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Principles and Practice of Radiotherapy Techniques in Thoracic Malignancies Technical Basis of Radiation Therapy Intracranial and Spinal Radiotherapy Principles and Practice of Modern Radiotherapy Techniques in Breast Cancer Principles and Practice of Modern Radiotherapy Techniques in Breast Cancer Radiation Therapy Techniques and Treatment Planning for Breast Cancer Radiation Therapy for Sarcomas and Skin Cancers Image-Guided Radiotherapy for Effective Radiotherapy Delivery Radiation Oncology for Pediatric CNS Tumors Radiotherapy Techniques For Brain Tumors (Conformal And Conventional) Principles and Practice of Modern Radiotherapy Techniques in Breast Cancer Interventional Radiation Therapy Radiation Therapy Techniques for Gynecological Cancers The Physics of Conformal Radiotherapy Validating Gel Dosimetry for Highly Conformal Radiotherapy Techniques Monte Carlo Techniques in Radiation Therapy Basics of Planning and Management of Patients during Radiation Therapy Image-Guided High-Precision Radiotherapy Radiation Oncology Clinical Radiation Oncology Radiotherapy for Head and Neck Cancers Intensity-Modulated Radiation Therapy Ophthalmic Radiation Therapy Principles and Practice of Urooncology Brachytherapy, Second Edition Development of Three-dimensional Radiotherapy Techniques in Breast Cancer Radiation Therapy for Genitourinary Malignancies Principles of Radiation Therapy Radiation Oncology E-Book Monte Carlo Techniques in Radiation Therapy New Technologies in Radiation Oncology Monte Carlo Techniques in Radiation Therapy Effects on Quality of Life of New Radiotherapy Techniques in Treatment of Head and Neck Cancer Adaptive Motion Compensation in Radiotherapy Innovative Radiotherapy Techniques for Prostate Cancer Radiation Oncology Comparison of Advanced Radiotherapy Techniques for Post-mastectomy Breast Cancer Patients Advanced Techniques for Radiotherapy Practical Approaches to the Techniques of Radiation Therapy Informatics in Radiation Oncology

Radiation Oncology: Rationale, Technique, Results, by James D. Cox, MD and K. Kian Ang, MD, PhD, provides you with authoritative guidance on the latest methods for using radiotherapy to treat patients with cancer. Progressing from fundamental principles through specific treatment strategies for the cancers of each organ system, it also addresses the effects of radiation on normal structures and the avoidance of complications. This 9th edition covers the most recent indications and techniques in the field, including new developments in proton therapy and intensity-modulated radiotherapy (IMRT). It also features, for the first time, full-color images throughout the text to match those that you see in practice, and uses new color-coded treatment plans to make targets, structures, and doses easier to read at a glance. Evidence from randomized clinical trials is included whenever possible to validate clinical recommendations. The state-of-the-art coverage inside this trusted resource equips you to target cancer as effectively as possible while minimizing harm to healthy tissue. Stands apart as the only book in the field to cover the conceptual framework for the use of radiotherapy by describing the most effective techniques for treatment planning and delivery and presenting the results of each type of therapy. Emphasizes clinical uses of radiation therapy, providing pertinent, easy-to-understand information on state-of-the-art treatments. Includes information useful for non-radiotherapists, making it "recommended reading" for other oncology specialists. Offers a practical, uniform chapter structure to expedite reference. Guides you through the use of the newest radiation oncology techniques, including principles of proton therapy and new developments in intensity-modulated radiotherapy (IMRT). Incorporates evidence from randomized clinical trials whenever possible to validate clinical recommendations. Presents full-color images throughout to match the images that you see in practice. Uses new color-coded treatment plans to make targets, structures, and doses easier to read at a glance. Extensive use of "combination" imaging presents a complete picture of how to more precisely locate and target the radiotherapy field. This book equips readers with detailed knowledge on the current status of image-guided radiotherapy with photons and particles and highlights issues that need to be addressed in order to further improve treatment outcomes. The opening chapters cover clinical and technical aspects of target volume definition using anatomic (computed tomography and magnetic resonance imaging; MRI) as well as functional (MRI and positron emission tomography) imaging. Up-to-date information is then provided on the full range of image-guided high-precision radiotherapy techniques, including IMRT/VMAT, stereotactic body radiation therapy, MR-guided linear accelerators, MR-guided brachytherapy, and particle therapy. The role of ultrasonography in image-guided radiotherapy is discussed, as are the available means for target volume demarcation and stabilization and adaptive