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Stereotactic Radiosurgery and Stereotactic Body Radiation Therapy

Stereotactic Body Radiation Therapy

Exploring RayStation Treatment Planning System

On-treatment verification imaging has developed rapidly in recent years and is now at the heart of image-guided radiation therapy (IGRT) and all aspects of radiotherapy planning and treatment delivery. This is the first book dedicated to just this important topic, which is written in an accessible manner for undergraduate and graduate therapeutic radiography (radiation therapist) students and trainee medical physicists and clinicians. The later sections of the book will also help established medical physicists, therapeutic radiographers, and radiation therapists familiarise themselves with developing

and cutting-edge techniques in IGRT. Features: Clinically focused and internationally applicable; covering a wide range of topics related to on-treatment verification imaging for the study of IGRT Accompanied by a library of electronic teaching and assessment resources for further learning and understanding Authored by experts in the field with over 18 years' experience of pioneering the original forms of on-treatment verification imaging in radiotherapy (electronic portal imaging) in clinical practice, as well as substantial experience of teaching the techniques to trainees

Quality and Safety in Radiotherapy

This book provides a radiotherapy perspective on the management of brain metastases with case-based discussion. This management has been rapidly evolving in the face of changing technology, progressing systemic therapy, and paradigm changes that all impact practice. These changes can be difficult, and this text gives a practical approach to help practitioners and trainees understand these changes and incorporate them into their practices. The work has two main sections: Clinical and Technical. The clinical section has chapters that address all aspects of radiation therapy for brain metastases, including integrating advances in surgery and drug treatments. The technical section focuses on the "how to" aspects of treatment, including treatment planning and delivery. This is an ideal guide for practicing radiation oncologists and trainees.

Practical Radiation Oncology

Dr. Van Dam is an internationally recognized leader in gastroenterology and has been a leader in advances in interventional endoscopy. He brings this expertise to the topic of management of benign and malignant pancreatic disease and has selected top experts in the field to provide state-of-the-art clinical information to gastroenterologists. The modern management treatise of each article addresses current diagnostics as well as medical management. Seven articles are devoted to pancreatic cancer and span medical management, surgical management, radiologic imaging, endoscopic diagnosis, palliation, and screening. Other important topics addressed are pancreatic transplantation, pancreatic cystic neoplasms, acute and chronic pancreatitis, and autoimmune pancreatitis.

The Duke Glioma Handbook

This book provides the reader with a detailed update on the use of stereotactic radiosurgery (SRS) in patients with lesions of the brain and other parts of the body. The aim is not simply to explain the application of SRS and document its value with reference to the author's own clinical experiences and other published evidence, but also to contextualize the technology within a new strategic concept of cancer care. When embedded within an appropriate conceptual framework, technology

becomes pivotal in changing therapeutic strategies. A new paradigm that is increasingly impacting on clinical practice is the oligometastatic state, on the basis that long-term survival might be achieved in patients with a low volume and number of metastatic lesions. This book accordingly addresses the value of SRS in patients with oligometastases of solid tumors to the brain, lung, spine, and liver. In addition, it examines the use of SRS in patients with diverse brain lesions, early-stage stage lung cancer, liver cancer, and early-stage prostate cancer. Readers will be persuaded that SRS, using cutting-edge imaging technologies to deliver precisely targeted radiation therapy, represents an exciting non-invasive procedure that holds great promise for the present and the future of cancer care.

CyberKnife NeuroRadiosurgery

Radiotherapy of Prostate Cancer aims to guide the reader through the recent data from clinical trials, to highlight the various approaches and to clarify the role of traditional radiation therapy in the management of the disease. It details established management protocols as well as more controversial issues and experimental approaches ranging from external beam radiotherapy, 3-dimensional conformal radiotherapy, heavy particle therapy and brachytherapy. The reader will not only gain a vast amount of knowledge regarding the many modes of currently available radiotherapy strategies for this disease, but will also gain a clearer perspective of the indications of a particular modality's use and how best to integrate therapy for the individual patient.

