# ESSENTIALS OF COMPUTERS FOR NURSES

**SECOND EDITION** 

VIRGINIA K. SABA KATHLEEN A. McCORMICK

## ESSENTIALS OF COMPUTERS FOR NURSES

### SECOND EDITION

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### ESSENTIALS OF COMPUTERS FOR NURSES

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### **FOREWORD**

The computer revolution is rapid and ongoing. It has impacted on the expansion of knowledge in health care and information management. The great strides in and amplification of information management are occurring because it has now been demonstrated that the use of computers in health care can increase the quality, effectiveness, and efficiency of documenting practice; improve administration in many health care settings; and broaden the education of professionals as well as the conduct of research. And there is movement in this revolution toward an electronic superhighway as a national information infrastructure. These new, and other, innovative movements are described in this second edition of Essentials of Computers for Nurses.

To many consumers of health care services, the technology seems linked directly to escalating health care costs. But the computer technology is described in several applications in this book as a means of providing care more effectively and efficiently at affordable costs. The use of computers in nursing is described by the authors as essential to improve health and the quality of care through effective documentation and record keeping.

When the first Nursing Information Systems Conference was held at the University of Illinois in Chicago, in June 1977, the concept of information system use in nursing was in its infancy. With nurturing and development, many of the concepts envisioned at that time have become realities for nurses and nursing.

In this new edition of *Essentials of Computers for Nurses*, those historical developments are highlighted, and the advances in computer technology presented. The application sections have been updated to include many new advanced usages of computers, such as in critical paths and outcomes management. The state of the science of nursing vocabulary is presented from both national and international perspectives. This new edition, therefore, should be useful to nursing in all English-speaking countries until the book is translated into other languages.

Like all sciences, nursing information science is not complete. In this book, the authors have defined areas where further research and application studies are needed. Among these, research on the Nursing Minimum Data Set (NMDS) should figure predominantly if nurses are to contribute

to the development of the computer-based health care record. The NMDS was designed to be appropriate for use in any setting where nursing care is provided. This book is designed to serve as a textbook in nursing educational programs. Its objectives will have been achieved if students come to appreciate the place of computers for nurses and identify some of the factors—economic, political, professional—that will advance the profession of nursing as nurses participate in information science.

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### **PREFACE**

This second edition of *Essentials of Computers for Nurses* is a comprehensive text on computer technology for nurses and other health professionals. There are so many new essentials of computers for nurses that we have selectively described only those applications that have had sustained usage in nursing. It includes issues and trends in the field—such as the electronic information superhighway, computer-based patient record, data standards and nomenclatures—as well as how the new technology is impacting on health policy.

The text provides an update of computer history as it impacts on the nursing profession. It highlights the milestones of nursing informatics and new applications in nursing practice, education, research, administration, community health, and intensive care. Information on new computer technologies that entered the market since the first edition is also covered.

In this revision, we made a concerted effort to direct students and readers to new national resources that update the state of the science. Because there are so many corporate mergers and so many new companies enter this market, we tried to instruct the readers about "where to seek current information." We omitted many of the applications and examples from the first edition; thus, this book has less chance of becoming outdated before it is printed.

The book consists of four parts. The first part provides historical perspectives of the computer and nursing. In the second part, an overview of computer hardware including microcomputers (personal computers), online networks, software, database management systems, and data processing provides state-of-the-art information. The third part focuses on computer systems and gives a current review of nursing and other health care systems, including a description of the status of the computer-based patient record system. Another chapter focuses on implementing systems as well as on the upgrading and reengineering of existing nursing information systems.

The fourth part focuses on computer applications in nursing administration, practice, education, and research, including computer applications in intensive care, community health, and home health. The former chapter on prospective payment has been replaced with a new chapter on the integration of guidelines, outcomes, critical paths, and benchmark or pro-

files into information systems. The chapter on community and home health systems highlights the Home Health Care Classification (HHCC) System. This new system is being used for assessing and documenting home health care using its unique HHCC vocabulary.

Many parts of the text have been expanded to incorporate what we currently know about the important advances in computer technology in nursing informatics internationally. We believe that this book will be especially useful to those nurses who contribute to such advancements in Australia, Belgium, Canada, Denmark, Sweden, the United Kingdom, and other countries with whom we network to share our applications in nursing informatics.

