University of California San Diego
Department of Radiation Medicine and Applied Sciences:

Department Overview

University of California San Diego

University of California System

The University of California (UC) http://www.universityofcalifornia.edu was chartered in 1868. As a whole, the UC is one of the largest Universities in the world consisting of over 7,000 faculty members, 160,000 students and employs approximately 121,000 faculty, staff and academics statewide. The UC system is currently comprised of 10 separate campuses: Berkeley, Davis, Irvine, Los Angeles, Merced, Riverside, San Diego, San Francisco, Santa Barbara and Santa Cruz. In 2011, there were over 76,000 student applications.

UC is affiliated with the Lawrence Livermore and Lawrence Berkeley Laboratories and the Los Alamos Facility. Each campus boasts a unique environment, and a variety of achievements, honors and academic disciplines.

There are 5 medical centers in the UC system: Davis, Irvine, Los Angeles, San Diego and San Francisco. A medical center in Riverside is under development. The 5 UC Medical Centers support the clinical teaching programs of the medical and health sciences schools and receive more than 138,000 inpatient discharges, 261,000 emergency room visits and more than 3.6 million outpatient visits per year. Collectively, these centers comprise the largest health care system in California.

University of California San Diego (UCSD)

UC San Diego http://www.ucsd.edu/ occupies 1200 acres along the Pacific coast in La Jolla, California. One of the premiere campuses of the UC system, UC San Diego is also one of the youngest (founded in 1960). The first graduate student was admitted in 1960 and the first undergraduate in 1964. UC San Diego is thus one of the youngest major Universities in the United States.

Since its beginnings, the focus of UC San Diego has been on science and engineering and over its short history 18 faculty members have awarded Nobel Prizes, including 3 in Medicine and Physiology: George Palade (1974), Renata Dulbecco (1975) and Sydney Brenner (2002). Roger Tsien PhD, a member of the UCSD Cancer Center, was the most recent Nobel Laureate receiving his Prize in Chemistry in 2009.

UC San Diego is affiliated with several prestigious research neighbors, including the Salk Institute http://www.salk.edu/, the Burnham Institute http://www.burnham.org/ and the Scripps Research Institute http://www.scripps.edu/e_index.html. The collective biomedical facilities are known in San Diego as "Bio Tech Beach". The Salk Institute is pictured below.

In 2013, the UC San Diego Moores Cancer Center, the Salk Institute and the Burnham Institute formed the "San Diego National Cancer Institute Cancer Centers Council". This council brings together a leading NCI-designated comprehensive cancer center with two of the seven NCI-designated basic science cancer centers in the country.

The UC San Diego annual research funding currently exceeds $1 billion, making it one of the highest funded research universities in the country.

UCSD shatters record with $1 billion for research

THURSDAY, JULY 1, 2010 AT 6 A.M.

UC San Diego raised a record $1 billion over the past year for research during a boom that's likely to create scores of jobs and deepen scientist's understanding of everything from climate change to sickle cell anemia.

The campus stayed among the top 10 schools research schools in the

In recent years, UCSD has received multiple prestigious awards. In 2012, Department of Bioengineering Professor (and Cancer Center member) Shu Chien PhD was awarded the *National Medal of Science* from President Obama.

His research has led to improved testing and treatment of atherosclerosis. The prior year, Chancellor Marye Ann Fox, also received a *National Medal of Science* award, making UC San Diego the first University ever to receive back-to-back National Medals of Science.

UC San Diego has been named one of the Top-Ranked "Happiest" colleges as well as a top-ranked college for nightlife, organizations, retention and sunny days. UC San Diego has also been named one of the Top Green Universities in the world due to its extensive initiatives in energy preservation and conservation.

Several years in a row, UC San Diego has even been named a Top-Ranked "Surf" University in the country. This recognition was based not only on its proximity to world-class beaches and surfing but also to its commitment to the "academics" of surfing. The Department of Physics offers a well-attended *Physics of Surfing* Class.

Under the leadership of Dean David Brenner (formerly Chair of Medicine at Columbia University), UCSD Health Sciences is an integral part of the University as a whole. Dr. Brenner oversees the Medical Center, the Clinical and Basic Science Departments, the UCSD Medical School and the Skaggs School of Pharmacy.

