

WELLS

Clinical Pathology

*Application and
Interpretation*

SECOND EDITION

Clinical Pathology

Application and Interpretation

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Foreword

IT WAS MY pleasant task to write a foreword for the first edition of this book. It is an honor and a privilege to accept the invitation a second time.

The history of clinical pathology—the development of laboratory methods for clinical diagnosis—has been my lifelong interest. I have seen the specialty develop during half a century of medical practice. I have watched the trends in medical education. In certain fields it seems that substantial growth has been sacrificed for haste. The demands of military service and a feverish postwar economy have curtailed the leisurely mastery of subjects so fundamental to education a generation ago. Because I am of that previous generation, I am critical of short cuts, of inattention to scientific methods and a disregard of the classics as a background for professional training.

However, in my association with the new generation of earnest clinicians, I have come to realize more and more that many things considered important a decade or two ago have lost their original significance. There are especially striking examples in the fields of bacteriology and serology. Public health education, sanitation and preventive medicine, use of the antibiotic drugs and a generally higher standard of living have changed the health problems of our people, and the practice of medicine, as well. These changes must necessarily be reflected in the practice of clinical pathology. On the other hand, the sciences of biochemistry and physics have contributed many new methods for the study of human physiology and disease, and have created an unprecedented demand for tests in these categories. Whether the tests are truly necessary is not always immediately evident. In any event, the clinician must select, apply and interpret all laboratory methods according to the needs of his patient.

During the past few years I have found the first edition of this book helpful in the formation of opinions concerning the importance of labora-

tory studies. The new edition will be even more useful, since it contains much that is new, and, by rearrangement of the old, it presents pertinent material in a proper setting. For example, the discussion of viral and rickettsial diseases has been moved from sections on miscellaneous infections and respiratory diseases; it now appears in expanded form as a prominent part of the first chapter. Here, also, is a note on the C-reactive protein test and a brief discussion of the Kveim test for Boeck's sarcoid. Gastrointestinal diseases are discussed in the second chapter and respiratory diseases in the third. In this edition, diseases of the cardiovascular system have been moved from the sixth chapter to become the fourth chapter. The fifth chapter is an expanded presentation of material on diseases of the kidney and urinary tract. Diseases of the blood are discussed in Chapter Six. Special mention is made of hereditary abnormalities of hemoglobin. There is new material on hypersplenism. The seventh chapter, on metabolic and endocrine disorders, contains an evaluation of tests for protein-bound iodine and a review of radioiodine methods. Tests are described for plasma acetone in diabetes. There is a new discussion of electrolytes and water balance. Diseases of the parathyroid glands are also discussed in this chapter. There is new material on the significance of 17-ketosteroids. Chapter Eight, on clinical laboratory studies in surgery, and Chapter Nine, on clinical laboratory studies in obstetrics, contain about the same topics as they did in the first edition. In place of an appendix there now appears a tenth chapter on laboratory procedures. The common tests that can be performed in a small office laboratory are described. The material will be found useful.

I have known the author for many years as a friend and colleague. He is also co-author with me in the publication of "Clinical Diagnosis by Laboratory Methods." In that book, interpretations are not presented in any expanded form. I find myself gladly turning to Dr. Wells for application and interpretations of much material found in the larger textbook.

In closing I urge the reader to contemplate most seriously the philosophy of the author in his introductory considerations. His warning against the excessive use of laboratory tests in diagnosis deserves to be emphasized. An impression of professional knowledge is not created by ordering a long list of tests. Technologists as well as patients appreciate an intelligent use of the laboratory. Evaluation of the findings is the physician's most important duty. The author, as clinical pathologist and professor of medicine, presents common sense advice on everyday problems.

ARTHUR HAWLEY SANFORD

Preface

THIS BOOK is offered to medical students and physicians as a guide in the application and interpretation of clinical laboratory studies. Its purpose is entirely practical. The topics are selected and developed only as they pertain to the more urgent and frequent needs of medical practice. The material is arranged exactly as the physician uses it. Beginning with a clinical problem, useful laboratory tests are named and discussed. Just enough theory and methodology are included to give proper meaning to the procedures or to define their limitations.

The text of this edition has been almost completely rewritten in order to reflect the many changes and developments that have taken place in the past five years. A short chapter on laboratory methods has been added. The latter will be useful to medical students and to doctors who are interested in office and bedside tests.

Every physician knows that the vast and dynamic field of clinical pathology cannot be compressed within these narrow limits. Every effort has been made, however, to choose the most essential parts and to present them in a concise and intelligible form. Beyond the faults, restrictions and omissions of these pages I hope that every student will be stimulated to find the abundantly rewarding experience of continuing contact with the clinical laboratory.

BENJAMIN B. WELLS

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Introductory Considerations

IN MODERN medical practice laboratory tests are as important as the clinical history and the physical examination. In many instances they are more important. We may expect the future progress of medicine to depend almost entirely on the development of new or more accurate laboratory tests. Correct evaluation of any patient means a skillful blending of history, physical and laboratory examination or a wise selection among the three. It is futile to argue the relative importance of these methods. A physician who depends on the laboratory to make his diagnoses is probably inexperienced; one who says that he does not need a laboratory is uninformed. In either instance the patient is in danger.

