
Church	5, 364	23	34	4, 608	756
Nonprofit association	8, 947	38	57	7, 956	991
Individual, partner	793	3	5	647	146
Corporation	672	3	4	576	96

[1] Includes 8,612 medical technologists registered by the ASCP.
[2] Percents do not add to total due to rounding.

Source: *Journal* of the American Medical Association, May 9, 1953.

Private hospitals employ the largest number of medical technicians. In 1952, almost twice as many medical technicians were employed by nongovernmental hospitals as by governmental hospitals, and less than 15 percent of all hospital medical technicians were employed in hospitals operated by the Federal Government. (See table 1.)

The importance of the clinical tests in hospital service is indicated by the fact that 85 percent of the 6,076 hospitals surveyed by the American Hospital Association in 1952 provided clinical laboratory services. The extent to which other services, such as blood bank and electrocardiograph, were provided by these hospitals is indicated in table 2.

TABLE 2.—FACILITIES AND SERVICES IN MEDICAL TECHNOLOGY AND RELATED SERVICES IN 6,076 HOSPITALS: 1952

Facilities and services	Hospitals	
	Number	Percent (of 6,076)
Clinical laboratory	5,173	85
Metabolism apparatus	4,863	80
Electrocardiograph	4,771	79
Blood bank	2,779	46
Cancer clinic	996	16
Electroencephalograph	789	13
Radioactive isotopes	348	6

Source: The American Hospital Association.

A Wide Range of Jobs Outside Hospitals

Jobs for laboratory technicians outside of hospitals are distributed among a wide range of employers: Private physicians who maintain their own laboratories; public health laboratories whose special concern is contagious and communicable disease; and private laboratories established by pathologists or other physicians to provide laboratory services to individual physicians.

Public health opportunities include State laboratories of all kinds, such as those where tissues are examined for purposes of disease prevention or to determine causes of death and medical research projects where special studies of disease are conducted, such as the Cancer Clinic of the National Institutes of Health.

Pharmaceutical and biological companies use medical technicians for research and manufacture of drugs, serums, vaccines and antibiotics.

Medical technologists who have special training or many years of experience may work in educational institutions as full-time instructors, and all are expected to instruct, on a part-time basis, in order to "break in" new employees on the job.

Medical Technicians in Military Service

The three major branches of the Armed Forces—the Army, Navy, and Air Force—offer opportunities to enlisted women to train as medical technicians. All three also have some women commissioned as officers who hold college degrees with training in special fields, such as bacteriology, biology, parasitology, hematology, serology, and toxicology. The Marine Corps and the Coast Guard do not train or place women in medical laboratory work because major medical care for

Figure 6.—Bacteriology technicians often work with samples which require the use of sterile procedures. This technician wears a face mask to protect the cultures she is preparing.

these services is provided by the Navy and the Public Health Service, respectively.

Of course, no individual recruit of the Armed Forces can be assured that she will be trained and utilized as a medical technician. Recruits are selected for various types of training according to the needs of the services. However, an effort is made, wherever feasible, to consider the vocational preference and interests of women who enlist.

WAC, WAVE, and WAF recruits are required first to take 8 to 9 weeks of basic military training which provides for indoctrination, career guidance, testing, and classification. Those who are to be trained in the medical field are then assigned to special training courses given by the medical and scientific specialists. Among the courses provided for the training of medical laboratory technicians are general chemistry, blood chemistry, hematology, bacteriology, and histology. These courses are directed toward teaching basic medical laboratory procedures and techniques, and are supplemented by practical experience in military hospitals.

After leaving the service, it should be possible for a woman who has had training and experience in medical testing in a military hospital to obtain a civilian job as an assistant laboratory technician. However, military training in laboratory techniques does not, in itself, qualify anyone for civilian employment, because military occupations often differ markedly from those outside the services. A tour of duty in the medical laboratory of a military hospital should provide a good foundation for further training, nevertheless, and accumulated GI benefits make it easy for young women who leave the services to finance further education in their chosen fields.

Geography and the Job-Seeker

As might be expected, the largest number of medical technologists are employed in the most populous States; however, some larger States have fewer technologists in proportion to their population. than some smaller States. (See appendix 4.) Of course, this does not necessarily mean that the medical services of the larger States are any less adequate because (1) information is available only for some 18,000 registered medical technologists and not for other medical laboratory personnel; and (2) the necessary or desirable ratio of medical laboratory workers to persons in the population is not known.

As of January 1954, there were 11 registered medical technologists per 100,000 population in the United States, but the proportion in individual States varied from a low of 6 per 100,000 in New York and South Carolina to a high of 28 per 100,000 in Colorado. Some populous States, such as Massachusetts and California, showed ratios

below the national average of 11 per 100,000, while some less populous States, such as Kansas and Montana, showed ratios above the national average. It would seem reasonable to assume that in States where the ratio is low and the medical facilities prefer to employ registered medical technologists, opportunities for fully qualified laboratory personnel would be greatest. Thus, substantial employment opportunities should exist in States showing the lowest ratio of registered technologists to population. Nevertheless, since the shortage of qualified technologists is relatively widespread and medical services are expanding throughout the country, opportunities should continue to exist even in States showing a higher than average ratio.

V. BREAD-AND-BUTTER QUESTIONS

How Much Does a Medical Laboratory Worker Earn?

Salaries for trained laboratory personnel, especially registered medical technologists—"M. T. (A. S. C. P.)"—compare favorably with those for such predominantly woman-employing occupations as nursing, social work, and teaching.

Among all medical laboratory classifications reliable information is on hand for registered medical technologists as a result of a 1953 study of 5,400 M. T.'s (A. S. C. P.) employed in 48 States. The median 1952 salary for the group surveyed was between $3,300 and $3,600 per year. Almost three-fourths of the group were paid between $2,700 and $3,900 per year; less than 10 percent received under $2,700 per year and 18 percent received $3,900 or more. About 11 percent received $4,200 or more.

Of course, quite a bit of variation existed in salaries from State to State, but the median salary in most States fell in the range $3,000 to $3,300 or $3,300 to $3,600. Only the following States showed median salaries below these ranges: Massachusetts, New Hampshire, Pennsylvania, Rhode Island, South Carolina, and Vermont. Their median salaries fell in the range $2,700 to $3,000 per year. The only median salaries above $3,600 were in the range $3,600 to $3,900 and these were found in California, Delaware, Michigan, and Nevada.

Present salaries may be slightly higher than those indicated in this survey since shortages still exist in this field. Of course, salaries for individual technologists and technicians vary according to education, training and experience, the locality, the size of the establishment or institution, the number of persons in the medical laboratory, and the nature of the job assignment.

In order to obtain reliable information about medical technician salaries it would be necessary to make a survey of standardized jobs—but this could not be done, for reasons previously explained (see Sections I, IV), except for the medical technologist group. From several sources, however, it is possible to estimate the salary ranges for the broad group of undifferentiated medical laboratory workers.

Exclusive of laboratory helpers, which are essentially unskilled or entry occupations, beginning salaries for a broad group of medical technicians in one large eastern city in 1953 were reported as ranging from $200 to $250 a month. Higher salaries were paid to persons in

this group who had some college training. It was common practice to grant periodic increases for satisfactory work after each 3 to 6 months of uninterrupted service. For those who advanced into supervisory positions (presumably technologists or specialists) salaries of $300 to $400 per month were shown. A few outstanding supervisory specialists with long and varied experience were paid as much as $500 per month.

