Radiobiological Modelling In Radiation Oncology

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Radiotherapy Treatment Planning - J. Donald Chapman 2016-04-21 Understand Quantitative Radiobiology from a Radiation Biophysics Perspective In the field of radiobiology, the linear-quadratic (LQ) equation has become the standard for defining radiation-induced cell killing. Radiotherapy Treatment Planning: Linear-Quadratic Radiobiology describes tumor cell inactivation from a radiation physics perspective and offers appropriate LQ parameters for modeling tumor and normal tissue responses. Explore the Latest Cell Killing Numbers for Defining Iso-Effective Cancer

Treatments The book compiles radiation mechanism information from biophysical publications of the past 50 years, addressing how ionizing radiation produces the killing of stem cells in human tumors. It presents several physical and chemical parameters that can modulate the radiation response of clonogenic cells in tumors. The authors describe the use of the LQ model in basic radiation mechanism studies with cells of relatively homogeneous radiation response and then extend the model to the fitting of survival data generated with heterogeneous cell populations (tumors). They briefly discuss how to use the LQ model for predicting tumor (local) control probability (TCP) and normal tissue complication probability (NTCP). The book also examines potential molecular targets related to alpha- and beta-inactivation and gives suggestions for further molecular characterizations of these two independent processes. Develop Efficacious, Patient-Friendly Treatments at Reduced Costs Focusing on quantitative radiobiology in LQ formulation, this book assists medical physicists and radiation oncologists in identifying improved cancer treatments. It also encourages investigators to translate potentially improved radiotherapy schedules based on TCP and NTCP modeling into actual patient benefit.

Basic Clinical Radiobiology - Michael C. Joiner 2018-08-28 Basic Clinical Radiobiology is a concise but comprehensive textbook

setting out the essentials of the science and clinical application of radiobiology for those seeking accreditation in radiation oncology, clinical radiation physics, and radiation technology. Fully revised and updated to keep abreast of current developments in radiation biology and radiation oncology, this fifth edition continues to present in an interesting way the biological basis of radiation therapy, discussing the basic principles and significant developments that underlie the latest attempts to improve the radiotherapeutic management of cancer. This new edition is highly illustrated with attractive 2-colour presentation and now includes new chapters on stem cells, tissue response and the convergence of radiotherapy, radiobiology, and physics. It will be invaluable for FRCR (clinical oncology) and equivalent candidates, SpRs (and equivalent) in radiation oncology, practicing radiation oncologists and radiotherapists, as well as radiobiologists and radiotherapy physicists.

Big Data in Radiation Oncology - Jun Deng 2019-03-07

Big Data in Radiation Oncology gives readers an in-depth look into how big data is having an impact on the clinical care of cancer patients. While basic principles and key analytical and processing techniques are introduced in the early chapters, the rest of the book turns to clinical applications, in particular for cancer registries, informatics, radiomics,

radiogenomics, patient safety and quality of care, patient-reported outcomes, comparative effectiveness, treatment planning, and clinical decision-making. More features of the book are: Offers the first focused treatment of the role of big data in the clinic and its impact on radiation therapy. Covers applications in cancer registry, radiomics, patient safety, quality of care, treatment planning, decision making, and other key areas. Discusses the fundamental principles and techniques for processing and analysis of big data. Address the use of big data in cancer prevention, detection, prognosis, and management. Provides practical guidance on implementation for clinicians and other stakeholders. Dr. Jun Deng is a professor at the Department of Therapeutic Radiology of Yale University School of Medicine and an ABR board certified medical physicist at Yale-New Haven Hospital. He has received numerous honors and awards such as Fellow of Institute of Physics in 2004, AAPM Medical Physics Travel Grant in 2008, ASTRO IGRT Symposium Travel Grant in 2009, AAPM-IPEM Medical Physics Travel Grant in 2011, and Fellow of AAPM in 2013. Lei Xing, Ph.D., is the Jacob Haimson Professor of Medical Physics and Director of Medical Physics Division of Radiation Oncology Department at Stanford University. His research has been focused on inverse treatment planning, tomographic image reconstruction, CT, optical and PET imaging instrumentations, image guided interventions,

nanomedicine, and applications of molecular imaging in radiation oncology. Dr. Xing is on the editorial boards of a number of journals in radiation physics and medical imaging, and is recipient of numerous awards, including the American Cancer Society Research Scholar Award, The Whitaker Foundation Grant Award, and a Max Planck Institute Fellowship.