radiation therapy. Finally, outcome evaluation is explored in depth, with a particular focus on the role of multimodality imaging in predicting tumor control and normal tissue toxicity. The authors are experts in different specialties and the book will be of high value for radiation oncologists, medical physicists, radiologists, nuclear medicine physicians, and radiation technicians. Principles of Radiation Therapy presents the applications, limitations, techniques, and results of treatment and possible complications of radiotherapy. This book discusses the general principles of the treatment. Organized into 15 chapters, this book begins with an overview of the aspects of the study of malignant disease and the experience needed by the radiotherapist to function fully as a clinical oncologist. This text then describes briefly the experiments and discoveries of Marie Curie and Wilhelm Konrad Roentgen. Other chapters consider the fundamental physical principles underlying the ... In this Handbook, a team of leading experts provide a comprehensive and up-to-date overview of the ever-changing field of radiation oncology. The publication is divided into three volumes, the first of which covers basics such as radiotherapy techniques, treatment documentation, clinical radiobiology, and patient management. In the second volume, all aspects of clinical radiation therapy are discussed in depth for the full range of tumor types. In order to ensure that the reader has a full understanding of cancer management in each scenario, information is also provided on diagnosis and classification, general management principles, the role of surgical and systemic therapy, and prognosis. The third volume focuses on medical physics, covering the mathematical and computer science background, biophysics, radiation physics, instrumentation, tracer kinetic modeling, pharmacokinetics and pharmacodynamics, radiation sources and detectors, biomedical engineering, imaging techniques, radiation treatment planning, and quality assurance. This book will be invaluable for all radiation oncologists. It is published as part of the SpringerReference program, which delivers access to living editions constantly updated through a dynamic peer-review publishing process. Radiation Oncology: Rationale, Technique, Results, by James D. Cox, MD and K. Kian Ang, MD, PhD, provides you with authoritative guidance on the latest methods for using radiotherapy to treat patients with cancer. Progressing from fundamental principles through specific treatment strategies for the cancers of each organ system, it also addresses the effects of radiation on normal structures and the avoidance of complications. This 9th edition covers the most recent indications and techniques in the field, including new developments in proton therapy and intensity-modulated radiotherapy (IMRT). It also features, for the first time, full-color images throughout the text to match those that you see in practice, and uses new color-coded treatment plans to make targets, structures, and doses easier to read at a glance. Evidence from randomized clinical trials is included whenever possible to validate clinical recommendations. 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Presents full-color images throughout to match the images that you see in practice. Extensive use of "combination" imaging presents a complete picture of how to more precisely locate and target the radiotherapy field. Breast cancer is the most common malignancy

among the female population. With advances in systemic therapies and modern radiotherapy techniques, breast cancer patients can have a long life-expectancy. However, it is crucial that radiation therapy is carried out with minimum complications and with the utmost efficiency. Principles and Practice of Modern Radiotherapy Techniques in Breast Cancer provides practical and current theoretical knowledge to the planning and implementation of breast cancer radiation therapy. All aspects of breast cancer are covered, including epidemiology, molecular and biological basis and integrating systemic therapies during all steps of treatment. The illustrated section of this book identifies anatomical structures in daily practice by presenting target and critical structures in actual treatment positions. These images show and mark the anatomical points of the patient lying in the position that breast radiation therapy would be performed. This text serves as a valuable resource for clinicians, residents and fellows practicing and learning breast cancer radiotherapy. With contributions by numerous experts This book is a comprehensive guide to the use of modern radiation therapy techniques for prostate cancer and other common and rare genitourinary malignancies. It will be an ideal resource for clinicians and trainees wishing to delve more deeply into the practical and technical aspects of radiotherapy for these malignancies and will serve to enhance day-to-day management in clinical practice. The first section is devoted to prostate cancer and includes coverage of low dose rate and high dose rate brachytherapy, conventionally