A survey conducted by the Bureau of Labor Statistics in 1951 [1] showed that 75 percent of the 2,738 medical technicians employed at that time by agencies of the Federal Government were in positions which were classified in grades 4 and 5. For these grades the current salary ranges (1954) are $3,175 to $3,655 and $3,410 to $4,160 per year. Some medical technicians (probably laboratory helpers) were in grade 1 positions, with a current salary range of $2,500 to $2,980; a very few were in grades 7 or 8, for which the top salaries are now $4,955 and $5,370.[2] An annual increase is given until the top salary for the grade is reached.

Among private employers (hospitals, clinics, and pharmaceutical manufacturers) it would be reasonable to conclude that wages for unskilled laboratory helpers follow the hourly rates for other unskilled workers in the locality, ranging from 80 cents to $1 per hour.

What Is the Workweek?

Full-time workers in medical laboratories are usually scheduled for an 8-hour day and a workweek of 40 to 44 hours, depending upon the employing institution. Where the laboratory, such as those in hospitals, operates on a 24-hour basis, arrangements are usually made for shift work, emergency duty, and weekend duty.

A great deal of variation exists among individual laboratories in schedules for providing 24-hour service. Some have separate shifts of workers, whereby certain persons work only at night or on weekends. Others provide for schedules in which the complete staff or selected members alternate between day work, night work, and weekend work. Many provide extra compensation for necessary emergency and overtime work by the regular staff. Some institutions use part-time workers on weekends and for emergency conditions and vacation periods.

"Fringe" Benefits

As is true for most occupations, the kind and amount of "fringe" benefits, such as retirement provisions, vacations with pay, sick leave

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[1] *Federal White-Collar Workers, June 1951.* Bureau of Labor Statistics, Bulletin 1117. 1953.

[2] At the time of the survey, in June 1951, Federal salaries for these grades were from $300 to $500 a year lower than in 1954, and the average annual salary for the 2,738 medical technicians included was $3,207 per year.

with pay, uniform laundry service, room, board, free medical care, and annual bonuses, depend upon the practices of the individual employer.

All Federal and most State and city institutions provide for vacations and sick leave with pay and also a retirement program to which employees make contributions. Most private employers also provide for vacations and sick leave with pay as well as for retirement benefits through the Social Security program; some make arrangements for additional retirement payments over and above the benefits provided through Social Security.

Individual private employers differ greatly in their practice so far as other types of "fringe" benefits go. However, many provide laundry service for uniforms and routine medical care. A few, especially those institutions which are isolated, or in rural locations, provide room and board.

Are There Part-Time Opportunities?

Part-time work is quite common in medical laboratory occupations, particularly in hospital laboratories which must operate on a 24-hour, 7-day basis. Part-time workers frequently supplement the regular staff in order to cover peak loads, evening and week-end work, and emergency situations.

About 10 percent of the medical technicians employed in hospitals in 1952 were part-time workers. Whereas only 6 percent of all the technicians employed in governmental hospitals were part-time workers, over 12 percent of all those in nongovernmental hospitals were employed on a part-time basis. (See table 1.)

Part-time work is frequently very suitable to married women or older women who do not wish to work full time because of other responsibilities. This is particularly true for women who, though temporarily unable to work full time, want to keep informed of changing techniques so that they may resume full-time work at a future date.

A women's Bureau study [3] in 1950 of part-time jobs for women in 10 cities showed that the most common hourly rate for laboratory technicians doing part-time work in hospitals was $1.25 to $1.50 per hour. The usual working hours of the part-time workers in hospital laboratories were 3 and 5 hours daily and 20 to 24 hours weekly.

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[3] Women's Bureau Bulletin No. 238, published in 1951.

VI. GUIDE-LINES FOR THE CAREER CHOICE

Is this your field?—Stories told by successfully employed medical laboratory workers about the ways in which they reached a career decision in this field often have one thread in common: a strong interest in medical service, coupled with a feeling for the precise methods of scientific inquiry. Many small interests, talents, and personal characteristics combine to make the stuff from which the bright thread of positive choice is spun. Some of the details are intangible, but most of them can be identified, with the help of an interested counselor.

In *school work*, the potential medical technician should be able to achieve average grades in mathematics and in the science courses like chemistry, zoology, botany, physics. If not, the chances are that college-level science courses will prove too difficult or demanding.

As for *personality*, the candidate for a medical laboratory career should find it pleasant to be surrounded by test tubes and scientific apparatus, working for long stretches at quiet, precise and detailed tasks, her busy hands guided by an alert and ordered judgment. She must be fastidious about order and detail, but she cannot be squeamish about the strange sights and scents that may confront her from time to time: Like the doctor and the nurse, the laboratory technician must learn to work, in scientific detachment, with materials that laymen often find objectionable.

More detached from people than the physician or nurse, because patient contacts are relatively limited, the trained technician nevertheless may be required to play a nurse's role from time to time, as when she takes a blood sample or gives a metabolism test.

Among the hard-to-measure characteristics required of medical-laboratory technicians are a strong sense of responsibility and a great deal of patience.

Concerning *physical demands*, it is essential that medical technicians possess normal vision, including color discrimination, that they have the full use of both arms and hands, and be able to stand during a part of the time. Some employers may allow handicaps which include impaired hearing or walking, but not to the degree to which these disabilities may create hazards in a particular job setting.

Generally, the hazards of the medical laboratory lie in contamination from infectious or toxic substances, but only on the part of the careless worker who does not observe the strict regulations concerning

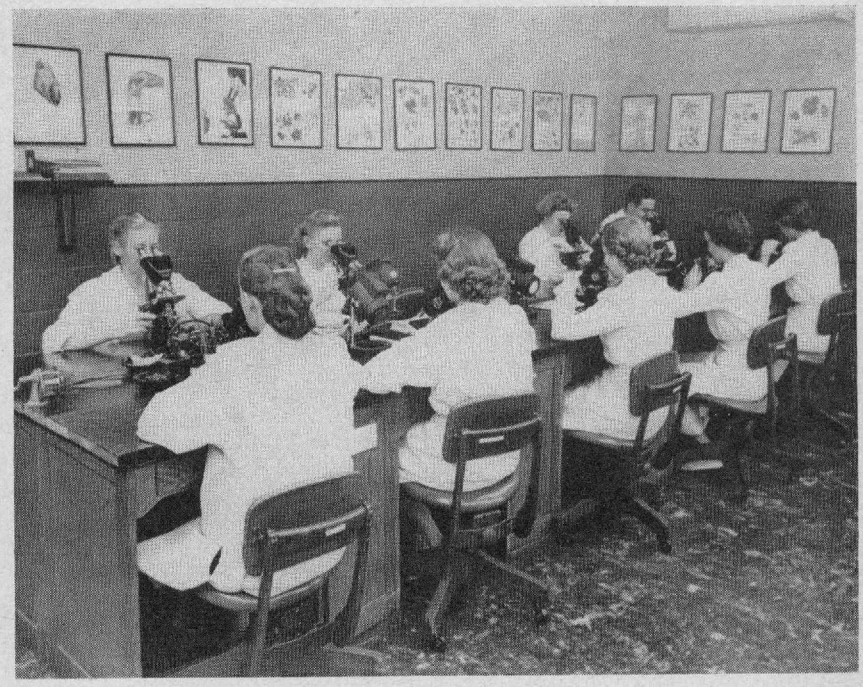

Figure 7.—Research laboratories often require many workers trained to perform a single procedure. All medical technicians here are part of a cancer research team to examine specimens microscopically for the detection of malignant tumors.

antiseptic or aseptic practice. Because the success of a majority of medical tests depends extensively upon a knowledge of antiseptic and sterile procedures, the likelihood of contagion for the technician is remote, even when assignments involve work with disease-producing bacteria. Treatment is readily available for the worker who may have been exposed to infection. However, test mistakes are not likely to be excused easily by the employer because of the hazards to the public.