Modelling Radiotherapy Side Effects - Tiziana Rancati 2019

The treatment of a patient with radiation therapy is planned to find the optimal way to treat a tumour while minimizing the dose received by the surrounding normal tissues. In order to better exploit the possibilities of this process, the availability of accurate and quantitative knowledge of the peculiar responses of the different tissues is of paramount importance. This book provides an invaluable tutorial for radiation oncologists, medical physicists, and dosimetrists involved in the planning optimization phase of treatment. It presents a practical, accessible, and comprehensive summary of the field's current research and knowledge regarding the response of normal tissues to radiation. This is the first comprehensive attempt to do so since the publication of the QUANTEC guidelines in 2010. Features: Addresses the lack of systemization in the field, providing educational materials on predictive models, including methods, tools, and the evaluation of uncertainties Collects

the combined effects of features, other than dose, in predicting the risk of toxicity in radiation therapy Edited by two leading experts in the field

Current Topics in Clinical Radiobiology of Tumors - Hans-Peter Beck-Bornholdt 2012-12-06

The impact of basic science radiobiological research is now being recognized of significant importance in clinical radiation oncology. Observations made in the laboratory using animals as'well as tissue culture have led to a better biologic understanding of techniques for altered fractionation, techniques for measuring tumor cell proliferation, the possi bilities and limitations of methods for evaluation of nonrandomized clinical studies in deriving time dose relationships for human tumors as well as a better understanding of repair kinetics in mammalian cells, fractionation sensitivity and the major impact oftechnologies to improve local/regional control with the subsequent impact on survival. These findings have led to changes in treatment schedules and have led to further close cooperation among the radiation oncologists and radiation biologists. Well support research efforts in radiation biology have a major and significant impact on the clinical care of the cancer patient. Studies that originated in the laboratory are now finding their way into clinical practice resulting in better local and regional control and improved number of patients

surviving without disease.

Handbook of Radiotherapy Physics - P Mayles 2007-06-12

From background physics and biological models to the latest imaging and treatment modalities, the Handbook of Radiotherapy Physics: Theory and Practice covers all theoretical and practical aspects of radiotherapy physics. In this comprehensive reference, each part focuses on a major area of radiotherapy, beginning with an introduction by the

Handbook of Radiobiology - Thayalan Kuppusamy 2016-11-30

Complete guide to radiobiology for postgraduate students. Covers beneficial damage to cancer cells and adverse effects on normal cells. Logical, easy to understand format.

Targeted Radionuclide Tumor Therapy - Torgny Stigbrand 2008-09-01

The last three decades have provided opportunities to explore the potential of treating malignant diseases with antibodies or other targeting molecules labelled with nuclides. While considerable advances have been reported, there is still a signi- cant amount of work left to accomplish before our ambitions can be achieved. It now seems timely to review the accomplishments achieved to date and to clarify the challenges that remain. The choice of radionuclide, the conjugation p- cedure employed, and the selection of suitable targets were early issues that were faced by our field that still persist, however we can now tackle these obstacles with significantly better

insight. The expanding array of new targeting molecules (recombinant antibodies, peptides and agents based upon alternate scaffolds) may increase the therapeutic efficacy or even modify the radiation sensitivity of the targeted tumor cell. The title of this book "Targeted Radionuclide Tumour Therapy – Biological Aspects" was selected to reinforce the concept that a major focus of this volume was devoted to understanding the biological effects of targeting and radiation. These important issues have not previously been the primary focus in this context. Furthermore, our rapidly expanding knowledge of different types of cell death and the increasingly likely existence of cancer stem cells suggests to us that even more efficient approaches in targeting might be possible in the future.

