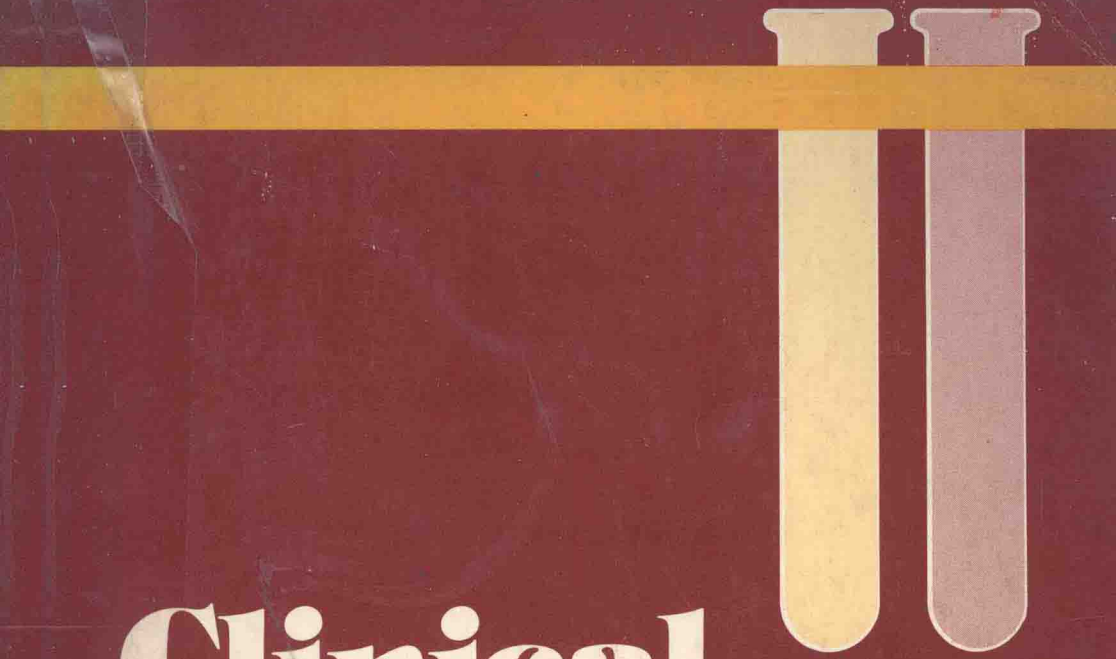

Clinical Laboratory Tests

Significance and Implications for Nursing

Kathleen Morrison Treseler

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Dedicated to

Elizabeth McDermott Morrison

A role model

Foreword

In the setting of today's modern hospital, it is essential that all members of the health care team have an understanding of the functions and abilities of the various support services to insure the proper and efficient use of these services for the patient's benefit. This is especially important in the relationship between nursing service and the clinical laboratory. The modern clinical nurse has a pivotal role in the ongoing care of a patient and is often relied on to detect changes in a patient's clinical condition. In this setting a nurse who can also detect and understand significant changes in a patient's laboratory values will be more effective in carrying out that role. Also, an understanding of specimen requirements for various tests will improve the quality of specimens obtained and allow the laboratory to deliver more clinically relevant results.

My involvement with this book was undertaken with the hope and expectation that it would serve as an instrument to improve and maintain better patient care. I believe it will be useful in not only the training of members of the health care team, but as an ongoing resource in both the inpatient and outpatient settings. The author has brought to the book a rich clinical nursing experience and a commitment to improve the nurse's ability to interpret laboratory data. I believe she has suc-

ceeded admirably in this effort. Although technologic advances in the laboratory will change the way many constituents are analyzed, the basic pathophysiologic mechanisms will remain valid, as will the majority of the interpretative statements in the book.

I am grateful for the opportunity to have played a small part in the production of this book and look forward to the results of its contribution to better patient care.