Candidates for medical laboratory careers can check their vocational aptitudes in several ways: (1) Through consultation with school counselors; (2) by taking aptitude tests offered on request, and free of charge, by most State employment offices; (3) by taking summer jobs as medical-laboratory helpers or aides.

A survey conducted among medical-technology students and workers by a professional group in 1952 revealed that the paths to the career choice were quite varied. They could be traced back, in some instances, to a single incident which served as a spark to set off the vocational decision, such as a visit to a hospital laboratory, a lecture

by a medical technologist, discovery of a book on the subject. Some students wishing to work in the medical field, but unable to undertake the physician's long-term, rigorous training, found a rewarding substitute in medical technology. One young woman, in a letter to the survey group mentioned previously, explained her career choice in this way:

> This job is useful to humanity, the wage is good, and technologists are needed in the world to save lives. These are some of the reasons why I want to be one. Also it is a profession that you may leave for a while and go back to it again. . . .[4]

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[4] "About Medical Technology—A Survey." By Sr. M. Alcuin, OSB. *The American Journal of Medical Technology*, Vol. 18, No. 2, March–April 1952, page 55 ff.

APPENDIX 1

Work Performed by the Medical Technologist [1]

Prepares for Laboratory Tests: Receives written requisition from physician for routine and special laboratory tests. Sets up and adjusts laboratory equipment and apparatus, such as chemical glassware, balance, microscope, slides, and reagents.

Obtains specimens: Obtains laboratory specimens, such as urine, blood, and sputum, from wards or directly from patient, using established laboratory techniques. Punctures ball of patient's finger or lobe of ear with sterile blood lancet in order to obtain capillary blood. Smears blood on microscope slide preparatory to examination. To obtain venous blood, applies torniquet about patient's elbow in order to distend vein. Cleanses site of puncture with alcohol, and punctures vein with needle attached to hypodermic syringe. Places specimens in containers under aseptic conditions. Stoppers and labels containers.

In large hospitals, and those engaged in research, MEDICAL TECHNOLOGISTS may be responsible for tests and examinations in only one of several fields of clinical pathology. In smaller hospitals, technologists may perform clinical tests in any one or a combination of following areas of specialization, depending on size and type of laboratory and scope of its activity:

In area of biochemistry: Makes qualitative and quantitative analyses of urine for determination of sugar and albumin; and performs laboratory tests to detect presence of acetone bodies, blood, bile derivatives, Bence-Jones protein, and various drugs and poisons in urine. Adds specific reagents, which act as indicators, to urine samples; and notes change of color or appearance of precipitates. Makes quantitative determinations by comparing resultant colors against standards, or by making simple calculations based on quantity of reagent or sample used to obtain specific color. May detect presence of blood by means of a spectroscope. Centrifuges urine and examines resultant sediments under a microscope to detect presence of various types of cell bodies. Determines specific gravity of urine, using a urinometer, and notes general odor, color, and turbidity of sample.

Tests gastric content for presence of free acids, using identifying reagents and noting changes of color. Titrates samples against standard reagents to make quantitative determinations.

Tests for presence of vitamins and hormones, using established chemical procedures or by observing their effect on test animals under experimental conditions.

Makes blood determinations for urea nitrogen, glucose, and carbon dioxide content of blood, and tests blood to determine impairment of liver functions.

In the area of bacteriology, parasitology, and serology: Cultivates and identifies micro-organisms found in air, milk, water, and such body materials as feces, sputum, pus, serous fluids, and autopsy material. Makes cultures of

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[1] Excerpt from U. S. Department of Labor's *Job Descriptions and Organizational Analysis for Hospitals and Related Health Services.*

micro-organisms, under aseptic conditions, in suitable media such as meat extracts, sugars, and body products and discharges. Incubates cultures for prescribed lengths of time before examination through a microscope. Collects swabs from throat, ear, nose, and similar locations of patients, under supervision of physician, and makes direct smears on microscope slides of material thus obtained.

Stains specimen under examination to define more clearly essential features, using one or a combination of standard stains.

Performs macroscopic and microscopic agglutination and precipitation tests to detect presence of pathological bacteria in human host through identification of specific antibodies which are formed. Identifies pathogenic bacteria, including Rickettsiae and virus, and writes report on findings, including a count of number of bacteria found.

Prepares culture media according to established formulas, titrating them to determine degree of acidity. Sterlizes media by autoclaving under standard conditions. Stores all media in refrigerators. Prepares bacteriophage (agents which destroy micro-organisms) by filtering feces or pus through special filters. Tests potency of phage by adding various dilutions to test tubes containing growths of organisms and noting reactions.

Prepares standard reagents, solutions, and stains. Injects, and removes blood sample from, laboratory animals.

Injects urine of women into rabbits, and makes a gross examination of rabbit's ovaries to determine presence of a reaction indicative of pregnancy.

Performs serologic tests for syphilis, using one of established laboratory methods, such as Wassermann, Kahn, Kline, or Eagle. Makes cell counts of cerebrospinal fluid. Places spinal fluid on counting chamber (glass microscope slide ruled into squares) and counts cells distributed within ruled area of a number of squares, as viewed through a microscope. Performs qualitative and quantitative determinations for proteins, glucose, and other chemicals indicative of abnormalities in cerebrospinal fluid; and performs such other tests as colloidal gold test for neurosyphilis.

In the area of hematology and metabolism: Makes platelet and total and differential blood cell counts. Places blood sample on counting chamber and counts number of cells within ruled squares of chamber as vewed through a microscope. Calculates number of cells per cubic millimeter of blood sample. Stains blood cells for clearer definition and to distinguish between various types of cells.

Determines quantity of hemoglobin. Adds prescribed reagents to blood sample, and compares resultant color with standard color scales representing blood containing various amounts of hemoglobin; or makes color comparisons in a colorimeter or photelometer and converts scale reading into percent and grams of hemoglobin.

Groups or types blood by mixing red cells of person to be typed with typing sera, and noting whether clumping of cells occurs. Cross-matches blood to determine compatibility of a donor's blood with that of a patient. Determines Rh factor in blood as a precaution against reactions occurring after transfusions with blood of patient's own group, and as a precaution in childbirth cases.

Performs coagulation, clot retraction, bleeding, and prothrombin time tests to provide information used in diagnosis and treatment of hemorrhagic diseases. Determines sedimentation rate and fragility of red blood cells to indicate progress or presence of certain types of infectious diseases, and others resulting in destruction of red blood cells.

Determines basal metabolism rate. Makes patient comfortable and at ease during test, and resting period prior to test. Fills apparatus with air and stoppers openings to test for leaks. Places mouthpiece in patient's mouth, and applies nose clip to patient to assure breathing through mouth. After prescribed length of time, removes graph traced by automatic pen. Calculates patient's rate of oxygen consumption based on height of graph lines, and temperature and pressure involved. Compares test data with tables of normal values based on age, weight, and height, to determine if patient's metabolic rate is normal.

In the area of histology: Prepare autopsy and surgical material for examination by PATHOLOGIST to provide information relative to cause of death, and to cause and progress of disease.