Handbook of Radiotherapy Physics - Philip Mayles 2019-10-30

From background physics and biological models to the latest imaging and treatment modalities, the Handbook of Radiotherapy Physics: Theory and Practice covers all theoretical and practical aspects of radiotherapy physics. Fully updated throughout, this comprehensive reference explores the major areas of radiotherapy. The first three parts present the fundamentals of the underlying physics, radiobiology, and technology involved. The ensuing sections discuss the support requirements of external beam radiotherapy, such as dose measurements, properties of clinical beams, patient dose computation, treatment planning, and quality

assurance, followed by a part that explores exciting new advances that include developments in photon and particle therapy. Subsequent sections examine brachytherapy using sealed and unsealed sources and provide the framework of radiation protection, including an appendix that describes the detailed application of UK legislation. The final part contains handy tables of both physical constants and attenuation data. With contributions from renowned specialists, this second edition of the key reference text in the field provides essential theoretical and practical knowledge for medical physicists, researchers, radiation oncologists, and radiation technologists.

Radiobiological Modelling in Radiation Oncology - Roger G. Dale 2007

The move towards individually-optimised treatments, using knowledge of normal tissue and tumour radiosensitivity, proliferation rates, etc, in combination with three-dimensional planning, will need mathematical modelling to achieve its full potential. This modelling process will also be capable of helping develop a rational and cost-effective use of resources.Amongst radiation oncologists and medical physicists there is a need for a greater understanding of the scope, applications and limitations of radiobiological modelling, particularly in complex situations that include multiple treatment variables, the respective influence of which are difficult to separate out by

randomised trials without using radiobiologically-based analysis.In future there will be increasing use of modelling in practical situations, including treatment gap corrections, normal tissue tolerance predictions, optimisation of therapy determined by predictive assays, multi-modality schedule design, the simulation of clinical trials, testing contemporaneous medico-legal problems and teaching general principals of radiotherapy.

Walter and Miller's Textbook of Radiotherapy: Radiation Physics, Therapy and Oncology - E-Book - R Paul Symonds 2019-07-11 Walter and Miller's Textbook of Radiotherapy is a key textbook for therapeutic radiography students as well as trainee clinical and medical oncologists, clinical physicists and technologists. The book is divided into 2 sections. The first section covers physics and provides a comprehensive review of radiotherapy physics. This section is designed to be non-physicist friendly, to simply and clearly explain the physical principles upon which radiotherapy and its technology are based. The second section is a systematic review by tumour site giving an up to date summary of radiotherapy practice. The title also covers the place of chemotherapy, surgery and non-radiotherapy treatments as well as the principles of cancer patient treatment including supportive care and palliative treatments. It is a comprehensive must-have resource for anyone studying therapeutic

radiotherapy. Highly illustrated in full colour including 350 photographs. Clearly and simply explains the fundamental physics for clinicians Gives an up to date summary of radiotherapy practice organised by tumour site making it very easy to navigate. Describes the wide range of devices and clearly explains the principles behind their operation. Comprehensively explains the calculation models of dose predictions for treatment preparation. Heavy emphasis on how clinical trials have influenced current practice. Shows how radiobiological knowledge has influenced current practice such as the fractionation regimens for breast and prostate cancer Proton therapy; machines, dose measurement, covering the clinical advantages and pitfalls of this treatment modality. New radiotherapy modalities such as stereotactic radiotherapy, types of intensity modulated radiotherapy and imaged guided radiotherapy are comprehensively covered as are recent advances in chemotherapy and molecular targeted therapy. In depth coverage of dose measurement and new devices.

Basic Clinical Radiobiology - G Gordon Steel 1997-09-26

This is a basic teaching book for radiation oncologists, radiation physicists, and radiobiologists, setting out concisely the biological basis of radiation therapy. Early chapters deal with essential areas of science, including cell proliferation in tumours and normal tissues, principles of radiation cell killing, theoretical and

modelling approaches and molecular aspects of radiobiology. Subsequent chapters deal with the applications of radiobiology to clinical radiotherapy. The principles of fractionation are described in detail, leading to the rationale of current approaches to the improvement of radiotherapy schedules. Also discussed are efforts to beat hypoxia in tumours, brachytherapy, the principles and use of particle beams, the combination of radiotherapy and chemotherapy, hyperthermia, targeted radiotherapy, and current efforts to individualize treatment with radiation therapy. This second edition uses the same clear and concise style as the first, maintaining a high ratio of charts to text, for the benefit of those who have a visual memory. The text has been fully updated and expanded to include recent advances in molecular growth which will be of particular importance to trainees and professionals alike. The charts of this second edition have been substantially revised and each chapter concludes with a series of Key Points. There are frequent cross-references between chapters and a glossary of scientific terms is provided.

