An Introduction to the PROFESSION OF MEDICAL TECHNOLOGY

THIRD EDITION

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An Introduction to the Profession of Medical Technology

Foreword to the First Edition

Medical technology in the past decade has grown from a health occupation to a health profession. As medical technologists have developed more of their own body of knowledge and as they have questioned more of their techniques and procedures in the laboratory, they have become true health professionals. The tasks of medical technologists and other allied health personnel in the laboratory will require highly competent and superbly educated persons performing more and more complicated scientific processes.

The medical technologist of tomorrow will have to assume responsibilities and perform duties that no one has thought of today. Medical technologists are moving to become managers of doers rather than doers. They will perform roles of supervisors, teachers, and administrators. The roles they previously assumed will be performed by those with post-high school and junior college education working under the direction and supervision of the medical technologist. The medical technologist of tomorrow will in reality become the clinical pathologist's assistant.

The technological advances that took us to the moon will take us to new heights in the delivery of health care. The medical laboratory of today does not resemble one of only a few years ago, and as in all of society, the most constant factor is change. Students in medical technology will require much more preparation in biophysics, bioen-

vironmental medicine, and basic electronics. The curricula for medical technologists, medical laboratory technicians, and certified laboratory assistants must be continually revised to meet the needs of tomorrow for laboratory personnel in the allied health occupations and professions.

The author of this most needed text is well qualified for the assignment. She joined the staff of the College of Health Related Professions in 1961 as Head of the Department of Medical Technology. She had been a medical technologist for twenty-eight years previous to this assignment. She has served on the Board of Schools, a standing committee of the American Society of Clinical Pathologists, for a four year term. She was a member of the Joint Committee of the American Association of Junior Colleges and the National Committee on Medical Technology Education for three years. Since 1965 she has been on the editorial staff of the *American Journal of Medical Technology,* and she is the author of numerous articles.

It is indeed heartening that this medical technologist, educator, and administrator should share her experience and knowledge with the many university, college, and junior college students who will be preparing for careers in medical technology. This book will also be found useful in counseling high school students seeking career information.

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Preface to the Second Edition

This book is the direct outgrowth of requests from students for a textbook in an introductory course in medical technology. Although it is intended primarily as a textbook, guidance counselors should find it a useful tool in counseling high school or junior college students. Medical technologists may find it of interest as a reference on the historical background of the profession.

Insofar as possible, information concerning the development of medical technology has been obtained from the bylaws and reports published by the American Society of Clinical Pathologists, reports and bylaws of the American Society for Medical Technology, and "A Short History of the Registry of Medical Technologists," the presidential address of Dr. Lall Montgomery at the 1967 convention of the American Society of Clinical Pathologists. Dr. Montgomery was the second chairman of the Board of Registry, holding this position from 1940 to 1964.

The second edition has been enlarged in several areas and completely updated. However, even the most dedicated effort to reflect the current status fails because of the rapid progress in the profession.

It is a pleasure to welcome a co-author, Dr. David Lindberg. Dr. Lindberg is well known in medical technology, particularly for his contributions in the field of education. There is no doubt that sub-

sequent editions will incorporate some of the same enthusiasm and vitality he demonstrates as a professional educator.

I wish to thank the host of people who encouraged me to write this book. Special thanks are extended to the Registry of Medical Technologists, American Society of Clinical Pathologists; Dr. Lall Montgomery; Mrs. Ruth Drummond; the executive office of the American Society for Medical Technology; and my colleagues at the University of Florida.

Gainesville, Florida — M. RUTH WILLIAMS

Preface to the Third Edition

This third edition required numerous revisions to update information about credentialing, professional societies, and many other facets of our profession. We found the revision process to be highly interesting yet frustrating, as the source materials were assembled and organized, and as the patterns of change that have taken place during the past four years began to be apparent. We were forcefully reminded that the clinical laboratory professions are just as dynamic in their constant change as are the technologies employed by clinical laboratory professionals. The process was frustrating since more changes will occur before the edition can be published.