Prepares tissue specimens. Fixes tissue in formalin for prescribed lengths of time. Prepares frozen sections or embeds specimen in paraffin or celloidin. Cuts thin sections for examination, using a microtome. Stains sections with standard dyes depending on type of structure to be examined. Sets up tissue on microscope stage for examination by pathologist.

Prepares specimens for museum exhibition by positioning specimen in jar so as to show up essential areas. Adds preservatives. Seals and labels jars.

Performs related tasks: May engage in research and teaching activities. May operate electrocardiograph and be required to assist in X-ray laboratory. Posts results of laboratory analyses on record cards and files report. Indicates on patient's charge card amount to be charged to patient's account. Identifies and labels all specimens to be retained, and files them for further reference or research.

APPENDIX 2

Requirements for Registration by the Registry of Medical Technologists of the American Society of Clinical Pathologists

Many employers of medical technologists require that they be registered or eligible for registration with the Registry of Medical Technologists of the American Society of Clinical Pathologists since this Registry is recognized by the American Medical Association, the Canadian Medical Association, the American College of Surgeons, the American College of Physicians, the American Hospital Association, the Catholic Hospital Association, and by pathologists, other physicians, and hospital administrators. Registration by this organization entitles the technologists to use the letters "M. T. (A. S. C. P.)" after her name and is a widely-recognized designation of an established level of achievement.

Application for the required examination for registration by the Registry of Medical Technologists may be filed with the Registry at Muncie, Ind., after completion of training in an approved hospital school. This examination is given twice yearly, usually in May and October, in various locations in the United States, Hawaii, Puerto Rico, and Canada. Under no circumstances are exemptions from the examination allowed.

In addition to certifying qualified medical technologists, the Registry also provides for the certification by examination of other medical laboratory classifications, namely, Specialist, Laboratory Aide, Histologic Technician, Chemist, Microbiologist and Blood-Bank Technician. Details on the requirements for these certifications and for medical technologists who completed their training at any time since 1928 may be secured from the Registry.

APPENDIX 3

Professional Organizations for Medical Technologists

The American Society of Medical Technologists

The professional organization for medical technologists is the American Society of Medical Technologists which was organized in 1933 and has a number of State and local affiliates. The Society has a membership of about 5,500, the majority of whom are women. Members customarily join through their State or local affiliate. Any technologist who has been certified by the Registry of Medical Technologists (A. S. C. P.) and is willing to abide by the code of M. T. (A. S. C. P.) ethics is eligible for membership.

The Society has three main purposes: (*a*) to elevate the status of the medical technologist and to promote higher standards by cooperating with medical groups and related organizations; (*b*) to have an affiliated organization of medical technologists in each State; and (*c*) to promote the mutual aid and benefit of the members.

The official journal of the Society is *The American Journal of Medical Technology*, which is published bimonthly. Inquiries about membership may be directed to the American Society of Medical Technologists, Suite 25, Hermann Professional Building, Houston 25, Tex.

The American Medical Technologists

A more recent organization, the American Medical Technologists, was formed about 1940. This organization registers its own medical technologists and designates them as "M. T.'s"; it is in no way affiliated with either the Registry of Medical Technologists of the American Society of Clinical Pathologists, or the American Society of Medical Technologists. This group publishes a bimonthly journal called *The Journal of the American Medical Technologists* from its headquarters at Easthampton, Mass. Its objectives are: (1) to gain professional status, (2) to provide quality service to the sick, and (3) to secure State licensure for technologists. Membership and registration are open by examination to those who have a high-school education or the equivalent and have completed 12 months of training in an acceptable school of clinical laboratory technique or 24 months of on-the-job training. No college work is required.

APPENDIX 4

NUMBER OF REGISTERED MEDICAL TECHNOLOGISTS AND NUMBER PER 100,000 POPULATION, BY REGION AND STATE, 1954

Region and State	Registered [1] medical technologists	
	Total number	Number per 100,000 population [2]
United States	[3] 17,773	11
New England	885	9
Central Atlantic	2,943	8
Southeast	3,408	10
Southwest	1,644	13
East North Central	3,974	12
West North Central	2,292	16
Rocky Mountain	716	19
Far West	1,911	12
New England:		
Connecticut	220	10
Maine	86	10
Massachusetts	404	8
New Hamsphire	84	16
Rhode Island	55	7
Vermont	36	10
Central Atlantic:		
Delaware	57	16
District of Columbia	128	15
Maryland	252	10
New Jersey	365	7
New York	899	6
Pennsylvania	1,086	10
West Virginia	156	8
Southeast:		
Alabama	286	9
Arkansas	141	8
Florida	376	12
Georgia	304	9
Kentucky	458	16
Louisiana	455	16
Mississippi	159	7

[1] These figures include only those medical technologists who were registered by the Registry of Medical Technologists of the American Society of Clinical Pathologists.

[2] Based on provisional estimates of the population of States, July 1, 1953, U. S. Department of Commerce, Bureau of the Census, Current Population Reports, Series P–25, No. 89.

[3] An additional 536 registered medical technologists resided in Canada, Alaska, the Canal Zone, Hawaii Panama, and Puerto Rico.

NUMBER OF REGISTERED MEDICAL TECHNOLOGISTS AND NUMBER PER 100,000 POPULATION, BY REGION AND STATE, 1954—Continued

Region and State	Registered [1] medical technologists	
	Total number	Number per 100,000 population [2]
Southeast—Continued		
North Carolina	324	8
South Carolina	122	6
Tennessee	330	10
Virginia	453	13
Southwest:		
Arizona	126	14
New Mexico	95	13
Oklahoma	261	12
Texas	1,162	14
East North Central:		
Illinois	950	10
Indiana	455	11
Michigan	916	13
Ohio	1,054	12
Wisconsin	599	17
West North Central:		
Iowa	227	9
Kansas	427	21
Minnesota	654	21
Missouri	594	15
Nebraska	218	16
North Dakota	84	14
South Dakota	88	14
Rocky Mountain:		
Colorado	406	28
Idaho	69	12
Montana	128	21
Utah	78	10
Wyoming	35	11
Far West:		
California	1,105	9
Nevada	21	11
Oregon	324	20
Washington	461	18

[1] These figures include only those medical technologists who were registered by the Registry of Medical Technologists of the American Society of Clinical Pathologists.

[2] Based on provisional estimates of the population of States, July 1, 1953, U. S. Department of Commerce, Bureau of the Census, Current Population Reports, Series P–25, No. 89.

Source: Registry of Medical Technologists of the American Society of Clinical Pathologists.