Optimization of Human Cancer Radiotherapy - G.W. Swan 2013-03-08

The mathematical models in this book are concerned with a variety of approaches to the manner in which the clinical radiologic treatment of human neoplasms can be improved. These improvements comprise ways of delivering

radiation to the malignan cies so as to create considerable damage to tumor cells while sparing neighboring normal tissues. There is no unique way of dealing with these improvements. Accord ingly, in this book a number of different presentations are given. Each presentation has as its goal some aspect of the improvement, or optimization, of radiotherapy. This book is a collection of current ideas concerned with the optimization of human cancer radiotherapy. It is hoped that readers will build on this collection and develop superior approaches for the understanding of the ways to improve therapy. The author owes a special debt of thanks to Kathy Prindle who breezed through the typing of this book with considerable dexterity. TABLE OF CONTENTS Chapter GENERAL INTRODUCTION 1. 1 Introduction 1 1. 2 History of Cancer and its Treatment by Radiotherapy 8 1. 3 Some Mathematical Models of Tumor Growth 12 1. 4 Spatial Distribution of the Radiation Dose 20 Chapter 2 SURVIVAL CURVES FROM STATISTICAL MODELS 24 2. 1 Introduction 24 2. 2 The Target Model 26 2. 3 Single-hit-to-kill Model 27 2. 4 Multitarget, Single-hit Survival 29 2. 5 Multitarget, Multihit Survival 31 2. 6 Single-target, Multihit Survival 31 2.

Radiation Oncology Physics - International Atomic Energy Agency 2005

This publication is aimed at students and teachers involved in teaching programmes in field of medical radiation physics, and

it covers the basic medical physics knowledge required in the form of a syllabus for modern radiation oncology. The information will be useful to those preparing for professional certification exams in radiation oncology, medical physics, dosimetry or radiotherapy technology.

Applied Radiobiology and Bioeffect Planning - David Wigg 2001

The purpose of this book is to encourage the development of bioeffect planning as an experimental tool so that bioeffect plans may be compared with standard isodose plans. The limitations of isodose planning become apparent in many common clinical circumstances when such comparisons can be made. The fundamental problems of the derivation of useful biological models for clinical application and the description of tumor and normal tissue parameter values and their variability are addressed. Particular emphasis is placed on comparing the predictive value of the models and parameters against clinical results of fractionated and continuous irradiation either alone or combined. Most of the models and graphs are ""live"" and interactive, permitting instant recalculations and redisplay of the graphs as the variables are redefined. The author acknowledges that bioeffect planning is strictly an experimental tool to compare with conventional isodose plans which, for the foreseeable future, remain the standard against which all plans must be judged. However, he believes this work

will be helpful in advancing the application of modern and rapidly evolving radiobiology to clinical practice.

Acute and Long-Term Side-Effects of Radiotherapy - Wolfgang Hinkelbein 2012-12-06
Biologists and radiotherapists present their experimental work and clinical data in the field of radiation injuries of normal tissues and organs. Particular regard is payed to the relevance of biological mechanisms in clinical situations. Principles of radiation damage and combined treatment toxicity in radio-chemotherapy are being explained. The main topics discussed are the importance of microvasculature, time, doseand fractionation and factors modifying clinical radioresponse for early andlate radiation effects. Tissues and organs considered in this volume are mucosa and skin, lung and heart, bladder and muscle, CNS and eye. Special problems of pediatric radiotherapy, TBI, IORT and second malignacies are also mentioned.

Investigations on the Quality of Treatment Plans for Carbon Ion Radiotherapy: Beam Delivery Systems and Radiobiological Models - Clarissa Gillmann 2014-11-12

The Interdisciplinary Program for Radiation Oncology Research - 1984

Basic Radiotherapy Physics and Biology - David S. Chang 2014-09-19
This book is a concise and well-illustrated review of the physics and biology of radiation therapy intended for radiation oncology residents, radiation

therapists, dosimetrists, and physicists. It presents topics that are included on the Radiation Therapy Physics and Biology examinations and is designed with the intent of presenting information in an easily digestible format with maximum retention in mind. The inclusion of mnemonics, rules of thumb, and reader-friendly illustrations throughout the book help to make difficult concepts easier to grasp. Basic Radiotherapy Physics and Biology is a valuable reference for students and prospective students in every discipline of radiation oncology.