The School of Medicine currently enrolls 120 students per year and is consistently ranked among the top American Medical Schools by the *U.S. News World Report* http://www.usnews.com/ usnews/edu/grad/rankings/med/. Despite its short history, the UCSD School of Medicine is consistently ranked among the Top 15 Research Medical Schools and the Top 15 NIH funded Medical Schools in the country.

UCSD Medical Center

The UCSD Medical Center is currently a two hospital system. Opened in 1993, the 128-bed John M. and Sally B. Thornton Hospital (photo below left) is located on the La Jolla campus.

The 422-bed, 11-floor Hillcrest Medical Center is located in the Hillcrest neighborhood near downtown San Diego (photo below right).

UCSD is currently building a new 10 story Medical Center in La Jolla adjacent to Thornton Hospital. Named after the founder of Qualcomm, the 500,000 square foot Jacobs Medical Center will consist of 3 separate hospitals including a dedicated Cancer Hospital and a Center for Advanced Surgery.

Several hospitals are closely affiliated with the UCSD Medical Center including the VA San Diego Hospital (La Jolla) (below upper right) and Rady Children's Hospital (below lower left) www.chsd.org. In addition, UC San Diego has an exclusive radiation oncology contract with Kaiser Permanente San Diego (below lower right).

Several other facilities are located on the UC San Diego campus adjacent to the Medical Center in La Jolla. These include several research facilities where many cancer center researchers have labs. In addition, a new 300,000 square foot Clinical and Translational Research Institute is currently under construction (photo below).

Other new building projects include the Sanford Consortium for Regenerative Medicine and the new Sulpizio Cardiovascular Center. Brachy-therapy (eye plaques) is commonly performed for choroidal melanoma in the Shiley Eye Institute adjacent to the Cancer Center.

Moores Cancer Center

Opened in 2005, the Rebecca and John Moores Comprehensive Cancer Center http://cancer.ucsd.edu/ is a 270,000 square foot state-of-the-art facility, one of only 41 NCI designated cancer centers in the country. As such, it ranks among the top centers in the nation in terms of clinical and basic science research, providing advanced patient care, and serving the community through education and outreach programs.

Named after John Moores the former owner of the San Diego *Padres,* the Moores Cancer Center is home to 300 individual UCSD faculty from over 23 departments and divisions and local institutions, including Rady Children's Hospital. Over 300 clinical trials are currently open at the Cancer Center including Radiotherapy Oncology Group (RTOG) trials.

The UCSD Moores Cancer Center is under the Directorship of Scott Lippman MD (right), an internationally-recognized medical oncologist formerly the Chair of the Department of Head/Neck and Thoracic Oncology at the MD Anderson Comprehensive Cancer Center. Since his arrival, Dr. Lippman has recruited aggressively from both academia and industry. Two noteworthy recruits have been Razelle Kurzrock MD (left) as Senior Deputy Director for Clinical Science, formerly the Phase I Clinical Trials Director at MD, Napoleone Ferrara PhD as Senior Deputy Director for Basic Science, formerly a Senior Researcher at Genentech Corporation. A recipient of the prestigious Lasker Award, Dr. Ferrara is known for discovering VEGF and developing Avastin.

The Cancer Center is internationally-known for exceptional basic science, with 14 cancer center members elected to the National Academy of Sciences (NAS) (UCSD is ranked 7th in the country for NAS membership). In 2011 alone, cancer center members published 59 articles in the journals *Cell, Nature* and *Science.*

Department of Radiation Medicine and Applied Sciences

The UCSD Department of Radiation Oncology was founded in 2006 with the recruitment of Arno J. Mundt MD (see photo) from the University of Chicago, an internationally-known academic radiation oncologist focusing on the application of novel technologies particularly in the treatment of gynecologic cancers. Today, the Department is home to a wide variety of clinicians and researchers. In 2012, the Department officially changed its name to the *Department of Radiation Medicine and Applied Sciences.*

Under Dr. Mundt, there are 3 Vice-Chairs: Kevin Murphy MD, Vice-Chair for Strategy and Business Development, Casey Sandack MBA, Vice-Chair for Administration and Finance, and Todd Pawlicki PhD, Vice-Chair for Medical Physics.