APPENDIX 5

Approved Schools for Medical Technologists, February 1954

Note: NA means Not Available. Dg means Degree

Name and location of school	*Minimum prerequisite college (years)*
Alabama:	
Baptist Hospital, Birmingham	2
Carraway Methodist Hospital, Birmingham	2
Jefferson-Hillman Hospital, Birmingham	3
St. Vincent's Hospital, Birmingham	2
South Highlands Infirmary, Birmingham	2
Lloyd Noland Hospital, Fairfield	2
Holy Name of Jesus Hospital, Gadsden	2
Mobile Infirmary, Mobile	2
St. Margaret's Hospital, Montgomery	Dg
Druid City Hospital, Tuscaloosa	2
Arizona:	
Good Samaritan Hospital, Phoenix	3
Memorial Hospital, Phoenix	2
St. Joseph's Hospital, Phoenix	3
Tucson Medical Center, Tucson	3
Arkansas:	
St. Vincent Infirmary, Little Rock	NA
University of Arkansas School of Medicine, Little Rock	2
Veterans Administration Hospital, Little Rock	2
St. Michael's Hospital, Texarkana	2
California:	
Kern General Hospital, Bakersfield	NA
Herrick Memorial Hospital, Berkeley	2
St. Joseph Hospital, Burbank	3
Glendale School of Medical Technology (Associated with Kimball Clinical Laboratories, Glendale Sanitarium and Hospital, Behrens Memorial Hospital and Physicians and Surgeons Hospital, Glendale), Glendale	NA
California—Continued	
Children's Hospital, Los Angeles	Dg
Los Angeles County Hospital, Los Angeles	Dg
St. Vincent's Hospital, Los Angeles	Dg
Veterans Administration Center, Los Angeles	Dg
White Memorial Hospital, Los Angeles	3
U. S. Naval Hospital, Oakland	3
Collis P. and Howard Huntington Memorial Hospital, Pasadena	3
St. Luke Hospital, Pasadena	2
Sacramento County Hospital, Sacramento	NA
San Bernardino County Charity Hospital, San Bernardino	3
Mercy Hospital, San Diego	2
Letterman Army Hospital, San Francisco	3
University of California School of Medicine, San Francisco	3
O'Connor Hospital, San Jose	2
Santa Clara County Hospital, San Jose	Dg
Santa Barbara Cottage Hospital, Santa Barbara	Dg
St. John's Hospital, Santa Monica	Dg
Colorado:	
Glockner-Penrose Hospital, Colorado Springs	2
St. Francis Hospital, Colorado Springs	2
Colorado General Hospital, Denver	3
Denver General Hospital, Denver	3
Mercy Hospital, Denver	3
St. Anthony Hospital, Denver	3
St. Joseph's Hospital, Denver	3
Colorado State Hospital, Pueblo	2
Connecticut:	
Danbury Hospital, Danbury	2
Hartford Hospital, Hartford	2

Name and location of school	*Minimum prerequisite college (years)*
Connecticut—Continued	
St. Francis Hospital, Hartford	2
Middlesex Hospital, Middletown	2
New Britain General Hospital, New Britain	Dg
Grace-New Haven Community Hospital, New Haven	NA
Hospital of St. Raphael, New Haven	2
Norwalk Hospital, Norwalk	2
Stamford Hospital, Stamford	2
Charlotte Hungerford Hospital, Torrington	2
St. Mary's Hospital, Waterbury	2
Waterbury Hospital, Waterbury	2
Delaware:	
Delaware Hospital, Wilmington	2
Memorial Hospital, Wilmington	3
Wilmington General Hospital, Wilmington	2
District of Columbia:	
Doctors Hospital, Washington	2
Garfield Memorial Hospital, Washington	2
Georgetown University Medical Center, Washington	Dg
George Washington University Hospital, Washington	2
Providence Hospital, Washington	2
Sibley Memorial Hospital, Washington	2
Florida:	
Florida State Hospital, Chattahoochee	2
Duval Medical Center, Jacksonville	2
St. Luke's Hospital, Jacksonville	2
St. Vincent's Hospital, Jacksonville	2
Jackson Memorial Hospital, Miami	Dg
Mount Sinai Hospital, Miami Beach	2
Escambia General Hospital, Pensacola	2
Georgia:	
Athens General Hospital, Athens	NA
St. Mary's Hospital, Athens	NA
Crawford W. Long Memorial Hospital, Atlanta	2
Georgia Baptist Hospital, Atlanta	2

Name and location of school	*Minimum prerequisite college (years)*
Georgia—Continued	
Grady Memorial Hospital, Atlanta	2
Piedmont Hospital, Atlanta	Dg
St. Joseph's Infirmary, Atlanta	Dg
Veterans Administration Hospital, Atlanta	NA
University Hospital, Augusta	2
Columbus City Hospital, Columbus	2
Emory University Hospital, Emory University	2
Kennestone Hospital, Marietta	2
St. Joseph's Hospital, Savannah	2
Idaho:	
St. Alphonsus Hospital, Boise	2
St. Luke's Hospital, Boise	2
Idaho Falls Latter-Day Saints Hospital, Idaho Falls	2
Illinois:	
Copley Memorial Hospital, Aurora	3
St. Joseph's Hospital, Bloomington	2
Burnham City Hospital, Champaign	NA
Alexian Bros. Hospital, Chicago	2
Augustana Hospital, Chicago	NA
City of Chicago Muncipal Tuberculosis Sanitarium, Chicago	2
Evangelical Hospital, Chicago	2
Grant Hospital, Chicago	3
Hospital of St. Anthony de Padua, Chicago	NA
Michael Reese Hospital, Chicago	2
Mount Sinai Hospital, Chicago	2
Northwestern University Medical School, Chicago	2
Norwegian-American Hospital, Chicago	2
Ravenswood Hospital, Chicago	2
St. Bernard's Hospital, Chicago	2
St. Luke's Hospital, Chicago	NA
St. Mary of Nazareth Hospital, Chicago	2
Wesley Memorial Hospital, Chicago	2
St. James Hospital, Chicago Heights	2
Lake View Hospital, Danville	2
Evanston Hospital, Evanston	2
St. Francis Hospital, Evanston	2
Ingalls Memorial Hospital, Harvey	NA

Name and location of school	Minimum prerequisite college (years)
Illinois—Continued	
Methodist Hospital of Central Illinois, Peoria	2
St. Francis Hospital, Peoria	2
St. Mary's Hospital, Quincy	2
Rockford Memorial Hospital, Rockford	2
St. Anthony Hospital, Rockford	2
Swedish-American Hospital, Rockford	2
Memorial Hospital, Springfield	2
St. John's Hospital, Springfield	2
St. Therese's Hospital, Waukegan	2
Indiana:	
St. John's Hickey Memorial Hospital, Anderson	2
Protestant Deaconess Hospital, Evansville	2
St. Mary's Hospital, Evansville	2
Lutheran Hospital, Fort Wayne	2
St. Joseph Hospital, Fort Wayne	2
Indiana University Medical School, Indianapolis	3
Methodist Hospital, Indianapolis	Dg
St. Vincent's Hospital, Indianapolis	2
St. Elizabeth Hospital, Lafayette	2
South Bend Medical Foundation (Memorial and St. Joseph Hospitals), South Bend	2
St. Anthony's Hospital, Terre Haute	2
Good Samaritan Hospital, Vincennes	2
Iowa:	
Mercy Hospital, Cedar Rapids	2
St. Luke's Methodist Hospital, Cedar Rapids	2
Mercy Hospital, Council Bluffs	2
Mercy Hospital, Davenport	2
Broadlawns Polk County Hospital, Des Moines	NA
Mercy Hospital, Des Moines	2
Finley Hospital, Dubuque	2
St. Joseph Mercy Hospital, Dubuque	2
Veterans Administration Hospital, Iowa City	NA
St. Joseph Mercy Hospital, Sioux City	2
St. Vincent's Hospital, Sioux City	NA
Kansas:	
Grace Hospital, Hutchinson	2
St. Elizabeth Mercy Hospital, Hutchinson	2
Bethany Hospital, Kansas City	2
Providence Hospital, Kansas City	Dg
St. Margaret's Hospital, Kansas City	Dg
University of Kansas Medical Center, Kansas City	Dg
Lattimore-Fink Laboratories (St. Francis, Stormont-Vail and Santa Fe Hospitals), Topeka	2
Veterans Administration Center, Wadsworth	2
St. Francis Hospital, Wichita	2
Wesley Hospital, Wichita	2
Wichita-St. Joseph Hospital, Wichita	2
Kentucky:	
St. Elizabeth Hospital, Covington	3
Good Samaritan Hospital, Lexington	2
St. Joseph Hospital, Lexington	2
Norton Memorial Infirmary, Louisville	2
St. Anthony Hospital, Louisville	2
St. Joseph Infirmary, Louisville	2
SS. Mary and Elizabeth Hospital, Louisville	2
University of Louisville School of Medicine, Louisville	2
Louisiana:	
St. Frances Cabrini Hospital, Alexandria	2
Baton Rouge General Hospital, Baton Rouge	2
Our Lady of the Lake Sanitarium, Baton Rouge	2
St. Francis Sanitarium, Monroe	2
Charity Hospital of Louisiana, New Orleans	Dg
Hotel Dieu, Sisters' Hospital, New Orleans	3
Mercy Hospital-Soniat Memorial, New Orleans	Dg
Ochsner Foundation Hospital, New Orleans	NA
Sara Mayo Hospital, New Orleans	3
Southern Baptist Hospital, New Orleans	2
Touro Infirmary, New Orleans	3