Radiobiology for the Radiologist - Eric J. Hall 2012-03-28

In print since 1972, this seventh edition of Radiobiology for the Radiologist is the most extensively revised to date. It consists of two sections, one for those studying or practicing diagnostic radiolo, nuclear medicine and radiation oncology; the other for those engaged in the study or clinical practice of radiation oncology--a new chapter, on radiologic terrorism, is specifically for those in the radiation sciences who would manage exposed individuals in the event of a terrorist event. The 17 chapters in Section I represent a general introduction to radiation biology and a complete, self-contained course especially for residents in diagnostic radiology and nuclear medicine that follows the Syllabus in Radiation Biology of the RSNA. The 11 chapters in Section II address more in-depth topics in radiation oncology, such as cancer biology, retreatment after

radiotherapy, chemotherapeutic agents and hyperthermia. Now in full color, this lavishly illustrated new edition is replete with tables and figures that underscore essential concepts. Each chapter concludes with a "summary of pertinent conclusions" to facilitate quick review and help readers retain important information.

Advanced and Emerging Technologies in Radiation Oncology Physics - Siyong Kim 2018-05-24

This new book educates readers about new technologies before they appear in hospitals, enabling medical physicists and clinicians to prepare for new technologies thoroughly and proactively, and provide better patient care once new equipment becomes available. Emerging technologies in imaging, treatment planning, treatment delivery, dosimetry and informatics are all discussed. The book is divided into three parts: recently developed technologies available for practice; technologies under development nearing completion; and technologies in an early stage of development that could have potential radiotherapy applications. Features: Introduces emerging technologies in imaging, treatment planning, treatment delivery, dosimetry and informatics The advantages and limitations of each technology in clinical settings are discussed, and recommendations on how to adopt the technologies are provided Critiques and improvement points are provided for researchers, in addition

to suggestions on how to prepare quality assurance are provided as needed

Targeted Radionuclide Therapy - Tod W. Speer 2012-03-28

Radioimmunotherapy, also known as systemic targeted radiation therapy, uses antibodies, antibody fragments, or compounds as carriers to guide radiation to the targets. It is a topic rapidly increasing in importance and success in treatment of cancer patients. This book represents a comprehensive amalgamation of the radiation physics, chemistry, radiobiology, tumor models, and clinical data for targeted radionuclide therapy. It outlines the current challenges and provides a glimpse at future directions. With significant advances in cell biology and molecular engineering, many targeting constructs are now available that will safely deliver these highly cytotoxic radionuclides in a targeted fashion. A companion website includes the full text and an image bank.

Comprehensive Biomedical Physics - 2014-07-25

Comprehensive Biomedical Physics is a new reference work that provides the first point of entry to the literature for all scientists interested in biomedical physics. It is of particularly use for graduate and postgraduate students in the areas of medical biophysics. This Work is indispensable to all serious readers in this interdisciplinary area where physics is applied in medicine and biology. Written by leading scientists who have evaluated and summarized

the most important methods, principles, technologies and data within the field, Comprehensive Biomedical Physics is a vital addition to the reference libraries of those working within the areas of medical imaging, radiation sources, detectors, biology, safety and therapy, physiology, and pharmacology as well as in the treatment of different clinical conditions and bioinformatics. This Work will be valuable to students working in all aspect of medical biophysics, including medical imaging and biomedical radiation science and therapy, physiology, pharmacology and treatment of clinical conditions and bioinformatics. The most comprehensive work on biomedical physics ever published Covers one of the fastest growing areas in the physical sciences, including interdisciplinary areas ranging from advanced nuclear physics and quantum mechanics through mathematics to molecular biology and medicine Contains 1800 illustrations, all in full color

Radiobiology and Radiation Hormesis - Charles L. Sanders 2017-08-08

This book presents new information on radiobiology that more clearly refutes the linear no-threshold (LNT) assumption and supports radiation hormesis. Fresh light is cast on the mechanisms of radiation hormesis and the potential benefits of low-dose ionizing radiation in preventing and treating a wide variety of inflammatory and proliferative diseases. It is proposed that these effects may derive

from cellular communication via electromagnetic waves directed by DNA, with each cell acting as a quantum computer. Readers will also find close analysis of the negative impacts of radiophobia on many aspects of modern life, including attitudes to imaging technologies, licensing of nuclear power reactors, and preparedness for survival of nuclear war. The book will be of interest to researchers and scientists in radiobiology, radiation protection, health physics, medical physics, and radiology. Specifically, it will provide medical physicians, radiation oncologists, radiation epidemiologists, gerontologists, cell biologists, toxicologists, and nuclear engineers with a wide range of interesting facts and enlightening novel perspectives.