Faculty

The Department is comprised of 5 academic divisions: Clinical Radiation Oncology (CRO), Clinical and Translational Research (CTR), Medical Physics and Technology (MPT), Proton Therapy and Particle Research (PTPR), and Veterinary Oncology (VO). Over 50 individuals, including 18 physicians and 21 medical physicists hold Academic Appointments in the Department (Appendix I).

DIVISION OF CLINICAL RADIATION ONCOLOGY
Under the Direction of Parag Sanghvi MD, the Division of Clinical Radiation Oncology consists of the clinical radiation oncologists at the main site as well as the satellites.

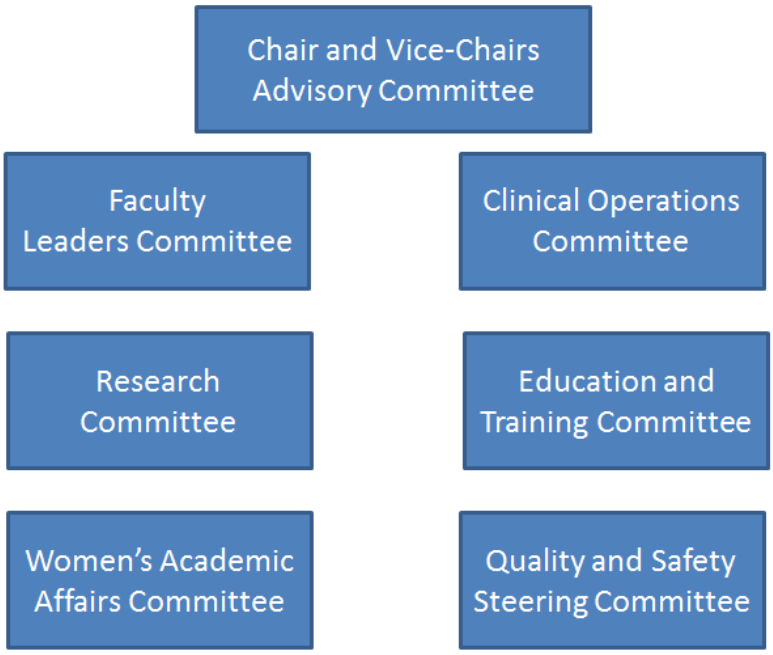
DIVISION OF MEDICAL PHYSICS AND TECHNOLOGY
Todd Pawlicki PhD was recruited as Division Director in 2006 and oversees all clinical and research medical physicists as well as technology researchers in the department. Several faculty in this division focus primarily on research and oversee post-doctoral and graduate/undergraduate students.

DIVISION OF CLINICAL
AND TRANSLATIONAL RESEARCH
Loren Mell MD was named Division Director in 2009 and oversees the clinical translational and basic research in the department and serves as principal investigator of the Radiation Therapy Oncology Group (RTOG) protocols.

DIVISION OF PROTON THERAPY AND PARTICLE RESEARCH
Under the Direction of Carl Rossi MD, the Division of Proton Therapy and Particle Research consists of the proton radiation oncologists and medical physicists at the Scripps Proton Therapy Center.

DIVISION OF VETERINARY ONCOLOGY
Dr. Gregory Ogvilie, the Director of the Angel Care Veterinary Hospital, serves as the director of the Division of Veterinary Oncology which also includes Dr. David Proulx who is double-boarded in Veterinary Medical Oncology and Radiation Oncology Oncology.

Governance Structure
There are seven department committees (see figure below):



The Chair and Vice-Chairs Advisory committee consists of the 3 Vice-Chairs who provide advice to the Chair on important department issues. The Faculty Committee consists of the Chair, Vice-Chairs and Division Directors as well as the Chair of the Women's Academic Committee and oversees all faculty-related issues in the department including recruitments, merits and promotions. The Clinical Operations Committee is chaired by the Director of the Division of Clinical Radiation Oncology and includes the Medical Directors, Clinic Managers and Lead Physicists at each of the treatment sites. The Research Committee is comprised of faculty across all divisions with a research focus. The Education and Training Committee consists of the Chair, the Directors of the Medical and Physics Residency Programs as well as the Director of Medical Student Education. The Women's Academic Affairs is comprised of all female faculty and residents and focuses on gender issues including faculty recruitments and promotions. Finally, the Quality and Safety Steering Committee oversees all quality-related issues in the department including quality assurance and safety programs.