In recent years there has been an enormous increase in the number of laboratory procedures. Because of this it has become more and more difficult to select the proper tests and to interpret them correctly. Most of us have neither the time nor the opportunity to master theories and methods of clinical pathology, so we take a good many results rather uncritically and deal with them according to our experience. This really is not too bad. We do the same thing with a host of signs and symptoms when basic explanations may be lacking or quite unknown to us. We are constantly being forced to make intelligent compromises between science, art and practice. All this does not mean that we must accept a lower standard of performance, but it does require us to focus our attention on matters of rather direct and practical concern to diagnosis and the care of patients.

The burden of the physician in laboratory matters has been very much lightened by the increasing number and improved quality of medical technologists. Also, there are many more people with specialized training in the basic sciences who are now applying their skills to various

phases of medical laboratory work. In our clinics and hospitals, individual physicians from every branch of practice often make themselves expert in one of the special fields of laboratory diagnosis. They provide a valuable source of consultation as well as a means to further progress.

In this book we are not concerned with *all* laboratory tests. This is manifestly impossible. In many cases the methods discussed will not be the most accurate ones or the ones that we might recommend under absolutely ideal conditions. An earnest effort will be made to discuss tests and results as they apply to a large number of common clinical problems. Without being too primitive, we shall try to keep in mind the limitations of average office and hospital practice. If a procedure is not generally available, it is not relevant to our purpose. If the accuracy of a particular test is far in excess of our ability to interpret the changes usually encountered in disease, it will not be introduced here. Such tests almost invariably add to the expense of medical care and often give unnecessary discomfort to our patient.

Perhaps our modest objectives may be expressed in another way. The practitioner must know three things about every laboratory procedure that he expects to use: (1) when to use it; (2) how to interpret the results; and (3) what technical or physiologic limitations must be taken into account in its interpretation. We shall scale our discussions to these three fundamental requirements, and leave most of the theory and technicality to those who make a specialty of clinical pathology or ancillary basic sciences.

In our effort to eliminate the irrelevant we must not forget that intelligent use of the clinical laboratory requires the physician to know something about the methods that are employed to carry out his request. This information can generally be had without entering into technical detail. For the most part, it pertains to accuracy, limitations, availability, and simple matters concerning the selection and handling of specimens. For example, the doctor must know whether a particular test is applied to whole blood, plasma or serum, and what precautions are to be used in drawing the specimen and in sending it to the laboratory. He must have some notion of the quantity of specimen material required in the various tests and what preservative, if any, is necessary. If several techniques are commonly available for a single determination, he should be able to make an informed selection. He should recognize in laboratory reports the variations that may be ascribed to faulty technique and those that come within the limits of unavoidable error. These and similar problems will be included wherever possible.

The organization of material in this book is designed for physicians and students of medicine. The procedures, therefore, are grouped around clinical problems to which they pertain. This arrangement often develops a constellation of quite dissimilar techniques. A serologic test, a blood chemical test, a urinalysis and a basal metabolic rate may all apply to the diagnosis of a single disease, yet each procedure is of a separate technical category. To the experienced physician a clinical problem usually suggests an associated group of laboratory tests. He

has learned to request these related tests simultaneously and thus relieve his patient of multiple venipunctures or other uncomfortable procedures. This simplifies the work of the laboratory, too, but most important of all, it increases the validity of results. This approach is especially useful in the study of hematologic diseases. It is far safer to interpret the results of a complete blood count, a reticulocyte count, a platelet count, bone marrow aspiration, icterus index or urobilinogen excretion when all, or as many as seem indicated, are carried out at approximately the same time. It can be quite confusing if the results are accumulated over a period of several days when there may have been important changes in the patient's condition or when any number of technicians may have taken part in the work. Many clinical problems such as jaundice, kidney disease, hepatitis or diarrhea immediately suggest an appropriate set of laboratory tests. Experience demonstrates the value of having these associations in mind, so that suitable groups of procedures can be run simultaneously.

It is frequently noted that a laboratory test, although pertinent to the clinical problem at hand, is not really necessary for its solution. The physician should keep these unprofitable examinations at a minimum. Laboratory tests are expensive, and most of them add to the patient's discomfort. Too often a consultant feels that he can create the appearance of knowledge by ordering a long list of laboratory tests and that his reputation is assured if he can think of a procedure with which the attending physician is not acquainted. This type of activity is wasteful and unbecoming. In the category of unnecessary laboratory work may be included many night orders and so-called emergency orders. A decent respect for patients, nurses and laboratory personnel will rule against all of these tests except the genuinely essential ones. Doctors who observe this courtesy and good sense always receive the best laboratory service for their patient.

Not infrequently a physician wishes to have a laboratory result simply to satisfy his scientific curiosity. This is often entirely justified. Competent laboratory workers and intelligent patients are pleased to cooperate. A fundamental distinction, however, should be made between this type of interest and organized research projects. It is neither good ethics nor sound scientific judgment to call upon the facilities of the clinical laboratory for research purposes unless there has been a previous conference and agreement with the clinical pathologist. The pathologist deserves to know when such activities are in progress and, if special procedures are required of him or his personnel, he should be considered a collaborator in the project. Of equal importance is the fact that few laboratories can maintain in their routine functions the high precision or uniformity of results that must be assured to research data.

Good laboratory facilities invariably raise the quality of all medical practice in a community. Physicians improve their skills by constantly checking their judgment and clinical perception against objective tests. Patients become accustomed to laboratory examinations, then learn to