Design and Shielding of Radiotherapy Treatment Facilities

Surface Guided Radiation Therapy provides a comprehensive overview of optical surface image guidance systems for radiation therapy. It serves as an introductory teaching resource for students and trainees, and a valuable reference for medical physicists, physicians, radiation therapists, and administrators who wish to incorporate surface guided radiation therapy (SGRT) into their clinical practice. This is the first book dedicated to the principles and practice of SGRT, featuring: Chapters authored by an internationally represented list of physicists, radiation oncologists and therapists, edited by pioneers and experts in SGRT Covering the evolution of localization systems and their role in quality and safety, current SGRT systems, practical guides to commissioning and quality assurance, clinical applications by anatomic site, and emerging topics including skin mark-less setups. Several dedicated chapters on SGRT for intracranial radiosurgery and breast, covering technical aspects, risk assessment and outcomes. Jeremy Hoisak, PhD, DABR is an Assistant Professor in the Department of Radiation Medicine and Applied Sciences at the University of California, San Diego. Dr. Hoisak's clinical expertise includes radiosurgery and respiratory motion management. Adam Paxton, PhD, DABR is an Assistant Professor in the Department of Radiation Oncology at the University of Utah. Dr. Paxton's clinical expertise includes patient safety, motion management, radiosurgery, and proton therapy. Benjamin Waghorn, PhD, DABR is the Director of Clinical Physics at

Vision RT. Dr. Waghorn's research interests include intensity modulated radiation therapy, motion management, and surface image guidance systems. Todd Pawlicki, PhD, DABR, FAAPM, FASTRO, is Professor and Vice-Chair for Medical Physics in the Department of Radiation Medicine and Applied Sciences at the University of California, San Diego. Dr. Pawlicki has published extensively on quality and safety in radiation therapy. He has served on the Board of Directors for the American Society for Radiology Oncology (ASTRO) and the American Association of Physicists in Medicine (AAPM).

Stereotactic Radiosurgery and Stereotactic Body Radiation Therapy (SBRT)

Expand your understanding of the physics and practical clinical applications of advanced radiation therapy technologies with Khan's *The Physics of Radiation Therapy*, 5th edition, the book that set the standard in the field. This classic full-color text helps the entire radiation therapy team—radiation oncologists, medical physicists, dosimetrists, and radiation therapists—develop a thorough understanding of 3D conformal radiotherapy (3D-CRT), stereotactic radiosurgery (SRS), high dose-rate remote afterloaders (HDR), intensity modulated radiation therapy (IMRT), image-guided radiation therapy (IGRT), Volumetric Modulated Arc Therapy (VMAT), and proton beam therapy, as well as the physical concepts underlying treatment planning, treatment delivery, and dosimetry. In preparing this new Fifth Edition, Dr. Kahn and new co-author Dr. John Gibbons made chapter-by-chapter revisions in the light of the latest developments in the field, adding new discussions, a new chapter, and new color illustrations throughout. Now even more precise and relevant, this edition is ideal as a reference book for practitioners, a textbook for students, and a constant companion for those preparing for their board exams. Features Stay on top of the latest advances in the field with new sections and/or discussions of Image Guided Radiation Therapy (IGRT), Volumetric Modulated Arc Therapy (VMAT), and the Failure Mode Event Analysis (FMEA) approach to quality assurance. Deepen your knowledge of Stereotactic Body Radiotherapy (SBRT) through a completely new chapter that covers SBRT in greater detail. Expand your visual understanding with new full color illustrations that reflect current practice and depict new procedures. Access the authoritative information you need fast through the new companion website which features fully searchable text and an image bank for greater convenience in studying and teaching. This is the tablet version which does not include access to the supplemental content mentioned in the text.

Principles and Practice of Image-Guided Radiation Therapy of Lung Cancer

This book is a comprehensive review of stereotactic radiosurgery (SRS) and stereotactic body radiation therapy (SBRT): its physics, clinical evidence, indications, and future directions. The utilization of stereotactic radiosurgery (SRS) and stereotactic body radiation therapy (SBRT) is increasing internationally because of several factors. First, it offers patients a local treatment option that has demonstrated effectiveness similar to traditional surgery without the morbidity of general anesthesia and open surgical resection. Second, recent advancements in the quality of scientific evidence supporting a SRS

or SBRT-containing approach in patients continues to evolve and demonstrate favorable disease-specific outcomes with little, if any, toxicity in various anatomic disease sites and for various conditions including cancer, benign tumors, and other psychiatric and neurologic conditions. Third, and most provocatively, is the notion that definitive local therapy (i.e. SRS or SBRT) in patients with cancer can boost the immune system to fight cancer in other sites throughout the body. While traditional medical knowledge would suggest that all patients with metastatic cancer are incurable, there is a mounting body of evidence that there is a subset of these patients that can be cured with definitive SRS or SBRT. This volume thus delves into each of these benefits and aspects of treatment, guiding physicians to the best treatment plan for their patients. Expert, international authors provide guidelines for SRS and SBRT use by clinicians. Chapters are divided into six main sections: Radiobiology of Radiosurgery and Stereotactic Body Radiation Therapy, Intracranial Radiosurgery Technique, Intracranial Radiosurgery by Indication, Stereotactic Body Radiation Therapy Technique, Stereotactic Body Radiation Therapy by Indication, The Future of Radiosurgery and SBRT. Overall physics are explained, as well as specific considerations for particular surgical tools (including the Leksell Gamma Knife and Accuray CyberKnife), techniques (including fractionated and charged particle radiosurgery), and anatomic sites (including brain metastases, pituitary tumors, and the prostate). Detailed images and charts enhance the chapters. This book provides physicians with a single, practical resource incorporating both of these broad categories of treatment, SRS and SBRT, and better defines the current role and the direction of radiosurgery.

