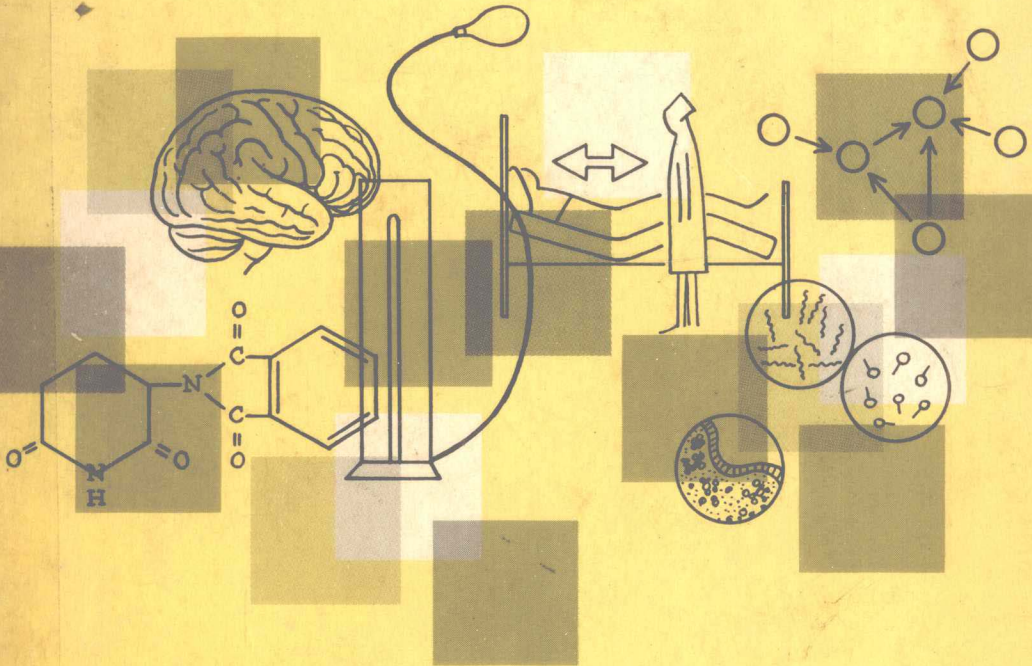


2nd Edition



*Scientific
Foundations
of Nursing*

*Nordmark
Rohweder*

Scientific Foundations of Nursing

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SECOND EDITION

J. B. LIPPINCOTT COMPANY

Philadelphia

Toronto

Second Edition

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Science Principles Applied to Nursing

First edition, by Madelyn Titus Nordmark and Anne W. Rohweder

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Distributed in Great Britain by

Blackwell Scientific Publications, Oxford, London, and Edinburgh

Library of Congress Catalog Card No. 67-17440

ISBN-0-397-54065-5

Printed in the United States of America

11 13 15 14 12 10

Scientific
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PREFACE TO SECOND EDITION

This book was conceived originally as a guide for teachers of nursing students. Since publication seven years ago, however, the book has been used increasingly by nursing students in both basic and graduate nursing programs. Comments and suggestions that filtered back to the authors seemed to indicate interest in a revision that would (1) increase the science content and the nursing applications, and (2) present the material in a form that might be more useful to students.

This current edition represents an amalgamation of the data from the original study done at the University of Washington, along with new material to expand both the science and the related nursing. The methods used for compiling the additional material are described in Part I.

The original Chapter II, "Potential Usefulness of the Principles for Nursing Education," which was specifically geared toward teacher use, has been revised as Part IV. In its place we have added a chapter to orient students and graduates to possible uses of the science and nursing sections. An index—an addition most frequently suggested by student users of the original text—follows Part IV.

We are grateful to Dean Mary S. Tschudin and Mrs. Louise Mansfield of the University of Washington School of Nursing for their cooperation and support during this year of revision. We also wish to take this opportunity to thank Mr. David T. Miller of the J. B. Lippincott Company, who has been a source of encouragement and assistance throughout the preparation of the revision.