Name and location of school	*Minimum prerequisite college (years)*
Louisiana—Continued	
U. S. Public Health Service Hospital, New Orleans	3
T. E. Schumpert Memorial Sanitarium, Shreveport	2
Shreveport Charity Hospital, Shreveport	2
Maine:	
Eastern Maine General Hospital, Bangor	3
Central Maine General Hospital, Lewiston	2
Maine General Hospital, Portland	2
Mercy Hospital, Portland	2
Maryland:	
Mercy Hospital, Baltimore	2
St. Joseph's Hospital, Baltimore	2
Union Memorial Hospital, Baltimore	2
Memorial Hospital, Easton	NA
Massachusetts:	
Beverly Hospital, Beverly	2
Faulkner Hospital, Boston	3
Massachusetts Memorial Hospitals, Boston	2
New England Deaconess Hospital, Boston	2
New England Hospital, Boston	2
Truesdale Hospital, Fall River	2
Burbank Hospital, Fitchburg	2
Holyoke Hospital, Holyoke	2
Lawrence General Hospital, Lawrence	2
St. Luke's Hospital, New Bedford	2
Newton-Wellesley Hospital, Newton Lower Falls	2
St. Luke's Hospital, Pittsfield	2
Quincy City Hospital, Quincy	3
Salem Hospital, Salem	2
Mercy Hospital, Springfield	2
Springfield Hospital, Springfield	2
Tewksbury State Hospital and Infirmary, Tewksbury	2
Memorial Hospital, Worcester	NA
Worcester City Hospital, Worcester	2
Worcester State Hospital, Worcester	2
Michigan:	
University Hospital, Ann Arbor	3
Leila Y. Post Montgomery Hospital, Battle Creek	2
Mercy Hospital, Bay City	2
Veterans Administration Hospital, Dearborn	3

Name and location of school	*Minimum prerequisite college (years)*
Michigan—Continued	
City of Detroit Receiving Hospital, Detroit	3
Detroit Memorial Hospital, Detroit	2
Evangelical Deaconess Hospital, Detroit	2
Grace Hospital, Detroit	2
Henry Ford Hospital, Detroit	Dg
Herman Kiefer Hospital, Detroit	Dg
Jennings Memorial Hospital, Detroit	2
Mount Carmel Mercy Hospital, Detroit	3
Providence Hospital, Detroit	2
St. John Hospital, Detroit	NA
St. Joseph Mercy Hospital, Detroit	2
Woman's Hospital, Detroit	3
Wayne County General Hospital and Infirmary, Eloise	3
Hurley Hospital, Flint	3
McLaren General Hospital, Flint	3
St. Joseph Hospital, Flint	3
Blodgett Memorial Hospital, Grand Rapids	2
Butterworth Hospital, Grand Rapids	2
St. Mary's Hospital, Grand Rapids	2
Mercy Hospital, Jackson	3
Borgess Hospital, Kalamazoo	2
Bronson Methodist Hospital, Kalamazoo	2
Edward W. Sparrow Hospital, Lansing	3
Michigan Department of Health, Division of Laboratories, Lansing	3
St. Lawrence Hospital, Lansing	3
Hackley Hospital, Muskegon	2
Port Huron Hospital, Port Huron	2
Saginaw General Hospital, Saginaw	2
Minnesota:	
St. Luke's Hospital, Duluth	2
St. Mary's Hospital, Duluth	2
Minneapolis General Hospital, Minneapolis	Dg
Swedish Hospital, Minneapolis	2
University of Minnesota Hospital, Minneapolis	3
St. Cloud Hospital, St. Cloud	2
Ancker Hospital, St. Paul	3
Charles T. Miller Hospital, St. Paul	3
St. Joseph's Hospital, St. Paul	Dg

Name and location of school	*Minimum prerequisite college (years)*
Mississippi:	
Mississippi Baptist Hospital, Jackson	2
Mercy Hospital-Street Memorial, Vicksburg	2
Missouri:	
St. Louis County Hospital, Clayton	2
Independence Sanitarium and Hospital, Independence	2
St. John's Hospital, Joplin	2
Kansas City General Hospital No. 1, Kansas City	2
Kansas City General Hospital No. 2, Kansas City	2
Menorah Hospital Medical Center, Kansas City	2
Research Hospital, Kansas City	2
St. Joseph Hospital, Kansas City	Dg
St. Luke's Hospital, Kansas City	2
St. Mary's Hospital, Kansas City	2
Trinity Lutheran Hospital, Kansas City	3
Missouri Methodist Hospital, St. Joseph	2
Barnes Hospital, St. Louis	2
DePaul Hospital, St. Louis	NA
Homer G. Phillips Hospital, St. Louis	2
Missouri Baptist Hospital, St. Louis	NA
St. John's Hospital, St. Louis	2
St. Louis City Hospital, St. Louis	2
St. Louis University School of Nursing, St. Louis	2
Burge Hospital, Springfield	2
St. John's Hospital, Springfield	2
Montana:	
St. Vincent's Hospital, Billings	2
Butte Community Memorial Hospital, Butte	Dg
Columbus Hospital, Great Falls	3
Montana Deaconess Hospital, Great Falls	2
Nebraska:	
Bryan Memorial Hospital, Lincoln	2
Lincoln General Hospital, Lincoln	2
Bishop Clarkson Memorial Hospital, Omaha	2
Creighton Memorial, St. Joseph's Hospital, Omaha	2
University of Nebraska Hospital, Omaha	2
Nevada:	
St. Mary's Hospital, Reno	3
New Hampshire:	
Mary Hitchcock Memorial Hospital, Hanover	2
Notre Dame de Lourdes Hospital, Manchester	2
Sacred Heart Hospital, Manchester	2
New Jersey:	
Atlantic City Hospital, Atlantic City	2
West Jersey Hospital, Camden	2
Englewood Hospital, Englewood	2
Monmouth Memorial Hospital, Long Branch	2
Fitkin Memorial Hospital, Neptune	NA
Hospital of St. Barnabas and for Women and Children, Newark	2
Newark Beth Israel Hospital, Newark	3
Presbyterian Hospital, Newark	3
St. Michael's Hospital, Newark	2
Passaic General Hospital, Passaic	NA
St. Mary Hospital, Passaic	2
Barnert Memorial Hospital, Paterson	2
Paterson General Hospital, Paterson	2
Muhlenberg Hospital, Plainfield	2
Overlook Hospital, Summit	NA
Holy Name Hospital, Teaneck	2
Mercer Hospital, Trenton	2
New Mexico:	
St. Joseph's Sanatorium and Hospital, Albuquerque	2
New York:	
Albany Hospital, Albany	NA
Bender School of Medical Technology, Albany	2
Binghamton City Hospital, Binghamton	2
Our Lady of Lourdes Memorial Hospital, Binghampton	NA
Jewish Hospital, Brooklyn	2
Prospect Heights Hospital, Brooklyn	2
St. Mary's Hospital, Brooklyn	2
Buffalo General Hospital, Buffalo	2
Edward J. Meyer Memorial Hospital, Buffalo	2
Mercy Hospital, Buffalo	2