Image-Guided and Adaptive Radiation Therapy

Written by internationally known experts in the field, Stereotactic Radiosurgery and Stereotactic Body Radiation Therapy examines one of the fastest-developing subspecialties within radiation oncology. These procedures deliver large doses of radiation in one to five sessions to a precisely determined target. Often these techniques have proven to be as or more effective than traditional radiation therapy techniques, while at the same time being cost-efficient and convenient for the patient. These techniques, however, require careful planning, specialized equipment, and well-trained staff. This volume provides a cutting-edge look at the biological and technical underpinnings of SRS and SBRT techniques. It includes a history of the development of SRS and SBRT; clinical applications of the techniques; dedicated devices for delivering precisely shaped, high doses of radiation; use of in-room imaging for treatment planning and treatment guidance; immobilization techniques for accurate targeting; and future developments that will continue to evolve and refine existing techniques. A valuable introduction to those just learning about these specialized techniques, and an ideal reference for those who are already implementing them, this book covers a wide variety of topics, with clear discussions of each aspect of the technology employed.

ICRU Report

This book gives a comprehensive overview on the use of image-guided radiation therapy (IGRT) in the treatment of lung cancer, covering step-by-step guidelines for clinical implementations, fundamental principles and key technical advances. It covers benefits and limitations of techniques as well as quality and safety issues related to IGRT practice. Addresses imaging simulation, treatment planning, verification, and delivery Discusses important quality assurance issues Describes current methods using specialized machines and technologies Jing Cai, PhD, is an Associate Professor of Radiation Oncology at Duke University Medical Center. Joe Y. Chang, MD, PhD, is Professor in the Department of Radiation Oncology at The University of Texas MD Anderson Cancer Center in Houston. Fang-Fang Yin, PhD, is Chief of the Division of Radiation Physics, Professor of Radiation Oncology, and Director of the Medical Physics program at Duke University.

RF Linear Accelerators

Precision Radiation Oncology

This Code of Practice, which has also been endorsed by WHO, PAHO and ESTRO, fulfils the need for a systematic and internationally unified approach to the calibration of ionization chambers in terms of absorbed dose to water and to the use of these detectors in determining the absorbed dose to water for the radiation beams used in radiotherapy. It provides a methodology for the determination of absorbed dose to water in the low, medium and high energy photon beams, electron beams, proton beams and heavy ion beams used for external radiation therapy.

Stereotactic Radiosurgery for Prostate Cancer

This book concisely reviews important advances in radiation oncology, providing practicing radiation oncologists with a fundamental understanding of each topic and an appreciation of its significance for the future of radiation oncology. It explores in detail the impact of newer imaging modalities, such as multiparametric magnetic resonance imaging (MRI) and positron emission tomography (PET) using fluorodeoxyglucose (FDG) and other novel agents, which deliver improved visualization of the physiologic and phenotypic features of a given cancer, helping oncologists to provide more targeted radiotherapy and assess the response. Due consideration is also given to how advanced technologies for radiation therapy delivery have created new treatment options for patients with localized and metastatic disease, highlighting the increasingly important role of image-guided radiotherapy in treating systemic and oligometastatic disease. Further topics include the potential value of radiotherapy in enhancing immunotherapy thanks to the broader immune-stimulatory effects, how cancer stem cells and the tumor microenvironment influence response, and the application of mathematical and systems biology methods to radiotherapy.

Adaptive Radiation Therapy

Modern medical imaging and radiation therapy technologies are so complex and computer driven that it is difficult for physicians and technologists to know exactly what is happening at the point-of-care. Medical physicists responsible for filling this gap in knowledge must stay abreast of the latest advances at the intersection of medical imaging and radiation therapy. This book provides medical physicists and radiation oncologists current and relevant information on Adaptive Radiation Therapy (ART), a state-of-the-art approach that uses a feedback process to account for patient-specific anatomic and/or biological changes, thus delivering highly individualized radiation therapy for cancer patients. The book should also benefit medical dosimetrists and radiation therapists. Adaptive Radiation Therapy describes technological and methodological advances in the field of ART, as well as initial clinical experiences using ART for selected anatomic sites. Divided into three sections (radiobiological basis, current technologies, and clinical applications), the book covers: Morphological and biological biomarkers for patient-specific planning Design and optimization of treatment plans Delivery of IMRT and IGRT intervention methodologies of ART Management of intrafraction variations, particularly with respiratory motion Quality assurance needed to ensure the safe delivery of ART ART applications in several common cancer types / anatomic sites The technology and methodology for ART have advanced significantly in the last few years and accumulated clinical data have demonstrated the need for ART in clinical settings, assisted by the wide application of intensity modulated radiation therapy (IMRT) and image-guided radiation therapy (IGRT). This book shows the real potential for supplying every patient with individualized radiation therapy that is maximally accurate and precise.