The many references and explanations of historical background have been retained from previous editions, so that the interested reader may have the opportunity to perceive just how much change has taken place in the professions in such a short period of years.

We are indebted to many persons who have assisted in the preparation of this edition through providing information, reviewing manuscript drafts, and who submitted helpful suggestions and comments to the publishers. Special thanks go to Sara Marie Cicarelli, Chester Dziekonski, and Lynn Silver, who supplied information and assistance concerning their respective agencies and organizations.

A sincere thank you is extended to Lea & Febiger for their continued interest, cooperation and encouragement.

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Contents

1

A Definition of Medical Technology

Many definitions have been proposed for the term, medical technology. Heinemann,[1] a medical technologist, defined it as "the application of principles of natural, physical, and biological sciences to the performance of laboratory procedures which aid in the diagnosis and treatment of disease." The definition by Fagelson,[2] also a medical technologist, is perhaps preferable, since it adds an important dimension. She considers medical technology to be "that branch of medicine concerned with the performance of the laboratory determinations and analyses used in the diagnosis and treatment of disease and the *maintenance of health.*" These laboratory determinations and analyses are performed in the clinical laboratory by the medical technologist, a person who has obtained a sound foundation in the scientific principles involved and a proficiency in the performance of the test procedures. Detailed information on professional preparation will be found in Chapter 5.

The director of the clinical laboratory usually is a pathologist. A pathologist is, first of all, a physician, either a doctor of medicine or a doctor of osteopathy. His specialty is pathology, which is defined by the American Board of Pathology as "that specialty of the practice of medicine which contributes to diagnosis, prognosis and treatment through knowledge gained by laboratory applications of the biologic, chemical or physical sciences to man, or material obtained from

man."[3] Pathology is further divided into two areas—anatomic and clinical. The physician preparing to be a pathologist may elect to specialize in either anatomic pathology or clinical pathology or both. If he is interested in the diagnosis or confirmation of diseases through autopsy examination and cellular differentiation of autopsy and surgical tissues, he may wish to specialize in anatomic pathology only. If he is more interested in the chemical, microbiological (study of bacteria), and hematological (study of blood) procedures, he may decide to specialize in clinical pathology.

In order to be eligible for certification by the American Board of Pathology in both clinical and anatomic pathology, the candidate must have taken four years of "combined training" in an institution approved by the Liaison Committee on Graduate Medical Education of the American Medical Association, or by the Board.[4] The time is equally divided between the two areas. In addition to the residency, he must have one more year of training, either an internship or further study in pathology.

"Combined training" may be defined as a total of four years of training in at least two of five subspecialty areas. Successful passing of an examination in the specialty in which certification is desired gives the candidate board certification, or in the vernacular, he has his "Boards."

In the Final Report of the Commission on Medical Education (1932)[5] is found this statement:

> The more scientific laboratory determinations become, and the wider the field of their application, the more thoroughly trained must the physician be to interpret, correlate, and utilize the findings of the laboratory in relation to the problem of the individual patient.

The years since this report have seen a marked increase in the variety of laboratory procedures available. New procedures are added as new knowledge and equipment make them possible. The extreme complexity of these procedures often makes it necessary for the physician to rely on the pathologist for assistance. The pathologist performs the role of interpreting and correlating for the physician the results obtained by the medical technologist in order that the physician may use them in the diagnosis and treatment of the patient. Thus, the pathologist and the medical technologist work together with the physician as members of a team whose goal at all times is better patient care.