Madelyn T. Nordmark
Anne W. Rohweder

FOREWORD TO FIRST EDITION

THE importance of the social, physical and biological sciences in nursing education has been emphasized repeatedly. The student is expected to draw upon all the science knowledge she possesses and to apply this knowledge in a variety of nursing situations. She is expected to see the relationships between many facts, principles and concepts and their relevance to particular problems in nursing, and, from this background, to make sound decisions for her nursing actions.

With the rapid expansion of scientific knowledge relevant to nursing care, the task of helping the student to achieve this level of performance becomes a major challenge for nursing educators. There is need to promote continued learning of the sciences throughout the educational program and to extend the meaningfulness of this knowledge for effective patient care.

This book presents the results of an extensive study of the application of social and natural science principles in nursing which was conducted at the University of Washington. A major portion of the material, which has been organized to facilitate its use by teachers, is devoted to the presentation of principles from psychology, sociology and anthropology, and from chemistry, physics, anatomy, physiology and microbiology, all of which are important to nursing. Accompanying each group of principles are the related statements of nursing care. Suggestions are offered to show how students may be helped to develop a greater understanding of the relevance of science to effective nursing care.

It is hoped that as teachers use the materials presented in this book, they will be stimulated to identify additional principles from the social and natural sciences and their implications for nursing practice.

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ACKNOWLEDGEMENTS TO FIRST EDITION

FOR many years nurse educators have shown a growing appreciation of the contributions of the basic sciences to nursing. This appreciation has led to the recognition of the need to delineate specifically the application of sciences to nursing practice. In addition, there has been an intensification of the felt need in the nursing profession for the formulation of a fundamental core of nursing knowledge. These two needs stimulated the study which is reported in this publication—an investigation that was supported by The Commonwealth Fund and carried out in the University of Washington School of Nursing.

A study of this kind cannot be accomplished without the cooperation and sustained efforts of many people. The authors wish to acknowledge, first of all, the members of the Natural and Social Science Committees of the University of Washington School of Nursing, who faithfully gave their time and energies during the five-year period. Members of the Natural Science Committee included: Helen Anderson, Helen Belcher, Lucy Enos, Shirley Frederickson, Julie Hanson, Stella Hay, Priscilla Normark, Bessie Robinson and Vesta Franz Skeins. Members of the Social Science Committee included: Viola Brown, Dorothy Burke, Marguerite Cobb, Betty Jane Ely, Betty Hart, Edith Heineman, Charity Kerby, Dolores Little, Mary O'Brien, Betty Olsen Ames, Maxine Patrick, Eleanor Perdelwitz, Lorraine Phillips, Patricia Rose, Patricia VanderLeest, Harriet Ulrich and Frances Zaleski.

The task of identifying important principles from the natural sciences was greatly aided by the major contributions of several of the teachers of science at the University of Washington. Dr. Julia Skahen, Assistant Professor of Physiology, Biophysics and Anatomy, devoted innumerable hours of her time to the study. Also of great assistance were Dr. B. S. Henry, Professor of Microbiology, Dr. S. G. Powell, Professor of Chemistry, and Dr. L. A. Sanderman, Associate Professor of Physics.

The following medical specialists were most gracious and helpful in reviewing and criticizing the nursing care principles related to the natural sciences: Doctors Robert M. Paine, Fred Casserd, Alexander P. Greer, Louis N. Hungerford, Jr., Hugh Jones, John F. Le Cocq,

x **Acknowledgements to First Edition**

Edward H. Morgan, Gerald Nowlis, Robert Pommerening, William J. Steenrod, Jr. and Heston L. Wilson.

For the collection of data for the social science portion of the study, the efforts of the nursing personnel in the five participating hospitals are particularly appreciated: King County Hospital, Northern State Hospital, Swedish Hospital, Seattle Veterans' Administration Hospital and Virginia Mason Hospital.

Special thanks go to Doctors Ivar Lovaas and James Taylor of the University of Washington Department of Psychology for reviewing and criticizing the social science data.

The authors are grateful to the members of both juries who evaluated the total data.

Much of the study was more easily facilitated by the secretarial assistance of Miss Doris Kelly, Mrs. Lois Martin and Mrs. Carolyn Miller.