Central Nervous System Metastases

This book addresses the most relevant aspects of radiation oncology in terms of technical integrity, dose parameters, machine and software specifications, as well as regulatory requirements. Radiation oncology is a unique field that combines physics and biology. As a result, it has not only a clinical aspect, but also a physics aspect and biology aspect, all three of which are inter-related and critical to optimal radiation treatment planning. In addition, radiation oncology involves a host of machines/software. One needs to have a firm command of these machines and their specifications to deliver comprehensive treatment. However, this information is not readily available, which poses serious challenges for students learning the planning aspect of radiation therapy. In response, this book compiles these relevant aspects in a single source. Radiation oncology is a dynamic field, and is continuously evolving. However, tracking down the latest findings is both difficult and time-consuming. Consequently, the book also comprehensively covers the most important trials. Offering an essential ready reference work, it represents a value asset for all radiation oncology practitioners, trainees and students.

Wiley Encyclopedia of Clinical Trials

The main result of this thesis is a software system, called PRIMO, which simulates clinical linear accelerators and the subsequent dose distributions using the Monte Carlo method. PRIMO has the following features: (i) it is self-contained, that is, it does not require additional software libraries or coding; (ii) it includes a geometry library with most Varian and Elekta linacs; (iii) it is based on the general-purpose Monte Carlo code PENELOPE; (iv) it provides a suite of variance-reduction techniques and distributed parallel computing to enhance the simulation efficiency; (v) it is graphical user interfaced; and (vi) it is freely distributed through the website <http://www.primoproject.net>. In order to endow PRIMO with these features the following tasks were conducted: - PRIMO was conceived with a layered structure. The topmost layer, named the GLASS, was developed in this thesis. The GLASS implements the GUI, drives all the functions of the system and performs the analysis of results. Lower layers generate geometry files, provide input data and execute the Monte Carlo simulation. - The geometry of Elekta linacs from series SU and MLCi were coded in the PRIMO system. - A geometrical model of the Varian True Beam linear accelerator was developed and validated. This model was created to surmount the limitations of the Varian distributed phase-space files and the absence of released information about the actual geometry of that machine. This geometry model was incorporated into PRIMO. - Two new variance-reduction techniques, named splitting roulette and selective splitting, were developed and validated. In a test made with an Elekta linac it was found that when both techniques are used in conjunction the simulation efficiency improves by a factor of up to 45. - A method to automatically distribute the simulation among the available CPU cores of a computer was implemented. The following investigations were done using PRIMO as a research tool : - The configuration of the condensed history transport algorithm for charged particles in PENELOPE was optimized for linac simulation. Dose distributions in the patient were found to be particularly sensitive to the values of the transport parameters in the linac target. Use of inadequate values of these parameters may lead to an incorrect determination of the initial beam configuration or to biased dose distributions. - PRIMO was used to simulate phase-space files distributed by Varian for the True Beam linac. The results were compared with experimental data provided by five European radiotherapycenters. It was concluded that the latent variance and the accuracy of the phase-space files were adequate for the routine clinical practice. However, for research purposes where low statistical uncertainties are required the phase-space files are not large enough. To the best of our knowledge PRIMO is the only fully Monte Carlo-based linac and dose simulation system , addressed to research and dose verification, that does not require coding tasks from end users and is publicly available.

Stereotactic Radiosurgery and Stereotactic Body Radiation Therapy

Usability Testing of Medical Devices covers the nitty-gritty of usability test planning, conducting, and results reporting. The book also discusses the government regulations and industry standards that motivate many medical device manufacturers to conduct usability tests. Since publication of the first edition, the FDA and other regulatory groups h

Dosimetric Evaluation and Verification of Respiratory Motion Management System in Radiation Oncology

Provides a summary of glioma biology, genetics and management, based on the world-leading Duke University Preston Robert Tisch Brain Tumor Center program.

