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MANIFESTATIONS OF CANCER AND CANCER TREATMENT

Part V from
CANCER NURSING
Principles and Practice
Second Edition

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FOREWORD

The pace of development in the cancer field and the gratifying assumption of a greater role for nurses in the delivery of cancer care dictates the need for freshness in a modern nursing text on cancer. The second edition of this text provides the opportunity to maintain that freshness. It also provides the opportunity to reflect on where we have been and where we are going. Much of the progress taking place can be described as occurring in two overlapping waves; a breathtaking wave of new technology, developed as a consequence of the biologic revolution, lapping at a wave of significant improvements in technology in existence before 1971. Nineteen seventy-one is a good benchmark year; the key event that year was the passage of the National Cancer Act. The vision of the architects of that Act was prescient. The resources supplied by the US Congress fueled the biologic revolution that is now affecting all of medicine. Before then we had little appreciation of the mechanism of uncontrolled growth we call cancer and how the cell machinery was damaged in the process of carcinogenesis. We knew early diagnosis was useful but not why, and while we had refined methods to control primary tumors with surgery and radiotherapy, more than 65% of the patients died of their disease as a result of micrometastases already present at the time of diagnosis, not included in surgical or radiation treatment fields. To overcome this problem, surgery and radiotherapy had become radicalized, and often mutilating, in an attempt to widen their impact on the illusive cancer cell, which was envisioned as spreading by contiguous involvement of adjacent tissue before entering the blood stream. The use of systemic therapy, concomitant with local treatment, was controversial and of unproven value. Attempts at prevention were almost nonexistent.

In other words, cancer was like a black box. We could remove it or destroy it, when we could identify it; we could examine it, we could measure it, we could weigh it, but we could not out-think it because we could not effectively look inside the cell itself. The biologic revolution wrought by the Cancer Act provided the tools of molecular biology that changed all that.

Now the cancer cell is like a blue print; not only is the machinery of the cancer process exposed for examination and manipulation, but also in this exposure we have uncovered important information in developmental biology—the essence of life itself. We now know that cell growth is controlled by a series of growth regulating genes that operate in a biologic cascade from recessive suppressor genes to dominant genes we know as proto-oncogenes in normal tissue and as oncogenes in cancer tissue, of which there are now more than 40 identified. These genes code for growth factors, their receptors, membrane signal transducing proteins, protein kinases, and DNA binding proteins, all important in signal transmission, which in turn is the way multicellular organisms maintain order in their community of cells. While these genes are involved in normal growth and development, mother nature has wisely provided a means for suppressing their expression in mature organisms since their continued operation would be dangerous. Similarly, the metastatic process is no longer thought to be a random phenomenon tied only to tumor growth but has been found to be an aberration of the process of cell migration in normal development and, like the growth controlling function of oncogenes, subject to manipulation by molecular methods. Cancer can result from damage to any of several of the steps in this genetic cascade. Inherited loss or damage of an allele of a recessive suppressor gene appears to lead to a release of the cascade of oncogenes and uncontrolled expression. Damage to a dominant oncogene can lead to escape from control by suppressor genes. Overproduction of a normal or abnormal protein product of an oncogene can occur due to failure of the cell to respond to "off" signals. The startling advances in molecular technology make it possible to isolate and manipulate the products of these genes with ease and use them as diagnostic and therapeutic targets. This was the promise of the cancer program and this is the payoff.

This new wave is, however, just now reaching the level of practical use. For example, in diagnosis, molecular probes and the extraordinarily sensitive polymerase chain reaction can be used to diagnose gene rearrangements to determine cell lineage in malignancies of lymphoid origin, and specific sequences at break points of nonrandom chromosome translocations can be used to diagnose solid tumors. The polymerase chain reaction can be used as a tool to monitor the effects of treatment by detecting one residual malignant cell out of a million normal cells. A molecular approach to treatment also is surfacing in the form

of antisense message compounds, chemically stabilized pieces of DNA complementary for, and inhibitory to, the message strand of the DNA of an operational gene or the message of specific target genes such as oncogenes. An extension of this approach will be the use of analogs of the recently identified products of suppressor genes to attempt to bring the oncogene cascade under control. A crest of this new wave of technology in treatment has reached the clinic in the practical application of the colony-stimulating factors produced through DNA recombinant technology, which is already influencing the use of chemotherapy, and the recombinant-produced interleukins and interferons, which have already produced useful antitumor effects by themselves.