fractionated, moderately hypofractionated, and ultra-hypofractionated external beam radiotherapy, and proton therapy. The second section focuses on radiotherapy considerations in relation to bladder cancer, testicular cancer, renal cell carcinoma, and rare malignancies such as penile cancer and urethral cancer. Radiotherapeutic treatment of patients with genitourinary malignancies now involves unprecedented precision and complexity, and this book will enable readers to exploit fully the exciting advances that have been achieved in recent years. This book summarizes the do’s and don’ts of managing a patient receiving radiotherapy or chemotherapy as well as how to manage common day to day situations that one comes across in radiation oncology practice. It aims to serve as a useful guide for students of radiation oncology for their practical exams and provides useful answers mostly to the why’s of the various steps of radiotherapy planning, prescribing, evaluation and treatment delivery. The intent of this book is to cover the various indications and techniques for taking a decision on the various practical aspects of radiotherapy planning and delivery and hopes to offer assistance to young radiation oncologists in handling cancer patients. This is a more practice oriented book and does not aim to cover the various sites, types and indications of radiotherapy as a whole. The purpose of radiation therapy is to use ionizing radiation, x, or gamma rays, to eradicate tumor cells, or more precisely to stop their growth without seriously damaging normal tissue. This is a difficult task since it is impossible to deliver dose solely to the target volume without affecting healthy tissues, especially when deep seated tumors are treated with external beams. In patients treated with conventional radiotherapy, the primary obstacles to achieving the maximum possible therapeutic advantage are the uncertainties in the true extent of the disease, inadequate knowledge of the exact shapes and locations of normal structures. So, the tumor dose often has to be maintained at sub-optimal levels to prevent unacceptable normal tissue complications which lead to a higher probability of local failures. Today, conformal radiotherapy is widely used in the management of cancers, especially brain tumors. Conformal radiotherapy is a new irradiation technique made possible by technological improvements, especially progress in imaging and 3D dosimetry by conforming the volume irradiated as closely as possible to the clinical anatomical target volume. Long established as a staple reference for all radiation oncologists, Radiotherapy for Head and Neck Cancers: Indications and Techniques is now in its Third Edition. This completely updated edition presents the state-of-the-art protocols currently used at the M.D. Anderson Cancer Center and thoroughly explains the principles, nomenclature, and clinical use of intensity-modulated radiotherapy (IMRT). New full-color illustrations have been added throughout the book. The first section discusses the practical aspects of external beam therapy, brachytherapy, and endocavitary beam therapy and offers guidelines on patient care before and during radiotherapy. The second section provides detailed coverage of site-specific indications and techniques. Successful clinical use of intensity-modulated radiation therapy (IMRT) represents a significant advance in radiation oncology. Because IMRT can deliver high-dose radiation to a target with a reduced dose to the surrounding organs, it can improve the local control rate and reduce toxicities associated with radiation therapy. Since IMRT began being used in the mid-1990s, a large volume of clinical evidence of the advantages of IMRT has been collected. However, treatment planning and quality assurance (QA) of IMRT are complicated and difficult for the clinician and the medical physicist. This book, by authors renowned for their expertise in their fields, provides cumulative clinical evidence and appropriate techniques for IMRT for the clinician and the physicist. Part I deals with the foundations and techniques, history, principles, QA, treatment planning, radiobiology and related aspects of IMRT. Part II covers clinical applications with several case studies, describing contouring and dose distribution with clinical results along with descriptions of indications and a review of clinical evidence for each tumor site. The information presented in this book serves as a valuable resource for the practicing clinician and physicist. A comprehensive source of authoritative information on ocular and adnexal radiation therapy This publication, a conjoint effort by ocular oncologists and radiation oncologists, comprises ten chapters covering basic and advanced radiation therapy techniques followed by specific indications by location (uveal, retinal, orbital tumors, eyelid and conjunctival tumors) and complications of radiation therapy. A chapter on investigational use of radiation therapy for age-related macular degeneration is also included. The contributions are illustrated by photographs, imaging studies, and detailed treatment