Automation of the Monte Carlo Simulation of Medical Linear Accelerators

Radiotherapy plays a key role in the treatment of many cancer types. This book is intended to bring forward the recent advancements in the field of radiation oncology. It presents the experience of several researchers who dedicate many hours a day to not only treat patients but also assess the physical aspects of newer radiotherapy facilities. This book contains many valuable contributions from radiation oncology physicians and medical physicists who are experts in their fields.

Radiotherapy

Stereotactic body radiation therapy (SBRT) has emerged as an important innovative treatment for various primary and metastatic cancers. This book provides a comprehensive and up-to-date account of the physical/technological, biological, and clinical aspects of SBRT. It will serve as a detailed resource for this rapidly developing treatment modality. The organ sites covered include lung, liver, spine, pancreas, prostate, adrenal, head and neck, and female reproductive tract. Retrospective studies and prospective clinical trials on SBRT for various organ sites from around the world are examined, and toxicities and normal tissue constraints are discussed. This book features unique insights from world-renowned experts in SBRT from North America, Asia, and Europe. It will be necessary reading for radiation oncologists, radiation oncology residents and fellows, medical physicists, medical physics residents, medical oncologists, surgical oncologists, and cancer scientists.

Practical Radiation Oncology Physics

The first text to focus solely on quality and safety in radiotherapy, this work encompasses not only traditional, more technically oriented, quality assurance activities, but also general approaches of quality and safety. It includes contributions from experts both inside and outside the field to present a global view. The task of assuring quality is no longer viewed solely as a technical, equipment-dependent endeavor. Instead, it is now recognized as depending on both the processes and the people delivering the service. Divided into seven broad categories, the text covers: Quality Management and Improvement includes discussions about lean thinking, process control, and access to services. Patient Safety and

Managing Error looks at reactive and prospective error management techniques. Methods to Assure and Improve Quality deals broadly with techniques to monitor, assure, and improve quality. People and Quality focuses on human factors, changing roles, staffing, and training. Quality Assurance in Radiotherapy addresses the general issues of quality assurance with descriptions of the key systems used to plan and treat patients and includes specific recommendations on the types and frequencies of certain tests. Quality Control: Equipment and Quality Control: Patient-Specific provides explicit details of quality control relating to equipment and patient-specific issues. Recently, a transformation of quality and safety in radiotherapy has begun to take place. Among the key drivers of this transformation have been new industrial and systems engineering approaches that have come to the forefront in recent years following revelations of system failures. This book provides an approach to quality that is long needed, one that deals with both human and technical aspects that must be the part of any overall quality improvement program.

Absorbed Dose Determination in External Beam Radiotherapy

Organized to serve as a ready reference, this book covers the design & principles of operation of microwave electron linear accelerators for the radiation treatment of cancer. Designed for use by persons without extensive knowledge & experience of accelerator technology, the book assumes a knowledge of elementary physics & mathematics & places its emphasis on how accelerators actually function & how they are used in cancer treatment. Coverage includes the history of development & application, general theory of acceleration, accelerator systems, radiation beam systems & associated equipment, performance characteristics, testing & use. The major modules of a representative medical accelerator are described, including principles of operation & how these models function collectively to produce electron & X-ray beams for radiotherapy.

Surface Guided Radiation Therapy

Respiratory caused intra-fraction motion is an important factor that can affect radiation treatment accuracy. Although the major effect of respiratory motion is in lung tumors, other tumor sites in thoracic and abdomen such as esophagus and liver cancer can also move significantly depending on patient's geometry. This thesis explains dosimetric discrepancy caused by respiratory motion during radiotherapy, describes different types of respiratory management system, and specifically discusses the clinical implementation of respiratory gating system including Varian RPM system commissioning, machine quality assurance, patient specific quality assurance, and dosimetric evaluation of gating Intensity Modulated Radiation Therapy (IMRT) treatment. In order to verify gated treatment plan, dynamic quality assurance phantoms have been developed to simulate patient's specific respiratory motion modifying traditional quality assurance devices. A Quasar respiratory motion phantom has been used to commission the Varian RPM system on CT simulator, Edge linear accelerator,

and TrueBeam linear accelerator.

On-Treatment Verification Imaging

"Kavanaugh (radiation oncology, University of Colorado Comprehensive Cancer Center) and Timmerman (image guided stereotactic radiation therapeutics, University of Texas Southwestern Medical Center) demonstrate the power of stereotactic body radiation therapy (SBRT) as a weapon in the cancer-fighting arsenal, and give advice on building a clinical SBRT program. Intended as a primer for radiation oncologists, physicists, radiobiologists, dosimetrists, and other members of the cancer team, and the book covers the radiobiology, physics, and dosimetry of SBRT, and gives practical details on procedures for specific conditions. B&w photos and medical images are included. Annotation: 2004 Book News, Inc., Portland, OR (booknews.com)"--[source inconnue].