Perhaps the most important and often overlooked implication of the biologic revolution is in its potential to allow meaningful approaches to cancer prevention. One of the main roadblocks to testing new ways to prevent cancer has been the identification of groups of high-risk populations small enough to allow prospective prevention trials to proceed at reasonable costs and with a reasonable prospect of answering important questions in the lifetime of the involved investigators. Genetic analysis of common tumors such as colon, breast, and lung cancers following on the heels of the first work on the identification of deletion of suppressor genes in the rare tumor retinoblastoma indicates that deletions of suppressor genes are common and likely to be tumor specific. These new approaches, when applied to the population at large, should allow us to identify individuals at high risk for getting common cancers. Then and only then can we accurately determine if the many interesting leads in prevention identified in the vast number of epidemiologic studies supported by the cancer program over the last two decades can truly be exploited to prevent common cancers.

This then is the new wave. A simultaneous wave of advancement in existing technology of a more practical nature has occurred in cancer management. The emergence of high-speed computers converted roentgenographic diagnosis and staging from plain film and linear tomography to computerized tomography and made magnetic resonance imaging an indispensable tool. Older, less precise, more morbid methods of diagnosis and staging have slowly, and appropriately, fallen into disuse. In 1971, we had just become aware that drugs could cure some types of advanced cancer, and the exploration of adjuvant chemotherapy had just begun. Now adjuvant drug treatments have proven beneficial in breast, colon, rectal, ovarian, head and neck, bladder, and pediatric tumors and in some kinds of lung cancer and bone and soft tissue sarcoma. Chemotherapy has quietly become the primary treatment for all stages of some types of lymphomas and for some stages of some types of head and neck cancers and bladder cancers. We also have developed a greater appreciation of the reason for treatment failure. A form of multiple drug resistance has been described in common tumors, derived from tissue exposed to the environment, that affects drugs derived from natural sources like some of our best antitumor antibiotics. We are just now beginning to design protocols to circumvent multidrug resistance. The use of bone marrow transplantation to support high doses of chemotherapy has made us acutely aware of past treatment failures due to inadequate dosing that can now be overcome with concomitant use of colony-stimulating factors to promote more rapid recovery of bone marrows. New radiotherapy equipment, coupled with computerized tomography treatment planning, has made radiotherapy less morbid and more acceptable as an alternative to radical surgery.

As a consequence of all this, combined modality treatment is no longer what it was in the early 1970s. It no longer means doing the standard radical surgical procedures, adding the standard extensive and toxic radiation therapy fields, and later the standard drug combination, but instead initial treatment is being offered with a precise design based on the capability of each modality in controlling local tumor and metastases while minimizing toxicity. In other words, cancer management has become a complex medical jigsaw puzzle administered by dedicated professionals, many of whom are nurse practitioners, and almost unnoticed, has become far less morbid. Since cancer treatment is still far too morbid, this latter change has been difficult for many to appreciate. However, those of us who have seen both ends of the spectrum over the past two decades have a greater appreciation of the change in morbidity of treatment than a newcomer. Nowhere is this change more evident than in breast cancer where 15 years ago a radical mastectomy followed by postoperative radiation cured a handful of patients, while leaving the few survivors with the morbid effects of a denuded chest wall and a swollen nonfunctional arm. Now survival is improved with specifically tailored local and systemic treatment with fewer side effects and excellent cosmetic results. Fifteen years ago nausea and vomiting, pain, and marrow suppression were largely uncontrollable side effects, and now all can be managed to a great degree.

Unlike the new wave of advances in molecular biology, which remains to be widely implemented before it will have an impact on cancer mortality, the improvement in current technology has already had an impact on national statistics. In 1971, the relative survival rate for all cancers combined was barely 36%; it has increased to 49% in the last available data ending in 1985. Declines in national mortality, formerly only noted in children under the age of 15, are now apparent in all age groups up to age 65, and if one excludes lung cancer, a largely preventable disease, a decline in national mortality is noted all the way up to age 85.

The challenge before us is to smooth the transition of these successive waves of progress into medical practice. It has never been easy because one must recognize them as they exist, separate and distinct bodies of knowledge, each affecting medical practice in different ways, but waves that will eventually summate. Their combined impact gives us the means to effect a significant reduction in cancer mortality by the year 2000. Successful reduction in cancer mortality, however, depends on a cooperative partnership between the medical profession and the public to use modern information to prevent cancer and to imple-

ment newly developed treatment rapidly and effectively nationwide. Aside from lagging support for cancer research, which threatens the momentum of change, the machinery in place to do all this is hampered by outdated regulations, unimaginative reimbursement policies, medical territoriality, and unwarranted pessimism about the prospects for controlling cancer in our lifetime. The prospects have never been better but, as the framers of the National Cancer Act knew, nonscientific reasons and failure of all of us to think about controlling cancer on a national scale are major deterrents to success. Nurses reading this text should keep this in mind because they will play an increasingly important role in the next decade in bridging the various medical specialty interests and the delivery of the new cancer care.