plans to clearly convey the fundamental concepts. Additional tables, flow diagrams, graphs or charts support the understanding of the subject. To ocular oncologists, radiation physicists, radiation therapists, and radiation oncologists this volume is a comprehensive source of authoritative information on the subject of ocular and adnexal radiation therapy. This fully updated and enhanced third edition offers a highly practical, application-based review of the biological basis of radiation oncology and the clinical efficacy of radiation therapy. Revised edition of the classic reference in radiation oncology from Dr. C.C. Wang, whose practical approach to clinical application was legendary Includes the latest developments in the field: intensity modulated radiation therapy (IMRT), image guided radiation therapy, and particle beam therapy Includes two brand new chapters Palliative Radiotherapy, and Statistics in Radiation Oncology Features a vibrant and extremely comprehensive head and neck section Provides immediately applicable treatment algorithms for each tumor This evidence-based, state of the art guide to the management of urological malignancies, including bladder cancer, prostate cancer, and testicular cancer, is designed to serve as an easy-to-consult reference that will assist in daily decision making and the delivery of optimal care for individual patients within a multidisciplinary setting. Readers will find up-to-date information on patient selection and the full range of treatment modalities, including modern radiotherapy techniques, systemic chemotherapy, surgical procedures (including robotic surgery and other minimally invasive approaches), hormonal therapies, immunotherapy, and focal therapies. With regard to radiotherapy, the coverage encompasses everything from delineation of tumor volumes and organs at risk based on CT simulation through to delivery of stereotactic body radiotherapy, intensity-modulated radiation therapy, tomotherapy, volumetric modulated arc therapy, and proton therapy. The authors are leading authorities with international reputations who have been selected for their expertise in the topic that they address. The book will be of value for all practicing urooncologists as well as other oncology fellows and residents interested in urooncology. This book addresses the day-to-day treatment planning issues that radiation oncologists are likely to encounter during the treatment of breast cancer patients and provides numerous practical “tips” that will assist in navigation of the treatment planning process, from delineation of the tumor boundaries to discrimination of adjacent normal tissues and critical structures at risk of radiation injury. Differences in target delineation and treatment planning according to technique are emphasized, with coverage of conventional radiation therapy and advanced techniques including cardiac-sparing approaches, e.g., using active breathing control, intensity-modulated radiation therapy, proton beam therapy, and electron beam therapy post mastectomy. Individual chapters also focus on radiation setup and verification techniques and radiation treatment planning systems. The book, which is part of the Springer series Practical Guides in Radiation Oncology, is designed for hands-on use by radiation oncology residents/fellows in training and practicing radiation oncologists. Reflecting the increased importance of the collaborations between radiation oncology and informatics professionals, Informatics in Radiation Oncology discusses the benefits of applying informatics principles to the processes within radiotherapy. It explores how treatment and imaging information is represented, stored, and retrieved as well as how this information relates to other patient data. The book deepens your knowledge of current and emerging information technology and informatics principles applied to radiation oncology so that all the data gathered—from laboratory results to medical images—can be fully exploited to make treatments more effective and processes more efficient. After introducing the basics of informatics and its connection to radiation oncology, the book examines

the process of healthcare delivery in radiation oncology, the challenges of managing images in radiotherapy, and the burgeoning field of radiogenomics. It then presents teaching, clinical trials, and research tools and describes open access clinical imaging archives in radiotherapy, techniques for maximizing information from multimodality imaging, and the roles of images in treatment planning. It also looks at how informatics can improve treatment planning, the safety and efficiency of delivery systems, image-guided patient positioning, and patient assessment. The book concludes with discussions on how outcomes modeling evaluates the effectiveness of treatments, how quality control informatics improves the reliability of processes, and how to perform quality assurance on the informatics tools. With contributions from a host of top international experts in radiation oncology, medical physics, and informatics, this book leads the way in moving the field