The support and encouragements which the authors received from the entire faculty of the University of Washington School of Nursing were invaluable. Last, but by no means least, special thanks go to Dean Mary S. Tschudin and Assistant Dean Katherine Hoffman for their consistent support.

Anne W. Rohweder
Madelyn T. Nordmark
Seattle, Washington
December 25, 1958

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Part I

Orientation

INTRODUCTION

The nurse is constantly called upon to make independent decisions in the solution of such problems as those concerned with patient care, safety for herself and others, and interpersonal relationships. Increasingly, she is expected not only to make wise decisions for herself, but to guide auxiliary personnel who perform nursing care functions. In the process of executing nursing activities, the nurse cannot always find a policy, a "rule of thumb," or a person in authority to assist her when a problem arises. Even if comprehensive sets of rules were available, the habitual use of such rules would be potentially dangerous, in that they could very likely lead to unthinking and harmful actions because the nurse failed to understand the reasons behind the rule. As demands for nursing services increase, the professional nurse will become more and more the diagnostician of nursing care problems, expected to devise creative nursing interventions; less and less will she function primarily as a follower of medical orders and an overseer of routine procedures. It would seem vital, then, that the professional nurse be equipped to solve problems in a wise and resourceful manner.

The successful use of problem-solving methods—which, hopefully, the nurse will employ in making her decisions—implies that the problem-solver has in her possession or at her disposal the facts and understanding necessary for the analysis and solution of problems. This implication leads to two significant questions:

What knowledge is it important for a professional nurse to possess?

How can this knowledge and its use in solving nursing problems be learned most effectively?

Recognition of the significance of these questions led the original planners of the five-year curriculum study in basic nursing education (at the University of Washington School of Nursing¹) to select as one area for investigation the relationship between the general and the professional education of nursing students. The Commonwealth Fund first supported this separate study within the framework of the total curriculum study, and the objective of the project was to find better ways to relate basic sciences and clinical nursing.

¹ Sand, Ole: Curriculum Study in Basic Nursing Education. New York, Putnam, 1955.

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The basic sciences were considered to include the social and the natural sciences. The former were defined as psychology, sociology and anthropology. The natural sciences were defined as the biological sciences of anatomy, physiology (including biochemistry) and microbiology, as well as the physical sciences of chemistry and physics.

During the first three years of the study, primary emphasis was placed on the development of methods for (1) teaching students how to apply basic science knowledge in solving nursing problems, and (2) evaluating students' abilities to apply basic science knowledge in solving nursing problems. When the Commonwealth Fund extended its financial support for an additional two years, the emphasis of the investigation shifted to the critical problem of identifying the basic science content that is applicable to nursing.

Fundamental differences between the natural and the social sciences and their application to nursing influenced the methods of approach in identifying important science content. The methods used in the original study will be described briefly.

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Methods Used in Original Study for Identification

The selection of methods amenable to the identification of science facts and principles important in nursing was somewhat problematic. The sheer bulk of natural science material alone, plus the wide variety of nursing practices dependent upon the application of natural science knowledge, presented a formidable barrier to the identification of specific facts and principles. The social sciences, although possessing a bulk of material, do not characteristically lend themselves to statements of science that can be directly applied. Much of social science knowledge is still in the stage of conceptualization and untested hypotheses. Nursing itself is not clearly defined, nor is nursing knowledge systematically organized; how then to pursue the task of identifying basic science content applicable to nursing?

NATURAL SCIENCES

Early in the study it was suggested that the science content generally taught to nursing students in the various science courses be examined in terms of possible applications to nursing. Although this was a feasible approach, it seemed that to work in exactly the opposite fashion might prove to be easier and somewhat more practical. By the "opposite fashion" is meant the examination of nursing itself to determine the related science content.

It was this latter approach that led to experimentation with the analysis of common nursing activities; such as, for example, measurement of blood pressure and catheterization. These procedures were examined in terms of facts from the natural sciences that when applied would result in procedures safely and effectively performed. Although these analyses proved useful for day-to-day teaching, this method was discontinued. The specific procedures represented a limited part of total nursing care, and the analyses completed showed—not surprisingly—too much repetition of some of the science content. For example, the fact

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that cleanliness inhibits the growth of microorganisms was repeated in each analysis.