Basic Clinical Radiobiology Fourth Edition - Michael C. Joiner 2009-03-27

This concise but comprehensive textbook sets out the essentials of the science and clinical application of radiobiology for those seeking accreditation in radiation oncology, clinical radiation physics and radiation technology. Fully revised and updated to keep abreast of current developments in radiation biology and radiation oncology, the fourth edition continues to present in an interesting way the biological basis of radiation therapy, discussing the basic principles and significant developments that underlie the latest attempts to improve the radiotherapeutic

management of cancer. New topics for the fourth edition include chapters on the mechanisms of cell death, biological response modifiers, and biological image guided radiotherapy, with major revisions to sections on the molecular basis of the radiation response, tumour hypoxia and the dose-rate effect. A variety of new authors have contributed to this revision, who, together with the new Editorial team, have used their significant international teaching experience to ensure the content remains clear and comprehensive, and as valuable to the trainee as it is to the established radiation oncologist. With the fourth edition we will see the most radical change so far - as Professor Gordon Steel has retired as Editor and has been replaced by Bert van der Kogel, the current current course director for the above-mentioned course, plus Michael Joiner, who is the head of the Radiation Biology Program at the Wayne State University and is the Associate Editor of the International Journal of Radiation Biology.

Computer Simulation in Cell Radiobiology - Andrej Yu Yakovlev 1988

Radiobiology of Glioblastoma - Luigi Pirtoli 2016-06-06

This text properly considers the most recent and relevant advances in molecular RB of GB, taking into account the related topics of pathobiology, and underscores the most promising translational perspectives from the preclinical to the clinical domain. Section I (From Bedside to Bench) discusses

conditions associated with RT resistance of GB and the consequent RB hints, technology improvements intended to overcome RT-resistance of GB, mathematical modeling of RB parameters from clinical studies, the present impact of molecular prognostic factors in therapy of GB, and RT tolerance of normal brain. Section II (Preclinical Research and Pathobiology Topics) presents the traditional and mechanistic/molecular approaches to RB of GB, genetic and epigenetic studies on GB, issues of cell-death pathways, stem-like cells, invasiveness, tumor microenvironment, hypoxia, mi-RNA manipulations, and nanoparticle technology. Section III (Translational Perspectives) presents RB issues related to molecular profiling and classification of GB as frames of reference for clinical studies, translational perspectives of gene therapy, evolving protocols based on pre-clinical data and large data-bases and ontologic models. Radiobiology of Glioblastoma: Recent Advances and Related Pathobiology will be of great value to pathologists, medical oncologists, radiation oncologists as well as basic researchers and clinical investigators.

Practical Radiobiology for Proton Therapy Planning - Bleddyn Jones 2017

"Practical Radiobiology for Proton Therapy Planning covers the principles, advantages and potential pitfalls that occur in proton therapy, especially its radiobiological modelling applications. This book is intended to

educate, inform and to stimulate further research questions. Additionally, it will help proton therapy centres when designing new treatments or when unintended errors or delays occur. The clear descriptions of useful equations for high LET particle beam applications, worked examples of many important clinical situations, and discussion of how proton therapy may be optimized are all important features of the text. This important book blends the relevant physics, biology and medical aspects of this multidisciplinary subject."--Prové de l'editor.

Practical Radiobiology for Proton Therapy Planning - Bleddyn Jones 2018-01-24

Practical Radiobiology for Proton Therapy Planning covers the principles, advantages and potential pitfalls that occur in proton therapy, especially its radiobiological modelling applications. This book is intended to educate, inform and to stimulate further research questions. Additionally, it will help proton therapy centres when designing new treatments or when unintended errors or delays occur. The clear descriptions of useful equations for high LET particle beam applications, worked examples of many important clinical situations, and discussion of how proton therapy may be optimized are all important features of the text. This important book blends the relevant physics, biology and medical aspects of this multidisciplinary subject.