forward. It encourages you to find new ways of applying informatics to radiation oncology and help your patients in their fight against cancer. This book is a practical guide to the use of modern radiation therapy techniques in women with gynecological cancers. Step-by-step instruction is provided on simulation, contouring, and treatment planning and delivery for cancers of the cervix, endometrium, vagina, and vulva. Beyond external beam radiation delivery, full details are presented on three-dimensional brachytherapy at all sites for which it is applicable. Moreover, in-depth guidance is offered on the various advanced techniques of radiation delivery, including intensity-modulated radiation therapy, image guidance for external beam and brachytherapy, and stereotactic body radiotherapy. Radiation therapy is a critical component of the multidisciplinary management of gynecological tumors. With modern technology, both external beam radiation and brachytherapy can be delivered in a highly conformal way. This requires precise contouring and accurate planning techniques. In clearly describing the indications for and the delivery of quality radiation therapy for gynecological tumors, this book will benefit radiation oncologists, medical physicists, medical dosimetrists, radiation therapists, and radiotherapy residents. This book reviews the principles and applications of radiotherapy in the management of pediatric brain tumors to allow the reader to gain a full appreciation of the major aspects involved in caring for these patients. Individual sections are devoted to basic principles, specific management for the full range of tumor entities, radiotherapy techniques, and potential toxicities and their management. The book is written and edited by world leaders in pediatric radiotherapy, and care has been taken to cover the latest advances in diagnosis and radiotherapy techniques. Pediatric brain tumors represent a diverse group of neoplasms that require carefully planned management for successful definitive treatment. Radiotherapy is one of the fundamental components in treatment for the majority of these vulnerable patients. The optimal radiation therapy approach will depend on multiple factors, including tumor type and location, extent of disease, age of the patient, and other therapies. A thorough understanding of the natural history of the disease, communication with the multidisciplinary team, full knowledge of available radiotherapy techniques, and consideration of potential acute and late toxicities are therefore essential for each patient. Breast cancer is the most common malignancy among the female population. With advances in systemic therapies and modern radiotherapy techniques, breast cancer patients can have a long life-expectancy. However, it is crucial that radiation therapy is carried out with minimum complications and with the utmost efficiency. Principles and Practice of Modern Radiotherapy Techniques in Breast Cancer provides practical and current theoretical knowledge to the planning and implementation of breast cancer radiation therapy. All aspects of breast cancer are covered, including epidemiology, molecular and biological basis and integrating systemic therapies during all steps of treatment. The illustrated section of this book identifies anatomical structures in daily practice by presenting target and critical structures in actual treatment positions. These images show and mark the anatomical points of the patient lying in the position that breast radiation therapy would be performed. This text serves as a valuable resource for clinicians, residents and fellows practicing and learning breast cancer radiotherapy. This book is a practical, up-to-date guide to the treatment of patients with brain and spinal tumors. Leading experts in the field explain treatment techniques in detail, highlighting key considerations in the use of external beam radiation therapy, intensity-modulated radiation therapy, particle therapy, radiosurgery, and stereotactic body radiation therapy. Specific recommendations are described for different tumor types, and helpful information provided on other important issues, such as the interaction of radiotherapy and systemic therapy and the avoidance of treatment complications. With the development of modern technology, highly conformal radiotherapy techniques have become more complicated, yet also more widely employed. This book will equip readers with the knowledge required to set up practices to deliver quality brain and spinal radiation therapy appropriate to each patient. It will be of benefit to radiation oncologists, clinical oncologists, medical physicists, medical dosimetrists, radiation therapists, and senior nurses as well as medical oncologists and surgical oncologists with an interest in radiotherapy. This book offers a detailed examination of the technological basis of radiation therapy. It is jointly written by North American and European authors, which broadens the contents and increases the book’s applicability in daily practice throughout the world. The only comprehensive guide to the latest knowledge