Name and location of school	*Minimum prerequisite college (years)*
New York—Continued	
Millard Fillmore Hospital, Buffalo	2
Arnot-Ogden Memorial Hospital, Elmira	2
St. Joseph's Hospital, Elmira	2
Flushing Hospital, Flushing	2
Meadowbrook Hospital, Hempstead	2
Mary Immaculate Hospital, Jamaica	2
Charles S. Wilson Memorial Hospital, Johnson City	2
St. John's Long Island City Hospital, Long Island City	2
Northern Westchester Hospital, Mount Kisco	2
Beth Israel Hospital, New York City	3
Montefiore Hospital for Chronic Diseases, New York City	Dg
St. Barnabas Hospital for Chronic Diseases, New York City	3
St. Clare's Hospital, New York City	2
United Hospital, Port Chester	NA
Rochester General Hospital, Rochester	Dg
St. Mary's Hospital, Rochester	2
Ellis Hospital, Schenectady	2
U. S. Public Health Service Hospital, Staten Island	2
St. Joseph's Hospital, Syracuse	2
Samaritan Hospital, Troy	3
St. Mary's Hospital, Troy	NA
Utica State Hospital Laboratory Institute, Utica	2
St. John's Riverside Hospital, Yonkers	2
North Carolina:	
St. Joseph's Hospital, Asheville	2
University of North Carolina School of Medicine, Chapel Hill	2
Charlotte Memorial Hospital, Charlotte	3
Mercy Hospital, Charlotte	2
Presbyterian Hospital, Charlotte	2
Duke Hospital, Durham	2
Watts Hospital, Durham	2
Rex Hospital, Raleigh	2
North Carolina Baptist Hospital, Winston-Salem	3
North Dakota:	
Bismarck Hospital, Bismarck	2
St. Alexius Hospital, Bismarck	2
St. Luke's Hospital, Fargo	3
Grand Forks Deaconess Hospital, Grand Forks	2
St. Michael's Hospital, Grand Forks	3
Trinity Hospital, Minot	2
Ohio:	
Children's Hospital, Akron	2
City Hospital, Akron	2
Peoples Hospital, Akron	2
St. Thomas Hospital, Akron	2
Alliance City Hospital, Alliance	2
Aultman Hospital, Canton	2
Mercy Hospital, Canton	2
Bethesda Hospital, Cincinnati	3
Christ Hospital, Cincinnati	3
Cincinnati General Hospital, Cincinnati	3
Good Samaritan Hospital, Cincinnati	Dg
Jewish Hospital, Cincinnati	2
Our Lady of Mercy Hospital, Cincinnati	3
City Hospital, Cleveland	2
Cleveland Clinic Hospital, Cleveland	2
Mount Sinai Hospital, Cleveland	2
University Hospitals, Cleveland	2
Grant Hospital, Columbus	2
Mount Carmel Hospital, Columbus	2
Ohio State University Hospital, Columbus	3
Good Samaritan Hospital, Dayton	2
Miami Valley Hospital, Dayton	2
St. Elizabeth Hospital, Dayton	2
Veterans Administration Center, Dayton	2
Huron Road Hospital, East Cleveland	2
Elyria Memorial Hospital, Elyria	2
Mercy Hospital, Hamilton	2
Lakewood Hospital, Lakewood	2
St. Rita's Hospital, Lima	2
St. Joseph's Hospital, Lorain	2
Mansfield General Hospital, Mansfield	2
Mercy Hospital, Portsmouth	2
Mercy Hospital, Springfield	2
Springfield City Hospital, Springfield	2
Ohio Valley Hospital, Steubenville	2
Flower Hospital, Toledo	2
Maumee Valley Hospital, Toledo	2
Mercy Hospital, Toledo	2

Name and location of school	*Minimum prerequisite college (years)*
Ohio—Continued	
Riverside Hospital, Toledo	Dg
St. Vincent's Hospital, Toledo	3
Toledo Hospital, Toledo	3
Trumbull Memorial Hospital, Warren	NA
St. Elizabeth Hospital, Youngstown	2
Youngstown Hospital, Youngstown	2
Oklahoma:	
Mercy Hospital, Oklahoma City	2
St. Anthony Hospital, Oklahoma City	Dg
University Hospitals, Oklahoma City	3
Wesley Hospital, Oklahoma City	Dg
Hillcrest Memorial Hospital, Tulsa	3
St. John's Hospital, Tulsa	Dg
Oregon:	
Sacred Heart General Hospital, Eugene	2
Emanuel Hospital, Portland	2
Good Samaritan Hospital, Portland	2
Portland Sanitarium and Hospital, Portland	3
St. Vincent's Hospital, Portland	Dg
University of Oregon Medical School Hospitals and Clinics, Portland	2
Salem Memorial Hospital, Salem	2
Pennsylvania:	
Abington Memorial Hospital, Abington	2
Allentown Hospital, Allentown	2
Sacred Heart Hospital, Allentown	3
St. Luke's Hospital, Bethlehem	2
Bryn Mawr Hospital, Bryn Mawr	2
Butler County Memorial Hospital, Butler	2
Geo. F. Geisinger Memorial Hospital and Foss Clinic, Danville	2
Fitzgerald-Mercy Hospital, Darby	2
Easton Hospital, Easton	2
St. Vincent's Hospital, Erie	2
Harrisburg Hospital, Harrisburg	2
Harrisburg Polyclinic Hospital, Harrisburg	2

Name and location of school	*Minimum prerequisite college (years)*
Pennsylvania—Continued	
Hazleton State Hospital, Hazleton	2
Mercy Hospital, Johnstown	2
Lancaster General Hospital, Lancaster	2
St. Joseph's Hospital, Lancaster	2
Frankford Hospital, Philadelphia	2
Germantown Dispensary and Hospital, Philadelphia	2
Hahnemann Hospital, Philadelphia	2
Jefferson Medical College Hospital, Philadelphia	2
Jewish Hospital (Northern Division—Albert Einstein Medical Center) Philadelphia	2
Lankenau Hospital, Philadelphia	2
Misericordia Hospital, Philadelphia	2
Mount Sinai Hospital (Southern Division—Albert Einstein Medical Center), Philadelphia	2
Nazareth Hospital, Philadelphia	2
Pennsylvania Hospital, Philadelphia	2
Philadelphia General Hospital, Philadelphia	2
Presbyterian Hospital, Philadelphia	2
St. Agnes Hospital, Philadelphia	2
St. Joseph's Hospital, Philadelphia	2
School of Auxiliary Medical Services, Graduate School of Medicine, University of Pennsylvania, Philadelphia	3
Temple University Hospital, Philadelphia	2
Allegheny General Hospital, Pittsburgh	2
Mercy Hospital, Pittsburgh	2
Montefiore Hospital, Pittsburgh	2
Pottsville Hospital, Pottsville	2
Community General Hospital, Reading	2
Reading Hospital, Reading	2
St. Joseph's Hospital, Reading	2
Robert Packer Hospital, Sayre	2
Moses Taylor Hospital, Scranton	2
Scranton State Hospital, Scranton	2
Sharon General Hospital, Sharon	3