In a recent paper to the British Library, Dr. Donald Lindberg, Director, National Library of Medicine, made the statement that, by the year 2000, those health providers who are illiterate in information systems and computer technology will be likened to the reading illiterate at the turn of the twentieth century. Another futurist mentions that the information area is doubling every six months. Other futurists describe the new libraries as libraries without walls. The electronic information superhighway has been described as an "infobahn" with no speed limits. We are all entering an educational framework of lifelong learning because we can no longer learn everything we need to know for our careers in structured and "brief" formal educational programs.

The future is exciting and challenging. Students, faculty, practitioners, and other nurses who wish to avoid becoming the illiterate of the new century are invited to read this book and learn of nursing's proud contributions in nursing informatics—information science, computer science, and nursing science. We need to become articulate spokespersons of the contributions of nursing informatics to health care and of the need for nursing data, information, and knowledge in our profession.

Virginia K. Saba, R.N., Ed.D., F.A.A.N., F.A.C.M.I. Kathleen A. McCormick, R.N., Ph.D., F.A.A.N., F.A.C.M.I.

### **ACKNOWLEDGMENTS**

This book took a great deal of effort to research, write, and compile. There are obviously many people whose contributions we wish to acknowledge. No book of this magnitude could have been completed without an editor who believed that the authors could accomplish this task. We wish to thank Gail Gavert for her patience, perseverance, and dedication to this book. The final product is an effort of the editorial team headed by Lester A. Sheinis at McGraw-Hill.

We also wish to thank Helen Foerst who reviewed numerous drafts of these chapters. Her many instructive and helpful comments and criticisms influenced the final manuscript. Barbara and Eugene Levine contributed by reading the chapters for clarity and consistency. Additionally, Nursing Informatics Experts (Judith Ronald, Dorothy Pocklington, and Mary Anne Schroeder) contributed their time by reviewing and commenting on specific topics, as well as Dr. Alan Zuckerman on the state of the art of computers.

There are several persons who contributed significantly to this edition. Kathy Milholland, who also authored Chapter 11, was prompt with her chapter and revisions when requested. Joan Burggraf Riley authored Chapter 14 and shared her innovative approach to and practical experience in teaching nursing informatics and technologies.

We are grateful to Lois Colliani and the staff of the National Library of Medicine for their comments on the Research Applications. The contributions of the National Library of Medicine to knowledge resources in health care are continuously being added to information science and are building the new library without walls in our future.

We are grateful to Andrew McLaughlin who prepared the final version using computer programs that resembled professional copyediting techniques, to Charles Morris for his graphical illustrations, and to Dolores Reinertson for the many textual tables she prepared.

To the hundreds of participants in Virginia's and Kathleen's lectures who have listened, read, and commented on parts of this book, we acknowledge their contributions.

Family and personal friends also contributed toward the production of the book. We are grateful to Dr. Faye G. Abdellah who inspired us and believed in this book from the beginning. Also, we thank our families and friends who provided emotional support. Because of the length of time Kathleen spent in Virginia's library, there were many weekends that Francis, Sr., Francis, Jr., and Christopher McCormick went without Mom. We thank you for giving of your time so that we could complete this book.

To Christopher, especially, who was in the formative years of 3 to 7, we hope that you have learned something about the perseverance required to complete a task. To Ellen Berman, author and friend, who knows the dedication required to complete a book, we thank you for being Kathleen's backup Mom and for providing so much support.

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Part

1

## HISTORICAL PERSPECTIVES OF THE COMPUTER AND NURSING

1

## HISTORICAL PERSPECTIVES OF NURSING AND COMPUTERS

### **OBJECTIVES**

- Describe the historical perspectives of nursing and computers.
- Describe early computer-based nursing applications in hospitals, community health agencies, education, and research.
- List the milestones of computers in nursing and nursing informatics.

The computer, a powerful technological tool, has transformed the nursing profession. Today computers are essential equipment in hospitals, community health agencies, academic institutions, research centers, and other settings where nurses function. Computers are vital tools of the nursing profession, making nursing part of the technological revolution.