and techniques in brachytherapy Since the first edition was published in 2006, Phillip M. Devlinís Brachytherapy has been acknowledged as the essential book on the practice. Inthis updated new edition, all chapters covering cancer sites have been significantly revised. Organized for specialists in several fields, Brachytherapy contains site-specific chapters that discuss how the evolving role of advanced image guidance has demonstrated greater efficacy and less toxicity. Clinical vignettes with images now accompany all site-specific chapters. The chapter on prostate brachytherapy has been expanded to include other indications in the genitourinary system, and there are two entirely new chaptersóone chronicling the history of brachytherapy and the other detailing the emergence of skin brachytherapy. Dr. Devlin, a leading world authority on brachytherapy, has assembled other leaders in the field from world-renowned radiation oncology programs to enrichthis comprehensive text. From new data on medical outcomes to the costs and benefits of running a brachytherapy practice, Brachytherapy, Second Edition is the first and last word on what still is considered the most conformal radiotherapy technique in the field. In the new edition: Over 300 images accompany the chapter text and clinical vignettes Essential tables and spreadsheets enhance the chapter on running a brachytherapy practice Ten years of technological advancements are assimilated and reviewed in each site-specific chapter Includes access to the fully-searchable downloadable ebook From the Foreword: ìAs education is essential to advance awareness of and proficiency in the full spectrum of brachytherapy applications, the appearance of the second edition of this highly regarded text is both a timely and most welcome event. The distinguished list of contributors to this work reads like a veritable ìWhoís Whoî of international brachytherapy expertise making this an indispensable resource for students and practitioners of this complex and challenging modality[Ö]A particularly welcome feature is the clinical vignettes at the close of every chapter that bring seemingly remote concepts to life in real world practical applications[Ö]With the second edition of Brachytherapy: Applications and Techniques, Dr. Devlin and colleagues give us a text that instills a profound appreciation for the critical value of this essential modality. This book makes it clear that brachytherapy not only works, it is an irreplaceable component of contemporary cancer care.î --David Wazer, MD, FACRO, FACR, FASTRO, Professor and Chairman, Departments of Radiation Oncology, Alpert Medical School of Brown University, Providence, RI This evidence-based guide on the use of radiotherapy in patients with common malignancies of the lung, esophagus, and thymus will help radiation oncologists to deliver optimal care within a multidisciplinary setting. Detailed information is provided on all aspects, from delineation of tumor volumes and organs at risk based on four-dimensional CT simulation through to the various advanced radiotherapy techniques, including stereotactic ablative radiotherapy (SABR), intensity-modulated radiation therapy (IMRT), tomotherapy, volumetric modulated arc therapy (VMAT), and proton therapy. Contouring, treatment planning, and treatment delivery are documented in a range of everyday cases, with illustrations of slice-by-slice delineations on planning CT images and finalized treatment plans based on detailed acceptance criteria. Numerous practical tips are highlighted, and relevant information is included on surgical techniques and systemic therapies. The book will facilitate decision making in the management of patients with common thoracic malignancies and assist in overcoming the challenges encountered in daily clinical practice. This practical guide to the use of radiotherapy for the treatment of sarcomas and skin cancers covers a wide range of disease scenarios, identifying which treatment techniques are applicable in particular clinical circumstances. Among the conditions considered are extremity soft tissue sarcomas, retroperitoneal soft tissue sarcomas, bone sarcomas, uterine sarcomas, chordomas, pediatric sarcomas, squamous cell carcinomas, basal cell carcinomas, melanomas, Merkel cell carcinomas, and cutaneous lymphomas. Detailed attention is devoted to the issues and considerations of relevance in everyday practice when treating these diseases. The use of multiple radiotherapy techniques and procedures, including IMRT, brachytherapy, radiosurgery, and particle therapy, is fully explained, and the role of radiotherapy in combination with chemotherapy and emerging therapeutics such as immunotherapy and biologic anticancer agents is also addressed. The book will be of high value for