The title of this book indicates a rather firm conviction that medical

technology is a profession. Perhaps it would be appropriate to quote from a publication of the American Society for Medical Technology.[6]

> Becoming a profession is a gradual process. There are basic qualifications that must be met to be an accepted, established profession. Because the profession of medical technology is in the process of fulfilling these qualifications, it is classified as an emerging profession. This presents many challenges to technologists individually and collectively. To fulfill the requirements of a profession members must jointly strive to:
>
> a. Acquire differential technological expertise
> b. Establish and maintain standards of excellence
> c. Formulate a code of ethics
> d. Establish and enforce rules of conduct
> e. Establish and enforce minimum qualifications for entrance into the profession
> f. Allow opportunities for human service
> g. Set criteria for recruitment and training
> h. Develop a sense of responsibility to the profession, to colleagues and to society as a whole
> i. Insure a measure of protection for members
> j. Establish collective control
> k. Endeavor to elevate their profession to a position of dignity and social standing in society
> l. Organize and develop a professional, qualifying association

Medical technology, as will be seen in subsequent chapters, does not meet several of these criteria. Since these criteria are similar to those qualifications usually attributed to professions, honesty compels the author to agree that medical technology can only be called an emerging profession.

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2

A Brief History of Medical Technology

Where does one look for the beginning of a profession? Herrick,[1] a medical technologist, traces the beginning of medical technology back to 1500 B.C. when intestinal parasites such as taenia and ascaris were mentioned in writings. She also notes that in the *Ebers Papyrus* (a "recipe" book for treatment of diseases) there is a description of the three different stages of hookworm infection. Both taenia and ascaris are large parasites, very characteristic in appearance, and would require no specialized knowledge to identify. All three stages of hookworm produce small forms that would demand more sophisticated study. This identification of intestinal parasites is done today in the parasitology division of the clinical laboratory.

Probably the most commonly performed laboratory test today is the urinalysis. Examination of the urine dates back to antiquity. Early Hindu doctors made the "scientific" observation that the urine of certain individuals attracted ants, and that such urine had a sweetish taste. During the Medieval period (1096–1438) urinalysis was a fad. Quacks calling themselves doctors reaped fortunes from diagnosing diseases by the appearance of the urine. In most cases the correlation between the diagnosed disease and the condition of the patient must have been coincidental.

The writings of Hippocrates who lived from 460 to 370 B.C. indicate he had a knowledge of tuberculosis, malaria, mumps, anthrax,

and purpural septicemia (childbed fever). His observations, however, were clinical rather than pathologic.

Fagelson[2] prefers to date medical technology from the 14th century when a prominent Italian physician at the University of Bologna employed one Alessandra Giliani to perform certain tasks which would now be considered those of the technologist. It may be of interest that this young lady died from a laboratory acquired infection.

During the 16th century Ambroise Paré contributed materially to the advance of anatomy, pathology, medicine, and surgery. He made pathology popular in France through his many postmortem examinations. His examinations included at least three members of royalty—Henry II, the king of Navarre, and Charles IX.[3]

The 17th century saw the invention of the microscope. We often associate Leeuwenhoek (1632–1723) with this invention, but compound microscopes had already been developed prior to his work. However, he improved the lenses and was the first to describe red blood cells, to see protozoa, and to classify bacteria according to shape. With the invention of the microscope, microbiology and pathology progressed rapidly, yet the beginning of pathology is not clearly defined.

Malpighi (1628–1694) was described as the "greatest of the early microscopists and his work in embryology and anatomy definitely marks him as the founder of pathology."[1] Kracke,[4] Gauss,[3] and many others do not agree with this statement but believe that pathology as it is practiced dates only from the time of Virchow, making it one of the youngest of the medical specialties. "In the 19th century the cell theory was enunciated and established; pathology was placed on a cellular basis; chemistry witnessed the rapid discovery and isolation of numerous elements; organic chemistry came into existence to be followed rapidly by physiological chemistry which paved the way for the newer blood chemistry."[3] Laboratory tests were greatly improved, moving from qualitative to quantitative. In 1848 Fehling performed the first quantitative test for urine sugar.

Virchow (1821–1902) saw the beginning of the organized advancement of science. His interests, while mainly in cellular physiology, included anthropology and physiology, and his publications covered many fields. He founded the Archives of Pathology in Berlin in 1847.

With the production of aniline dyes about the middle of the 19th century it became possible to stain bacteria and to study them under the microscope. Concurrently, the rapid advancement in the knowledge of chemical compounds and reactions laid the groundwork for the development of our modern clinical chemistry.