At this point it was decided that a much broader view of nursing care should be considered in developing a methodology. It seemed that if the nursing care designed to meet expected physical and medical needs of patients with particular types of physiological problems were analyzed, the resulting science content would be more comprehensive and less repetitive. This method necessitated the development of nursing care plans for hypothetical patients with problems involving the different structures and functions of the body. Many faculty members contributed to the development of these care plans and the combining and condensing of the nursing care once identified. These activities proved to be highly valuable for teaching; however, when some of the completed sections of nursing care were analyzed for the related science content, the amount of science identified grew to such an extent that working with all the material in its interrelated and unorganized state was utterly impractical. It was obvious that some method of study had to be devised that could provide for organization of the science content. Surely, one way to provide some organization was to direct attention to one area of science at a time.

A review of the science already identified revealed that most of the science content came from anatomy and physiology. Moreover, it was notable that the statements concerned with physiology tended to fall into some broad categories—categories that involved such processes as blood circulation, fluid balance and nutrition. These two observations resulted in the use of the concept of physiological homeostasis as a basis for the determination of which content from anatomy and physiology is important in nursing. If the physical nursing care of patients is directed toward either the maintenance or the restoration of homeostasis, this concept should be an excellent organizing factor in the identification of basic science applicable to nursing.

Ten factors involved in the maintenance of a constant internal environment of an individual were identified. These included such things as oxygen, blood pressure, nutrition and electrolyte balance. Seven additional factors were then identified as being necessary for effective and independent functioning of the human organism (though not essential to homeostasis). These factors included locomotion, sensory processes and certain protective mechanisms.

After each of these factors had been identified and incorporated in a general statement that provided some indication of how this particular factor is important to the total functioning of the human organism, each factor was studied in terms of its embodiment of major facts from anatomy and physiology and the application of these facts in nursing. The process required two associated activities. Nursing care related to each of the factors had to be identified and then analyzed for related

science content. Practically simultaneously, anatomy and physiology content related to the specific factor under consideration had to be reviewed and facts that seemed to be applicable to patient care had to be selected. One activity supplemented the other.

As the material was developed, no attempt was made to associate any specific science statements with any statements of specific nursing care. Instead, the material was prepared in sections; statements of nursing care related to each factor were made, and these were followed by selected facts from anatomy and physiology that were believed to underlie that nursing care. Because the human body is a whole functioning unit, the placement of the facts about structure and function into separate sections proved a difficult and perhaps impossible task. Repetition was purposely avoided, however, and this was achieved primarily through the use of many cross-references.

There were variations in the degree of specificity of the science statements. An attempt was made to keep the levels of the statements somewhat similar all the way through, but it seemed most important to state the science content in such a way that it could have meaning to a nurse and really serve as a guide to action. All the many details that are sometimes involved in a brief statement of scientific fact were not included, and, hopefully, generalizations were not made to the extent that nursing applications would be a puzzle or be so vague as to be of little practical use.

Elements of pathology were occasionally included along with the anatomy and physiology. The amount of pathology was kept to a minimum, but there were times when certain aspects of disease were important in the application of some of the content from physiology.

When each of the sections of nursing care and related science had been completed, the nursing care was reviewed and criticized by both a medical specialist and a committee of clinical nursing instructors. The science statements were reviewed and criticized by a physiologist. Changes were made as recommended by these people.

After the identification of the anatomy and physiology content had been completed, the nursing care was analyzed for the purpose of identifying any science aspects from the fields of physics and chemistry. Some of the chemistry identified, though not directly applicable in nursing, was thought to contribute to the intelligent application of some of the physiology content, and was thus included. Clinical nursing instructors and professors of chemistry and physics criticized the physics and chemistry statements, and changes were made as recommended. These statements were then added to each of the seventeen sections.

Nursing care concerned with the protection of patients from microbial injury provided the basis for the identification of important facts and principles from the field of microbiology. Again, nursing care was identified along with applicable science content. Clinical nursing instruc-

tors and a pathologist reviewed and criticized the nursing section, and a medical microbiologist criticized the science statements. Changes were made as recommended.