practicing radiation oncologists, medical and surgical oncologists, medical physicists, medical dosimetrists, trainees, and other medical professionals. - Summarizes the state of the art in the most relevant areas of medical physics and engineering applied to radiation oncology - Covers all relevant areas of the subject in detail, including 3D imaging and image processing, 3D treatment planning, modern treatment techniques, patient positioning, and aspects of verification and quality assurance - Conveys information in a readily understandable way that will appeal to professionals and students with a medical background as well as to newcomers to radiation oncology from the field of physics For physicians, particularly oncologists, and for specialists involved with the equipment or procedures of nuclear medicine, describes the use of large nuclear installations to treat cancer. Reviews the results obtained with neutrons produced by accelerators of different energies; details the use of nuclear reactors for Boron Neutron Capture Therapy, emphasizing the collaboration between disciplines; surveys the experience of medium- and high- energy accelerators in various laboratories; and the assesses the advantages of Synchrotron light emitted from large electron storage rings in both diagnosis and therapy. No index. Annotation copyright by Book News, Inc., Portland, OR External-beam radiotherapy has long been challenged by the simple fact that patients can (and do) move during the delivery of radiation. Recent advances in imaging and beam delivery technologies have made the solution—adapting delivery to natural movement—a practical reality. Adaptive Motion Compensation in Radiotherapy provides the first detailed treatment of online interventional techniques for motion compensation radiotherapy. This authoritative book discusses: Each of the contributing elements of a motion-adaptive system, including target detection and tracking, beam adaptation, and patient realignment Treatment planning issues that arise when the patient and internal target are mobile Integrated motion-adaptive systems in clinical use or at advanced stages of development System control functions essential to any therapy device operating in a near-autonomous manner with limited human interaction Necessary motion-detection methodology, repositioning techniques, and approaches to interpreting and responding to target movement data in real time Medical therapy with external beams of radiation began as a two-dimensional technology in a three-dimensional world. However, in all but a limited number of scenarios, movement introduces the fourth dimension of time to the treatment problem. Motion-adaptive radiation therapy represents a truly four-dimensional solution to an inherently four-dimensional problem. From these chapters, readers will gain not only an understanding of the technical aspects and capabilities of motion adaptation but also practical clinical insights into planning and carrying out various types of motion-adaptive radiotherapy treatment. Image-guided radiotherapy (IGRT) is a new radiotherapy technology that combines the rapid dose fall off associated with intensity-modulated radiotherapy (IMRT) and daily tumor imaging allowing for high precision tumor dose delivery and effective sparing of surrounding normal organs. The new radiation technology requires close collaboration between radiologists, nuclear medicine specialists, and radiation oncologists to avoid marginal miss. Modern diagnostic imaging such as positron emission tomography (PET) scans, positron emission tomography with Computed Tomograpgy (PET-CT), and magnetic resonance imaging (MRI) allows the radiation oncologist to target the positive tumor with high accuracy. As the tumor is well visualized during radiation treatment, the margins required to avoid geographic miss can be safely reduced , thus sparing the normal organs from excessive radiation. When the tumor is located close to critical radiosensitive structures such as the spinal cord, IGRT can deliver a high dose of radiation to the tumor and simultaneously decreasing treatment toxicity, thus potentially improving cure rates and patient quality of life. During radiotherapy, tumor shrinkage and changes of normal tissues/volumes can be detected daily with IGRT. The volume changes in the target volumes and organs at risk often lead to increased radiation dose to the normal tissues and if left uncorrected may result in late complications. Adaptive radiotherapy with re-planning during the course of radiotherapy is therefore another advantage of IGRT over the conventional radiotherapy techniques. This new technology of radiotherapy delivery provides the radiation oncologist an effective tool to improve patient quality of life. In the future, radiation dose-escalation to the residual tumor may potentially improve survival rates. Because the treatment complexity, a great deal of work is required from the dosimetry staff and physicists to ensure quality of care. Preliminary clinical results with IGRT are encouraging but more prospective studies should be performed in the future to assess the effectiveness of IGRT in improving patient quality of life and local control. In this Frontiers Research Topic, we encourage submission of original papers and reviews dealing with imaging for radiotherapy planning, the physics and dosimetry associated with IGRT, as well as the clinical outcomes for cancer treatment with IGRT for all