Radiological Safety Aspects of the Operation of Electron Linear Accelerators

RayStation, a new treatment planning system (TPS), was purchased and recently commissioned for clinical use by the institution. As part of the commissioning process, an accurate model of the TrueBeam linear accelerator was made prior to clinical acceptances. Data collection, importing measurements, beam modeling, point dose verifications and clinical plan comparisons are procedures that must be done in order to complete the commissioning of photon and electron energies. During the beam modeling process, various parameters were modified to achieve close matches between the computed and measured PDD curves, as well as measured and computed beam profiles. The tolerance objectives were to have computed data deviating from the measured data within the 2% in fall-off regions, 3% tolerance within in-field and out-of-field regions, and 10% tolerance in build-up regions and penumbra regions [1] . The dosimetric validation procedure followed. Point dose measurements were completed using both the ArcCHECK phantom and the water tank. The majority of the results met the set criteria except for some measurements blocked by MLC leaves or jaws when taken adjacent to the edge of fields. To further confirm the goodness of modeled beams, clinical treatment plans developed with the previously clinically commissioned Pinnacle TPS and imported into the RayStation TPS to generate new plans with same beam arrangements and control points and used as comparisons. After clinical commissioning was completed for RayStation software, a feasibility of using FFF beams to deliver identical or superior beam profile provided by conventional flattened beams of the same energy was investigated. The objective of this research was to show that through sliding window treatment planning, one can create optimized plans and hence no longer the technology of flattening filter is required in modern linear accelerators. To explore this topic, a two stage analysis was carried out. First, delivering doses in a water cube with 10×10 to 30×30 cm² open-field 6 MV flattened beams and also create 0.1cm thick square plane structures to be used when undergo the optimization process with 6 FFF beams. Then scaling doses to prescribe 100 cGy at the center of

the plane for comparison purpose. The overall uniformity of line profile for FFF beams across the CAX at 10 cm depth showed 1% to 2% superior to flattened beams. For the clinical treatment plans comparison, ten patients were selected with five head and neck cancer plans as well as five lung and mediastinum cancer plans. Original plans were all completed with 6 MV flattened beams and approved by radiation oncologists. New plans were accomplished with 6 FFF beams and same coverages of PTVs were achieved. Most of average mean doses to critical structures and normal tissue volumes receiving 5%, 10%, 20% and 30% of the prescription dose were reduced with FFF plans with slightly increased average max doses.

Accelerator Physics

Perfect for radiation oncologists, medical physicists, and residents in both fields, Practical Radiation Oncology Physics provides a concise and practical summary of the current practice standards in therapeutic medical physics. A companion to the fourth edition of Clinical Radiation Oncology, by Drs. Leonard Gunderson and Joel Tepper, this indispensable guide helps you ensure a current, state-of-the art clinical practice. Covers key topics such as relative and in-vivo dosimetry, imaging and clinical imaging, stereotactic body radiation therapy, and brachytherapy. Describes technical aspects a.

Khan's The Physics of Radiation Therapy

This book provides a comprehensive overview of brain metastases, from the molecular biology aspects to therapeutic management and perspectives. Due to the increasing incidence of these tumors and the urgent need to effectively control brain metastatic diseases in these patients, new therapeutic strategies have emerged in recent years. The volume discusses all these innovative approaches combined with new surgical techniques (fluorescence, functional mapping, integrated navigation), novel radiation therapy techniques (stereotactic radiosurgery) and new systemic treatment approaches such as targeted- and immunotherapy. These combination strategies represent a new therapeutic model in brain metastatic patients in which each medical practitioner (neurosurgeon, neurologist, medical oncologist, radiation oncologist) plays a pivotal role in defining the optimal treatment in a multidisciplinary approach. Written by recognized experts in the field, this book is a valuable tool for neurosurgeons, neuro-oncologists, neuroradiologists, medical oncologists, radiation oncologists, cognitive therapists, basic scientists and students working in the area of brain tumors.

Advances in Radiation Oncology

Design and Shielding of Radiotherapy Treatment Facilities provides readers with a single point of reference for protection advice to the construction and modification of radiotherapy facilities. The book assembles a faculty of national and international experts on all modalities including megavoltage and kilovoltage photons, brachytherapy and high-energy

particles, and on conventional and Monte Carlo shielding calculations. This book is a comprehensive reference for qualified experts and radiation-shielding designers in radiation physics and also useful to anyone involved in the design of radiotherapy facilities.