After the eighteen sections of nursing care and related science had been completed, the total material was given to a jury for evaluation. The jury was composed of six nurse educators in different parts of the United States who were known to have particular interest in one or more of the natural science areas. The jury members were asked to review and criticize all eighteen sections of nursing and science, and to evaluate the relatedness of the nursing and science in each. Their responses were used to reorganize, delete and correct the material.

THE SOCIAL SCIENCES

Since the social sciences are concerned with human behavior without respect to specific physiological illness, treatment, or nursing procedures, it did not seem expedient in the original study to analyze nursing care plans or nursing procedures to determine social science principles. Such plans and procedures are usually oriented toward physical care, toward maintaining physiological homeostasis, or toward the mechanics of carrying out a procedure. Any psychosocial aspects of care that might be appended to such plans or procedures would have had to be stated in broad, relatively meaningless terms, such as "provide reassurance" or "avoid embarrassment."

The possibility of analyzing social science texts, outlines or other reference material was also ruled out as a possible methodology. It would have been difficult to arrive at defensible criteria for the selection and/or ruling out of concepts and principles (as found in current textbooks) that would have particular relevance to nursing. It also would have been extremely difficult to develop a framework from which to review the diverse theories and approaches expounded in contemporary sociological literature. One finds a wide variety of theoretical approaches to man's individual and collective behavior, and not all theories are mutually compatible. This lack of agreement was especially crucial to the original study when choices had to be made regarding terminology. The problem of terminology is discussed later with particular reference to some of the concepts and principles included in Part III.

Eventually the author settled on an analysis of actual patient-nurse situations as a most profitable initial approach. Such a method could provide information about the kinds of psychosocial problems that patients actually encounter in the course of illness and hospitalization, irrespective of the presenting complaint, physiological illness or the resulting care and treatment. Material collected in this way also might help to circumvent one of the major complaints about the use of social

science concepts in teaching nursing students—the difficulty in arriving at specific principles to guide the nurse's behavior.

With these considerations in mind, an adaptation of Flanagan's² "Critical Incident Technique" was chosen as the primary means of collecting source material for the original study. This method provided for the collection of descriptions of patient and nurse behavior in operationally defined critical situations. Critical incidents were defined as nurse-patient situations in which patients were either helped (a positive situation) or harmed (a negative situation) by some action of a nursing team member. The benefit or harm to the patient was described in terms of the patient's observable reaction to the situation.

Descriptions of nurse-patient situations were collected from nurses who were involved in giving patient care or in supervising patient care on medical, surgical and obstetrical³ services of four large general hospitals. The nurses were asked to describe incidents in which they had recently been involved or which they had recently observed. These incidents then were analyzed in terms of the social science principles that seemed to be inherent in the situation. The collection and analysis of situations represented an attempt to arrive at some of the factors that influence the human being's psychosocial equilibrium while he is in a situation requiring nursing care.

The author was assisted in the process of screening and analyzing incidents by a group of faculty members from the University of Washington School of Nursing, who were representative of all clinical areas in nursing. Throughout the entire period of study, this committee functioned both as an informal jury to guide the decisions of the author and as a work group to analyze situations and formulate statements of principal. After preliminary work-up, the material was critically reviewed by two members of the University of Washington Department of Psychology.

The final draft of the material was submitted to a group of six additional social scientists for review. This group included one psychologist, two sociologists and three anthropologists. With the exception of the anthropologists, all of the reviewers had had some experience in the health science fields. They were asked to consider the principles and hypotheses from the standpoint of: (1) the truth of the statements, (2) the relevance of sub-statements to major statements, and (3) the relevance of the nursing section to the science sections. The responses of

² Flanagan, John C.: *The Critical Incident Technique*. Psychological Bulletin, Vol. 51, No. 4, pp. 327-358, July 1954.

³ Since one of the hospitals did not have an obstetrical unit, material in this area was supplemented by a study using similar methods for the same purpose:

Rose, Patricia: *The Identification of Psychiatric Principles Inherent in the Nursing Care of a Selected Group of Maternity Patients*. (Unpublished Masters thesis. Univ. Washington, 1958.)