tumor sites. About ten years after the first edition comes this second edition of Monte Carlo Techniques in Radiation Therapy: Introduction, Source Modelling, and Patient Dose Calculations, thoroughly updated and extended with the latest topics, edited by Frank Verhaegen and Joao Seco. This book aims to provide a brief introduction to the history and basics of Monte Carlo simulation, but again has a strong focus on applications in radiotherapy. Since the first edition, Monte Carlo simulation has found many new applications, which are included in detail. The applications sections in this book cover the following: Modelling transport of photons, electrons, protons, and ions Modelling radiation sources for external beam radiotherapy Modelling radiation sources for brachytherapy Design of radiation sources Modelling dynamic beam delivery Patient dose calculations in external beam radiotherapy Patient dose calculations in brachytherapy Use of artificial intelligence in Monte Carlo simulations This book is intended for both students and professionals, both novice and experienced, in medical radiotherapy physics. It combines overviews of development, methods, and references to facilitate Monte Carlo studies. The Physics of Conformal Radiotherapy: Advances in Technology provides a thorough overview of conformal radiotherapy and biological modeling, focusing on the underlying physics and methodology of three-dimensional techniques in radiation therapy. This carefully written, authoritative account evaluates three-dimensional treatment planning, optimization, photon multileaf collimation, proton therapy, transit dosimetry, intensity-modulation techniques, and biological modeling. It is an invaluable teaching guide and reference for all medical physicists and radiation oncologists/therapists that use conformal radiotherapy. Cancer is a dreadful disease characterized by out-of-control cell growth. The cancer harms the human body when damaged cells divide uncontrollably to form lumps or masses of tissue called tumors. Radiotherapy (RT) is one of the major modalities of cancer treatment and every alternate cancer patient will require radiation during the course of treatment. Over the years, RT has progressed considerably towards this goal by the development of three dimensional (3D) conformal radiation therapy techniques such as IMRT, Stereotactic Radiosurgery and Radiotherapy (SRS/SRT), Brachytherapy and etc. These techniques are becoming standards of practice benefiting a significant proportion of patients. Therefore the verification of the actual dose delivery is vital to the effective delivery of conformal RT. Conventional dosimeters such as, ion chambers, thermoluminescent dosimeters (TLDs) and radiographic film are only 1 and 2-D dosimeters, and therefore are limited in their ability to integrate radiation dose over 3-D volumes. Gel dosimetry is the only 3-D dosimetric technique which is capable of recording and integrating complex 3-D dose distributions and offers comprehensive verification. Breast cancer is the most common malignancy among the female population. 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This text serves as a valuable resource for clinicians, residents and fellows practicing and learning breast cancer radiotherapy. Modern cancer treatment relies on Monte Carlo simulations to help radiotherapists and clinical physicists better understand and compute radiation dose from imaging devices as well as exploit four-dimensional imaging data. With Monte Carlo-based treatment planning tools now available from commercial vendors, a complete transition to Monte Carlo-base Thoroughly updated throughout, this second edition of Monte Carlo Techniques in Radiation Therapy: Applications to Dosimetry, Imaging, and Preclinical Radiotherapy, edited by Joao Seco and Frank Verhaegen, explores the use of Monte Carlo methods for modelling various features of internal and external radiation sources. Monte Carlo methods have been heavily used in the field of radiation therapy in applications such as dosimetry, imaging, radiation chemistry, modelling of small animal irradiation units, etc. The aim of this book is to provide a compendium of the Monte Carlo methods that are commonly used in radiation therapy applications, which will allow students, postdoctoral fellows, and university professors to learn and teach Monte Carlo techniques. This book provides concise but detailed information about many Monte Carlo applications that cannot be found in any other didactic or scientific book.

This second edition contains many new chapters on topics such as: Monte Carlo studies of prompt gamma emission Developments in proton imaging Monte Carlo for cone beam CT imaging Monte Carlo modelling of proton beams for small animal irradiation Monte Carlo studies of microbeam radiation therapy Monte Carlo in micro- and nano-dosimetry GPU-based fast Monte Carlo simulations for radiotherapy This book is primarily aimed at students and scientists wishing to learn and improve their knowledge of Monte Carlo methods in radiation therapy.

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