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Preface

This book focuses on the implications of laboratory tests for individuals studying or practicing health care delivery. The stress is on using the *results* of laboratory testing to better plan and evaluate health care. By understanding the physiologic and pathophysiologic mechanisms that brought about a test result, the reader should be better able to act in the identification and implementation of preventative or supportive measures.

The book was written for baccalaureate nursing students in a medical-surgical setting. However, it will be of value to any student in any aspect of health care delivery, from vocational nursing students to medical students, since the book functions as a composite resource. It is hoped and expected that it will be of ready-reference value to the practicing professional as well, as it is designed to serve both as a teaching and reference tool.

The book was written out of frustration—frustration on the part of my students and myself as we were consistently unable to find information about variations in reference ranges of patients' laboratory test results. Gathering such information alone required a major search of literature. To synthesize the applicable patient care needs and

potential problems, and to provide accurate rationale for intervention, necessitated an even broader search, requiring more time and more resources than were usually available. Consequently, data from laboratory findings were infrequently utilized. As a medical-surgical nursing instructor of many years experience, I have synthesized a fund of information about the significance of laboratory findings and their implications for nursing which I shared verbally with my students as the need arose. But this method resulted in haphazard and inadequate learning at best, and inaccurate recall, therefore inaccurate understanding and use by the student at worst. Other books available for use on laboratory testing did not adequately address the reasons for variations in test results, the interrelationships between abnormal tests' results, and certainly gave no clues as to what actions might be undertaken by the health care worker to prevent abnormalities, or to deal with them as they occurred. My colleagues expressed similar frustration, as well as concern about the effects of inaccurate understanding of laboratory findings on the patient care of health care providers. The book was written with the encouragement of my peers and guidance from experts in many areas of health care delivery. It is the result of a long and thorough search of available literature on clinical testing. Certainly, whenever conflicts appeared in the literature, I used my own experience and judgment to select the more commonly agreed upon methods of testing, values, or results, but the book is primarily objective in scope. It represents a collection of most of what is known or thought to be good technique in testing.

The book is organized to benefit both students and practicing professionals. Some of the major features include:

1. *Outline format* to provide quick retrieval of specific information about specific tests.
2. *Implications for nursing* to help the reader know what to do with the information available from test results, whether the reader is a nurse or not.
3. *Extensive use of lists and tables* to help the reader find material rapidly and to enable the student to memorize, and the working professional to consult quickly, the details of any particular test.
4. *Current information* on tests in use, providing an evaluation of the current usefulness of a given test.
5. *Reference range of normal variation in tests' results for different age groups* when available (e.g., senior adult, adult, and specified age levels for pediatric patients).
6. *Causes of variation from normal range* are extensively covered, including physiologic variation.

7. *Usefulness as a teaching tool.* If introduced early in the nursing curriculum, the book will help students understand the relationship of the test to the patients' medical problems. The overview of physiology for each screening test will reinforce learning from courses in anatomy and physiology. It will serve as a supplementary reference text in almost all nursing courses. The implications for nursing *are* medical-surgical nursing concepts, and consist of extensive instruction in general patient care in the disease conditions related most frequently to the test under discussion.
8. *Usefulness as a reference tool.* The book is envisioned as a guide for employed health care professionals that can be quickly consulted whenever needed on the job. It can serve as an aid at the hospital nursing station, in doctors' offices, in out-patient clinics, in the health professionals' personal library, and certainly in hospital and school of nursing libraries.
9. *Provision of rationale* for physiologic or pathophysiologic occurrences, and for suggested interventions.
10. *Definition of terms* which may be unfamiliar to a new health care worker. For the most part such terms are defined in the body of the text where they first occur. Because the book will probably not be read in a consecutive order, the definitions may not always appear in the area being read. Thus, a few basic terms are defined in Appendix E.
11. *Supplementary information* about subjects of interest, but not essential to understanding the material in the book, is given in the appendixes.
12. *Extensive cross referencing* within the body of the text. Material such as the anion gap is explained for the reader's use.