Practical Radiotherapy Planning Fourth Edition

This book is a practical guide on image-guided robotic (CyberKnife®) radiosurgery of the brain and the spine. The volume introduces the radiosurgical community to the potential of image-guidance in the treatment of neurosurgical diseases including neuro-oncological, vascular and functional disorders. Principles of image-guided radiosurgery, including physics and radiobiology are considered. Each chapter provides a critical review of the literature and analyses of several aspects to offer an assessment of single and hypofractionated treatments. Based on the authors experience, tables or summaries presenting the treatment approaches and associated risks are included as well. Providing a practical guide to define the selection of dose, fractionation schemes, isodose line, margins, imaging, constraints to the structures at risk will support safe practice of neuroradiosurgery. This book aims to shed new light on the treatment of neoplastic and non-neoplastic diseases of the central nervous system using the CyberKnife® image-guided robotic radiosurgery system. It will be adopted by neurosurgery residents and neurosurgery consultants as well as residents in radiation oncology and radiation oncologists; medical physicists involved in radiosurgery procedures may also benefit from this book.

Radiotherapy of Prostate Cancer

Precision medicine is a rapidly-evolving field in the management of cancer. The use of novel molecular or genetic signatures in local-regional management is still in its infancy. Precision Radiation Oncology demystifies this state-of-the-art research and technology. By describing current existing clinical and pathologic features, and focusing on the ability to improve outcomes in cancer using radiation therapy, this book discusses incorporating novel genomic- or biology-based biomarkers in the treatment of patients moving radiation oncology into precision/personalized medicine. Precision Radiation Oncology provides readers with an overview of the new developments of precision medicine in radiation oncology, further advancing the integration of new research findings into individualized radiation therapy and its clinical applications.

Radiotherapy in Managing Brain Metastases

Stereotactic Radiosurgery and Stereotactic Body Radiation Therapy (SBRT) is a comprehensive guide for the practicing physician and medical physicist in the management of complex intracranial and extracranial disease. It is a state-of-the-science book presenting the scientific principles, clinical background and procedures, treatment planning, and treatment

delivery of SRS and SBRT for the treatment of tumors throughout the body. This unique textbook is enhanced with supplemental video tutorials inclusive to the resource. Beginning with an overview of SRS and SBRT, Part I contains insightful coverage on topics such as the evolving radiobiological principles that govern treatment, imaging, the treatment planning process, technologies and equipment used, as well as focused chapters on quality assurance, quality management, and patient safety. Part II contains the clinical application of SRS and SBRT for tumors throughout the body including those in the brain, head and neck, lung, pancreas, adrenal glands, liver, prostate, cervix, spine, and in oligometastatic disease. Each clinical chapter includes an introduction to the disease site, followed by a thorough review of all indications and exclusion criteria, in addition to the important considerations for patient selection, treatment planning and delivery, and outcome evaluation. These chapters conclude with a detailed and site-specific dose constraints table for critical structures and their suggested dose limits. International experts on the science and clinical applications of these treatments have joined together to assemble this must-have book for clinicians, physicists, and other radiation therapy practitioners. It provides a team-based approach to SRS and SBRT coupled with case-based video tutorials in disease management, making this a unique companion for the busy radiosurgical team. Key Features: Highlights the principles of radiobiology and radiation physics underlying SRS and SBRT Presents and discusses the expected patient outcomes for each indicated disease site and condition including a detailed analysis of Quality of Life (QOL) and Survival Includes information about technologies used for the treatment of SRS and SBRT Richly illustrated with over 110 color images of the equipment, process flow diagrams and procedures, treatment planning techniques and dose distributions 7 high-quality videos reviewing anatomy, staging, treatment simulation and planning, contouring, and management pearls Dose constraint tables at the end of each clinical chapter listing critical structures and their appropriate dose limits Includes access to the fully-searchable downloadable eBook

A Primer on Theory and Operation of Linear Accelerators in Radiation Therapy

Planning is a critical stage of radiotherapy. Careful consideration of the complex variables involved and critical assessment of the techniques available are fundamental to good and effective practice. First published in 1985, Practical Radiotherapy Planning has, over three editions, established itself as the popular choice for the trainee radiation oncologist and radiographer, providing the 'nuts and bolts' of planning in a practical and accessible manner. This fourth edition encompasses a wealth of new material, reflecting the radical change in the practice of radiotherapy in recent years. The information contained within the introductory chapters has been expanded and brought up to date, and a new chapter on patient management has been added. CT stimulators, MLC shieldings and dose profiles, principles of IMRT, and use of MRI, PET and ultrasound are all included, amongst other new developments in this field. The aim of the book remains unchanged. Complexity of treatment planning has increased greatly, but the fourth edition continues to emphasise underlying principles of treatment that can be applied for conventional, conformal and novel treatments, taking into

account advances in imaging and treatment delivery.