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PREFACE TO THE SECOND EDITION

Our goal in the second edition of *Cancer Nursing: Principles and Practice* is to provide the reader with the most comprehensive information about cancer nursing available in the 1990s. Each of the original 44 chapters in the first edition was thoroughly reviewed and updated. Twenty-five new content areas were added, including Relation of the Immune System to Cancer, Cancer Risk and Assessment, Biotherapy, Bone Marrow Transplantation, AIDS-Related Malignancies, Late Effects of Cancer Treatment, Psychosocial Dimensions: Issues in Survivorship, Sexual and Reproductive Dysfunction, Oncologic Emergencies, Delivery Systems of Cancer Care, Economics of Cancer, Teaching Strategies: The Public, and Teaching Strategies: The Patient. This edition contains 60 comprehensive chapters representing the contributions of over 75 recognized oncology nursing experts.

The exponential increase in information about oncogenes resulting from a massive research effort has provided a greater understanding of the nature of carcinogenesis. This improved understanding is reflected in this second edition and will continue to have a significant impact on the nature of clinical care. Even with this research effort and greater understanding of the nature of carcinogenesis, however, it is unlikely that a magic cure or vaccine for cancer will be available in the near future. There will continue to emerge new approaches to early diagnosis of cancer, new techniques to treat cancer, new measures to ameliorate distressing manifestations of cancer and its treatment, and new approaches to improve the quality of life for cancer survivors. Cancer nurses are integral to these developments. It is to these nurses that this text is dedicated.

The editors wish to gratefully acknowledge the tremendous effort of the contributors who enthusiastically shared their knowledge and expertise and gave their time and energy to this endeavor. We wish to especially acknowledge our husbands Keith, Jim, Larry, and John for their assistance, support, and patience during this mammouth project.

The editors have developed this text to be a comprehensive resource for nurses who provide or manage care for patients in the home, hospital, or community, who teach patients and nurses, and who conduct research to find better approaches to patient care—all of whom contribute to our steady gains in providing quality care to individuals with cancer.

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PREFACE TO THE FIRST EDITION

This text is one I always wished to have. As a graduate student of oncology nursing, and later as an oncology clinical nurse specialist and educator at Rush-Presbyterian St. Luke's Medical Center, I became frustrated by the dearth of texts written at the level of the oncology graduate student or oncology nurse specialist. Oncology nursing texts lack the depth and breadth of scientific information that I believe is an essential element in the armamentarium of the professional nurse; medical literature, while it contains the necessary scientific information, lacks application of scientific principles to the nursing care arena.

In this text, the contributors and I committed ourselves to presenting the reader with the most comprehensive information about oncology nursing available, including relevant science and clinical practice content that addresses both the whys and hows of oncology nursing practice. All chapters cite original published research as the scientific foundation for the application of these findings to clinical practice. All students of oncology nursing—beginning or advanced—will find this book valuable as a text and as a reference for clinical practice.

The disease of cancer in the adult is approached from many angles to address the complex learning needs of the oncology nurse specialist. Part I includes cancer epidemiology and deals with individual and societal attitudes toward cancer and the impact of attitudes on health behaviors. Part II provides the foundation of scientific information about the malignant cell on which all subsequent chapters are built. Concepts such as carcinogenesis, oncogenesis, metastasis, invasion, and contact inhibition are included in Part II, and thorough attention is given to changes that occur in a normal cell and its behavior as it transforms to a malignant cell.

In Part III, the psychosocial dimensions of cancer are approached according to critical phases through which patients, families, and caregivers may pass as they cope with the stressors induced by cancer. Part IV presents a conceptual approach to the most common manifestations of cancer and their effects on the individual with cancer. Each chapter includes pathophysiology, assessment, and medical and nursing therapies. Part V describes each of the major cancer treatment methods, their uses, adverse effects, and nursing care considerations for individuals receiving cancer therapy. Included in this part is a chapter on unproven methods of treatment. Part VI is a comprehensive review of most of the major cancers by body system and the problems experienced by people who live with cancer. (Information pertaining to pediatric malignancies and nursing care of the child with cancer has been omitted. Although pediatric oncology is a critical area of interest for many nurses, it could not be covered in sufficient depth within this text.) Part VII presents continuing-care options for the individual living with the problems imposed by cancer. Part VIII analyzes several issues relevant to the oncology nurse: consumerism, ethics, cancer nursing education, and cancer nursing research. Part IX, which lists oncology resources of many types, is a handy reference tool.

Some of the information presented in this text is out of date even as it is written because of ever-expanding knowledge about cancer and its treatment. As Dr. Vincent DeVita remarked at his swearing-in as Director of the National Cancer Institute (*The Cancer Letter*, 1980:4), "What we now know of the cancerous process and what we do to prevent, diagnose, and treat it will be outmoded and radically different by the end of the 80s." This book is our best effort to put down in writing the science and art of cancer nursing in the 1980s.

SUSAN L. GROENWALD

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