Name and location of school	*Minimum prerequisite college (years)*
Pennsylvania—Continued	
Allegheny Valley Hospital, Tarentum	2
Wilkes-Barre General Hospital, Wilkes-Barre	2
Williamsport Hospital, Williamsport	2
Rhode Island:	
State Hospital for Mental Diseases, Howard	Dg
Memorial Hospital, Pawtucket	Dg
Rhode Island Hospital, Providence	Dg
St. Joseph's Hospital, Providence	2
South Carolina:	
Anderson County Memorial Hospital, Anderson	2
Medical College of the State of South Carolina, Charleston	2
McLeod Infirmary, Florence	2
Greenville General Hospital, Greenville	2
Spartanburg General Hospital, Spartanburg	2
South Dakota:	
St. Luke's Hospital, Aberdeen	2
St. John's McNamara Hospital, Rapid City	2
McKennan Hospital, Sioux Falls	2
Sioux Valley Hospital, Sioux Falls	2
Sacred Heart Hospital, Yankton	2
Tennessee:	
Baroness Erlanger Hospital, Chattanooga	2
Memorial Hospital, Chattanooga	2
East Tennessee Baptist Hospital, Knoxville	2
Knoxville General Hospital, Knoxville	2
St. Mary's Memorial Hospital, Knoxville	2
Madison Sanitarium and Hospital, Madison College	NA
Blount Memorial Hospital, Maryville	NA
Baptist Memorial Hospital, Memphis	2
John Gaston Hospital, Memphis	2
Methodist Hospital, Memphis	2
St. Joseph Hospital, Memphis	2
Geo. W. Hubbard Hospital, Nashville	2
Nashville General Hospital, Nashville	2
St. Thomas Hospital, Nashville	2
Veterans Administration Hospital, Nashville	2
Texas:	
Hendrick Memorial Hospital, Abilene	2
Brackenridge Hospital, Austin	Dg
Baptist Hospital of Southeast Texas, Beaumont	2
Hotel Dieu Hospital, Beaumont	2
St. Therese's Hospital, Beaumont	2
Baylor University Hospital, Dallas	2
Parkland Hospital, Dallas	NA
St. Paul's Hospital, Dallas	NA
Hotel Dieu Sisters' Hospital, El Paso	2
Harris Hospital, Fort Worth	3
Pennsylvania Avenue Hospital (Affiliated with Fort Worth Medical Laboratories and Texas Department of Public Health), Fort Worth	Dg
Terrell's Laboratories (All Saints and City-County Hospitals), Fort Worth	2
St. Mary's Infirmary, Galveston	2
University of Texas Medical Branch Hospitals, Galveston	2
Hermann Hospital, Houston	2
Jefferson Davis Hospital, Houston	2
Methodist Hospital, Houston	2
St. Joseph's Hospital, Houston	2
Midland Memorial Hospital, Midland	NA
St. Mary's Hospital, Port Arthur	2
Shannon West Texas Memorial Hospital, San Angelo	2
Baptist Memorial Hospital, San Antonio	2
Robert B. Green Memorial Hospital, San Antonio	NA
Nix Memorial Hospital, San Antonio	2
Santa Rosa Hospital, San Antonio	2
U. S. Air Force Hospital (Lackland), San Antonio	2

Name and location of school	*Minimum prerequisite college (years)*
Texas—Continued	
Scott and White Hospital, Temple	2
U. S. Air Force Hospital (Sheppard), Wichita Falls	2
Utah:	
St. Benedict's Hospital, Ogden	2
Thomas D. Dee Memorial Hospital, Ogden	2
Utah Valley Hospital, Provo	2
Dr. W. H. Groves Latter-Day Saints Hospital, Salt Lake City	3
Holy Cross Hospital, Salt Lake City	3
St. Mark's Hospital, Salt Lake City	2
Salt Lake County General Hospital, Salt Lake City	3
Vermont:	
University of Vermont College of Medicine, Burlington	3
Virginia:	
University of Virginia Hospital, Charlottesville	2
Chesapeake and Ohio Hospital, Clifton Forge	NA
Memorial Hospital, Danville	2
Mary Immaculate Hospital, Newport News	3
Riverside Hospital, Newport News	2
DePaul Hospital, Norfolk	2
Norfolk General Hospital, Norfolk	2
Grace Hospital, Richmond	2
Johnston-Willis Hospital, Richmond	2
Medical College of Virginia, Hospital Division, Richmond	2
Stuart Circle Hospital, Richmond	2
Jefferson Hospital, Roanoke	2
Lewis-Gale Hospital, Roanoke	2
Memorial and Crippled Children's Hospital, Roanoke	2
Washington:	
Children's Orthopedic Hospital, Seattle	2
King County Hospital, Seattle	Dg
Providence Hospital, Seattle	2
Swedish Hospital, Seattle	NA
University of Washington School of Medicine, Seattle	3
Deaconess Hospital, Spokane	2
Sacred Heart Hospital, Spokane	2
St. Luke's Hospital, Spokane	2
St. Joseph's Hospital, Tacoma	2
Tacoma General Hospital, Tacoma	2
St. Elizabeth Hospital, Yakima	2
West Virginia:	
St. Luke's Hospital, Bluefield	2
St. Mary's Hospital, Clarksburg	2
Fairmont General Hospital, Fairmont	3
School of Medicine, West Virginia University, Morgantown	3
Camden-Clark Memorial Hospital, Parkersburg	2
St. Joseph's Hospital, Parkersburg	2
Myers Clinic Hospital, Phillippi	2½
Wisconsin:	
St. Agnes Hospital, Fond du Lac	2
St. Francis Hospital, La Crosse	2
Madison General Hospital, Madison	2
St. Mary's Hospital, Madison	2
State of Wisconsin General Hospital, Madison	3
St. Joseph's Hospital, Marshfield	2
Columbia Hospital, Milwaukee	2
Evangelical Deaconess Hospital, Milwaukee	2
Milwaukee County Hospital, Milwaukee	2
Milwaukee Hospital, Milwaukee	2
Mount Sinai Hospital, Milwaukee	2
St. Joseph's Hospital, Milwaukee	2
St. Luke's Hospital, Milwaukee	2
St. Mary's Hospital, Milwaukee	2
St. Mary's Hospital, Racine	2
St. Mary's Hospital, Wausau	2
Veterans Administration Center, Wood	2
Wyoming:	
DePaul Hospital, Casper	NA
Memorial Hospital, Cheyenne	2
Canal Zone:	
Board of Health Laboratory Gorgas Hospital, Ancon	2

Name and location of school	*Minimum prerequisite college (years)*
Hawaii:	
Kuakini Hospital, Honolulu	3
Queen's Hospital, Honolulu	3
St. Francis Hospital, Honolulu	3
Tripler Army Hospital, Moanalua, Honolulu	3
Puerto Rico:	
University of Puerto Rico, School of Tropical Medicine, San Juan	Dg
Health Department, Commonwealth of Puerto Rico, Santurce	2

Source: Council on Medical Education and Hospitals of the American Medical Association, 535 North Dearborn Street, Chicago, Ill.

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