Optimization of Cancer

Radiotherapy - Bhudatt R. Paliwal 1985

Advances in Radiation Therapy - M. Guckenberger 2018-04-12 Developments in radiation oncology have been key to the tremendous progress made in the field in recent years. The combination of optimal systemic treatment and local therapy has resulted in continuing improved outcomes of cancer therapy. This progress forms the basis for current pre-clinical and clinical research which will strengthen the position of radiation oncology as an essential component of oncological care. This book summarizes recent advances in radiotherapy research and clinical patient care. Topics include radiobiology, radiotherapy technology, and particle therapy. Chapters cover a summary and analysis of recent developments in the search for biomarkers for precision radiotherapy, novel imaging possibilities and treatment planning, and advances in understanding the differences between photon and particle radiotherapy. Advances in Radiation Therapy is an invaluable source of information for scientists and clinicians working in the field of radiation oncology. It is also a relevant resource for those interested in the broad topic of radiotherapy in general.

Mathematical Modelling of Dose Planning in High Dose-Rate Brachytherapy - Björn Morén 2019-04-24 Cancer is a widespread type of diseases that each year affects millions of people. It is mainly treated by chemotherapy, surgery or radiation therapy, or a

combination of them. One modality of radiation therapy is high dose-rate brachytherapy, used in treatment of for example prostate cancer and gynecologic cancer. Brachytherapy is an invasive treatment in which catheters (hollow needles) or applicators are used to place the highly active radiation source close to or within a tumour. The treatment planning problem, which can be modelled as a mathematical optimization problem, is the topic of this thesis. The treatment planning includes decisions on how many catheters to use and where to place them as well as the dwell times for the radiation source. There are multiple aims with the treatment and these are primarily to give the tumour a radiation dose that is sufficiently high and to give the surrounding healthy tissue and organs (organs at risk) a dose that is sufficiently low. Because these aims are in conflict, modelling the treatment planning gives optimization problems which essentially are multiobjective. To evaluate treatment plans, a concept called dosimetric indices is commonly used and they constitute an essential part of the clinical treatment guidelines. For the tumour, the portion of the volume that receives at least a specified dose is of interest while for an organ at risk it is rather the portion of the volume that receives at most a specified dose. The dosimetric indices are derived from the dose-volume histogram, which for each dose level shows the corresponding

dosimetric index. Dose-volume histograms are commonly used to visualise the three-dimensional dose distribution. The research focus of this thesis is mathematical modelling of the treatment planning and properties of optimization models explicitly including dosimetric indices, which the clinical treatment guidelines are based on. Modelling dosimetric indices explicitly yields mixedinteger programs which are computationally demanding to solve. The computing time of the treatment planning is of clinical relevance as the planning is typically conducted while the patient is under anaesthesia. Research topics in this thesis include both studying properties of models, extending and improving models, and developing new optimization models to be able to take more aspects into account in the treatment planning. There are several advantages of using mathematical optimization for treatment planning in comparison to manual planning. First, the treatment planning phase can be shortened compared to the time consuming manual planning. Secondly, also the quality of treatment plans can be improved by using optimization models and algorithms, for example by considering more of the clinically relevant aspects. Finally, with the use of optimization algorithms the requirements of experience and skill level for the planners are lower. This thesis summary contains a literature review over

optimization models for treatment planning, including the catheter placement problem. How optimization models consider the multiobjective nature of the treatment planning problem is also discussed.

Understanding Radiation Biology - Kenneth Chadwick 2019-11-15

This book provides a qualitative and quantitative exploration of the action of radiation on living matter which leads to a complete and coherent interpretation of radiation biology. It takes readers from radiation-induced molecular damage in the nucleus of the cell and links this damage to cellular effects such as cell killing, chromosome aberrations and mutations before exploring organ damage, organism lethality and cancer induction. It also deals with radiological protection concepts and the difficulties of predicting the dose–effect relationship for low-dose and dose rate radiation risk. The book ends with separate chapters dealing with the effects of UV light exposure and risk classification of chemical mutagens, both of which are derived by logical extensions of the radiation model. This book will provide the basic foundations of radiation biology for undergraduate and graduate students in medical physics, biomedical engineering, radiological protection, medicine, radiology and radiography. Features Presents a comprehensive insight into radiation action on living matter Contains important implications for radiological protection and regulations Provides