Stereotactic Body Radiation Therapy

Here you'll find more than 500 entries from the world's leading experts in the field on the basic concepts, methodologies, and applications in clinical trials. The range of topics includes: basic statistical concepts, design and analysis of clinical trials, ethics, regulatory issues, and methodologies for clinical data management and analysis

Modern Management of Benign and Malignant Pancreatic Disease, An Issue of Gastroenterology Clinics - E-Book

Scientists are continuously improving the accelerator and light source technologies to observe the secret of matter as well as the origin of nature which create new opportunities for accelerator physics research. This book provides a glance view on phase space dynamics of electron beam, motion of relativistic electrons in three-dimensional ideal undulator magnetic field, numerical simulation of electron multi-beam linear accelerator EVT, nuclear safety design of high energy accelerator facilities, and radiation safety aspects of operation of electron linear accelerators. The determination of the structure of biomolecules is presently among the best examples of the application of synchrotron radiation. This book also covers synchrotron-based X-ray diffraction study of mammalian connective tissues and related disease. Furthermore, an overview of the versatile applications of ion beam and synchrotron radiation techniques in hair elemental profiling in biomedical studies is also incorporated in this book.

Medical Electron Accelerators

Borne out of twentieth-century science and technology, the field of RF (radio frequency) linear accelerators has made significant contributions to basic research, energy, medicine, and national defense. As we advance into the twenty-first century, the linac field has been undergoing rapid development as the demand for its many applications, emphasizing high-energy, high-intensity, and high-brightness output beams, continues to grow. RF Linear Accelerators is a textbook that is based on a US Particle Accelerator School graduate-level course that fills the need for a single introductory source on linear accelerators. The text provides the scientific principles and up-to-date technological aspects for both electron and ion linacs. This second edition has been completely revised and expanded to include examples of modern RF linacs, special linacs and special techniques as well as superconducting linacs. In addition, problem sets at the end of each chapter supplement the material covered. The book serves as a must-have reference for professionals interested in beam physics and accelerator technology.

Intensity-Modulated Radiation Therapy

Clinical conformal radiotherapy is the holy grail of radiation treatment and is now becoming a reality through the combined efforts of physical scientists and engineers, who have improved the physical basis of radiotherapy, and the interest and concern of imaginative radiotherapists and radiographers. Intensity-Modulated Radiation Therapy describes in detail the physics germane to the development of a particular form of clinical conformal radiotherapy called intensity modulated radiation therapy (IMRT). IMRT has become a topic of tremendous importance in recent years and is now being seriously investigated for its potential to improve the outcome of radiation therapy. The book collates the state-of-the-art literature together with the author's personal research experience and that of colleagues in the field to produce a text suitable for new research workers, Ph.D. students, and practicing radiation physicists that require a thorough introduction to IMRT. Fully illustrated, indexed, and referenced, the book has been prepared in a form suitable for supporting a teaching course.

Image-Guided Stereotactic Radiosurgery

This book provides detailed, state-of-the-art information and guidelines on the latest developments, innovations, and clinical procedures in image-guided and adaptive radiation therapy. The first section discusses key methodological and technological issues in image-guided and adaptive radiation therapy, including use of implanted fiducial markers, management of respiratory motion, image-guided stereotactic radiosurgery and stereotactic body radiation therapy, three-dimensional conformal brachytherapy, target definition and localization, and PET/CT and biologically conformal radiation therapy. The second section provides practical clinical information on image-guided adaptive radiation therapy for cancers at all common anatomic sites and for pediatric cancers. The third section offers practical guidelines for establishing an effective image-guided adaptive radiation therapy program.

Usability Testing of Medical Devices

This book offers a comprehensive evaluation of the use of stereotactic body radiosurgery (SBRT) for the treatment of prostate cancer. The rationale, selection criteria, and treatment planning for prostate SBRT are explained. Important imaging and anatomic considerations are discussed, and detailed consideration devoted to organ motion and tumor tracking during SBRT. Outcomes of therapy are then examined, with thorough appraisal of side effect profiles and quality of life impacts. Clear guidance is provided on how to deliver the therapy in a way that minimizes the risk of long-term urinary and rectal toxicities. Stereotactic radiosurgery for prostate cancer is an increasingly used form of treatment. Retrospective investigations have demonstrated the safe application of high-dose treatments, with 5-year results comparable to those achieved with protracted external beam radiotherapy. Prospective studies are underway comparing SBRT with more

traditional forms of image-guided and intensity-modulated radiotherapy. In offering in-depth guidance on safe delivery of prostate SBRT, this book will be of value for students of radiation oncology, more experienced practitioners, and medical physicists.

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