The book is divided into three parts. Part 1, "Multisystem Screening Tests," includes the more commonly used screening tests for blood chemistry, hematology, coagulation, urinalysis, as well as special pediatric screening tests. The tests in this portion of the book are covered in the greatest depth. Each section is devoted to one test, and contains the procedure and purpose of the tests, underlying physiology and pathophysiology, lists of those conditions in which test results are altered (which includes a statement as to the usual mechanisms), and implications for nursing related to the patient problems usually evident with abnormalities in the tests. These implications are focused strongly on preventive measures. The in-depth information given with these tests transfers readily to specific physiologic systems, covered in Part 3 (e.g., serum creatinine; section 1.5 material applies to the renal system, Chapter 9).

Part 2, "Diagnosis of Infectious Disease," covers very broad areas of testing, describing general approaches to laboratory methods. Specific implications for nursing are interspersed throughout, including areas in some of the many tables, and are found as well at the end of the section. This latter coverage focuses on both prevention and management of infectious disease. Prevention is considered as a major responsibility for health care persons.

Part 3, "Laboratory Tests of Specific Body Systems," is more in the genre of what has become an expectation in a laboratory book, that is, a listing of tests by physiologic systems with normal reference ranges and a brief description of the test. Management suggestions for the health care worker are limited to patient preparation. It is a strength of the book that material contained in implications for nursing sections in Part 1 may be transferred for use here. A very complete listing of conditions that will alter test results is given, an addition not routinely found in other texts. Unique to this book is the inclusion, at the beginning of each chapter, or prior to discussion of a discrete functional area of a system, of a listing of "clues" that indicate need for in-depth evaluation of the system or function. These "clues" are made up of findings from screening tests and clinical signs and symptoms. This list provides the reader with a ready-made set of necessary and important observations to be made of any person with a suspected, or already diagnosed, disorder of the given system.

It is the author's belief that the use of this text will enhance the knowledgeable application of laboratory findings to the data base on which patient care is planned.

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The author would like to acknowledge with thanks and gratitude the remarkable amount of help and guidance received—so freely and generously given, and "without which this book would never have been written": or, if written, would not have been anywhere nearly as accurate, or as well done. Although this large group of people have no part in any errors or lack of style the book may possess, they are responsible for most of that which may be good. Space, unfortunately, does not allow listing each and every person, but some must receive specific recognition.

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To all these and to all whose names should appear on this page but do not, THANK YOU.

Seattle, Washington Kathleen M. Treseler

Note to the Reader

To help the reader of this book get maximum benefit from it, the following "caveats" are supplied.

1. The "normal range" for any given test varies with the method used for testing and with many specific characteristics of the laboratory itself, such as distance from sea level and the ambient temperature routinely present during testing. Therefore, *all the reference ranges given are examples only*, and can be expected to differ from the local laboratory's reference range. The reader is *strongly encouraged* to use the "normals" from the laboratory that has performed the test rather than those given herein. Normals for this text have been acquired from many sources—all accurate in their own setting, but perhaps not as accurate for the reader's setting.

2. Where data were available, the normal range has been separated into normals for given age groups. The age spans used are defined as follows:

Premature	birth to 1 month of age
Newborn	birth to 1 week of age
Neonatal	1 week to 1 month of age
Infant	1 month to 2 years of age

Child	2 years to puberty
Adolescent	puberty to 18 years of age
Adult	18 years to 69 years
Senior adult	70 years and thereafter

3. The terms "serum" and "plasma," although not synonymous (see Appendix E for definitions), are often used interchangeably—and are so used to a degree in this text. When either serum or plasma can be used for a given test, both terms may be used, although "serum" is used more frequently. When only one is preferred in a given test, it is so indicated in the text and so used.

4. Units of measurement are generally abbreviated. For the less common units, the term is spelled out the first time it is used. Definitions, as well as some conversions, for many of the measurement units are given in Appendix D.

Summary Contents

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