analytical methods for applications in radiotherapy

Radiobiology Self-Assessment Guide - Jennifer Yu 2016

Cover -- Title -- Copyright -- Contents -- Contributors -- Preface -- Share Radiobiology Self-Assessment Guide -- Chapter 1: Interaction of Radiation With Matter -- Chapter 2: Cell Survival Curves and Cell Death -- Chapter 3: DNA, Chromosome and Chromatid Damage, Repair, and Measurement -- Chapter 4: Radiosensitivity and the Dose-Rate Effect -- Chapter 5: Radiation Damage Repair and Models for Normal Tissues -- Chapter 6: Hypoxia, Oxygen, Reoxygenation, and Angiogenesis -- Chapter 7: Linear Energy Transfer and Relative Biological Effectiveness

Machine Learning With Radiation Oncology Big Data - Jun Deng 2019-01-21

Evolution of Ionizing Radiation Research - Mitsuru Nenoi 2015-09-17

The industrial and medical applications of radiation have been augmented and scientific insight into mechanisms for radiation action notably progressed. In addition, the public concern about radiation risk has also grown extensively. Today the importance of risk communication among stakeholders involved in radiation-related issues is emphasized much more than any time in the past. Thus, the circumstances of radiation research have drastically changed, and the demand for a novel approach to radiation-related issues is increasing. It is thought that the publication of the book Evolution of Ionizing Radiation Research at this time would have enormous impacts on the

society. The editor believes that technical experts would find a variety of new ideas and hints in this book that would be helpful to them to tackle ionizing radiation.

Modelling Radiotherapy Side Effects - Tiziana Rancati 2019-06-11

The treatment of a patient with radiation therapy is planned to find the optimal way to treat a tumour while minimizing the dose received by the surrounding normal tissues. In order to better exploit the possibilities of this process, the availability of accurate and quantitative knowledge of the peculiar responses of the different tissues is of paramount importance. This book provides an invaluable tutorial for radiation oncologists, medical physicists, and dosimetrists involved in the planning optimization phase of treatment. It presents a practical, accessible, and comprehensive summary of the field's current research and knowledge regarding the response of normal tissues to radiation. This is the first comprehensive attempt to do so since the publication of the QUANTEC guidelines in 2010. Features: Addresses the lack of systemization in the field, providing educational materials on predictive models, including methods, tools, and the evaluation of uncertainties Collects the combined effects of features, other than dose, in predicting the risk of toxicity in radiation therapy Edited by two leading experts in the field

Radiobiology for the Radiologist - Eric J.

Hall 2006
The updated Sixth Edition of this popular text will remain the first choice for those who need current, clinically relevant information on how radiation affects the human body. Written by practicing, active radiobiologists, the book brings together basic laboratory research and practical, clinical applications. The easy-to-read text and informative illustrations ensure comprehension, and summaries at the end of each chapter facilitate quick review. The first section covers topics applicable to diagnostic radiology, nuclear medicine, and radiation oncology; the second section offers material specifically for radiation oncologists. This edition includes new material about doses and risks in interventional radiology and cardiology.

Advances in Particle Therapy - Manjit Dosanjh 2018-05-11
Hadron therapy is a groundbreaking new method of treating cancer. Boasting greater precision than other therapies, this therapy is now utilised in many clinical settings and the field is growing. More than 50 medical facilities currently perform (or are planned to perform) this treatment, with this number set to double by 2020. This new text covers the most recent advances in hadron therapy, exploring the physics, technology, biology, diagnosis, clinical applications, and economics behind the therapy. Providing essential and up-to-date information on recent developments in the field, this book will be of interest to current

and aspiring specialists from a wide range of backgrounds. Features: Multidisciplinary approach: explores the physics, IT (big data), biology, clinical applications from imaging to treatment, clinical trials, and economics associated with hadron therapy Contains the latest research and developments in this rapidly evolving field, and integrates them into the current global challenges for radiation therapy Edited by recognised leaders in the field, including the co-ordinator of ENLIGHT (the European Network for Light Ion Hadron Therapy), with chapter contributions from international leading experts in the field

The Biological Basis of Radiotherapy - George Gordon Steel 1983