Today nurses are concerned not only with computers, computer technology, and computer systems but also with nursing information systems (NISs) and nursing informatics. "Nursing informatics" has emerged as a new term to describe the use of computer technology in nursing and NISs. Nursing informatics encompasses computer technology that enables nurses to manage society's health care needs more efficiently and effectively. At the same time, it makes nurses more accountable. As in all fields of health care, efficiency, effectiveness, and accountability depend largely on how well computers are understood and used.

Computers are used to manage information in patient care, monitor the quality of care, and evaluate the nursing process. NISs are also being used to manage planning, budgeting, and policy making for nursing services. Moreover, computer applications are being used to enhance nursing education with new media modalities. Computers are providing students with computer-based literature, information, and knowledge databases. They are converting libraries into information centers without walls. Computers are also being used to support nursing research, test new systems, design new knowledge databases, and address the changing role of nursing in the health care industry.

This textbook provides an overview of what a computer is and how it functions. It describes computer applications for nursing and discusses how computers affect the nursing profession. It also discusses NISs and nursing informatics, terms that are used interchangeably here.

This chapter provides an overview of the historical perspectives of nursing and computers by describing five time periods and five nursing components. It highlights how early computer-based nursing applications in hospitals, community health agencies, ambulatory care centers, educational institutions, and research centers set the stage for today's NISs. It describes the major milestones that influenced the introduction of computers into the nursing profession.

The chapter is divided into three sections:

- Historical perspectives of nursing and computers
- Early computer-based nursing applications
- Landmark events in nursing and computers

### HISTORICAL PERSPECTIVES OF NURSING AND COMPUTERS

Computer technology was introduced into nursing in response to the need to keep the field abreast of changing and developing technologies in the health industry and in nursing practice. It can be analyzed in three ways: (1) according to five time periods: prior to the 1960s, the 1960s, the 1970s, the 1980s, and the 1990s, (2) according to four major nursing areas: nursing administration, nursing practice, nursing education, and nursing research, and (3) from the perspective of nursing standards and legislation that affected the nursing profession and its need for technology.

For nursing to enter the computer age, the profession had to review, revise, and update practice standards so that they could be implemented in computer systems; develop a variety of materials that could be computerized, such as the nursing minimum data set, standardized nursing vocabularies, and nursing care planning protocols; and design several computer instruments to support the use of the new technology. A brief

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discussion of the historical perspectives of nursing and computers in five time periods follows.

### **Five Time Periods**

### Prior to the 1960s

Beginning in the 1950s, as the computer industry grew, the use of computers in the health care industry grew. In the early days of this evolving field a few professionals formed a cadre of pioneers using computers for health care. During this period the nursing profession was expanding and undergoing major changes. The image of nursing was improving, nursing practices and services were expanding in scope and complexity, and the number of nurses was increasing. These events and initiatives created an incentive to bring computers into the profession.

Computers were initially used in hospitals and community health agencies for basic business office functions. Early computer equipment used punched cards to store data and computer programs and employed card readers and sorters to prepare the data for processing. Very early electronic computers were essentially large calculating machines that were linked together and operated by paper tape and that used teletypewriters to print their output. As the technology advanced, the equipment improved.

### 1960s

During the 1960s, as the computer began to be used in the health care setting, critical questions such as "Why computers?" and "What should be computerized?" were asked. Nursing practice standards were reviewed, and nursing resources were analyzed. Studies were conducted to determine which aspects of nursing should be automated and how computer technology could be utilized effectively in the health care industry. The hospital nursing station was viewed as the hub of communications and the most appropriate site for the development of computer applications.

During this period, computers improved and technology advanced. Health care facilities grew. The introduction of cathode ray tube (CRT) terminals, on-line data communication, and real-time processing added other essential dimensions to computer systems, making them more accessible and "user-friendly."

Hospital information systems (HISs) were developed primarily to process financial transactions and serve as billing and accounting systems. At that time a few HISs emerged that could document and process medical orders; these systems also offered selected patient and nursing care activities. Vendors were beginning to enter the field and market software applications to automate various hospital functions; however, because of the limitations of the technology, the lack of standardization, and the diversity of paper-based patient care records, progress was slow.