See the Department Bylaws for a more complete review of the Department Committees and Sub-Committees.

Clinical Programs

The UCSD Department of Radiation Medicine and Applied Sciences offers patients access to cutting-edge technologies for adult and pediatric tumors, including stereotactic radiosurgery (SRS), stereotactic body radiation therapy (SBRT), IMRT, IGRT and proton therapy. A wide variety of brachytherapy programs are also available for patients with breast, gynecologic, prostate, ocular and lung cancers.

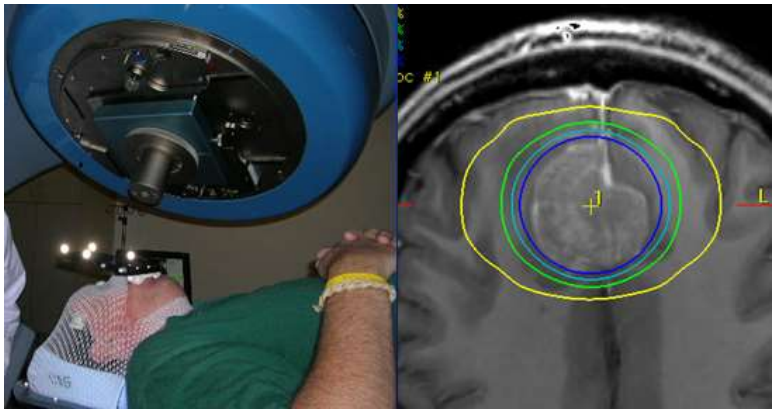
Department clinicians attend tumor boards at both the main campus, satellites and affiliates hospitals, including the VA, Rady Children's Hospital and Kaiser Permanente.

Conference	Frequency	Faculty Representative(s)
UCSD Moores Cancer Center		
Breast Cancer	Weekly	Yashar, Einck
Brain Tumor	Weekly	Hattangadi, Sanghvi
Gynecologic Oncology	Bi-Monthly	Yashar, Einck, Mell
Gastrointestinal (GI) Tumors	Weekly	JMurphy, Hattangadi
Head and Neck Cancer	Weekly	Mell, Sanghvi
Genitourinary (GU) Cancers	Weekly	Einck, Sandhu
Leukemia/Lymphoma/BMT	Weekly	Sanghvi
Soft Tissue/Bone	Bi-Monthly	Einck
Rady Childrens Hospital		
General Tumor Board	Bi-Monthly	KMurphy
Brain Tumors	Monthly	KMurphy
Encinitas		
Breast Cancer	Weekly	Urbanic
Lung Cancer	Bi-Monthly	Urbanic
VA Hospital		
General	Weekly	Sandhu
Lung Cancer	Weekly	Sandhu
Kaiser Permanente Hospital		
General Tumor Board	Weekly	Mundt, JMurphy, Urbanic
Breast Cancer	Bi-Weekly	Yashar, Einck, Mansy
Head and Neck Cancer	Bi-Weekly	Mell, Sanghvi
Pulmonary	Bi-Weekly	Sandhu

UCSD Radiation Oncology offers numerous cutting-edge clinical programs, many not available elsewhere in the region. Several clinical programs are highlighted below:

FRAMELESS BRAIN STEREOTACTIC RADIOSURGERY

The stereotactic radiosurgery (SRS) program at UCSD is a joint program between Radiation Oncology and Neurosurgery. Initially using a customized bite-block and infrared-based localization, Department physicians have tremendous experience with frameless SRS in patients with malignant and benign CNS tumors and staff two multidisciplinary clinic with UCSD and Kaiser Neurosurgeons.



Attention has recently turned to the development of a novel frameless bite block-less SRS approach using 3-D surface video cameras. The 3D surface of the patient is monitored in real-time. UCSD was the *first* center in the world to offer this novel approach.

Recent SRS Publications

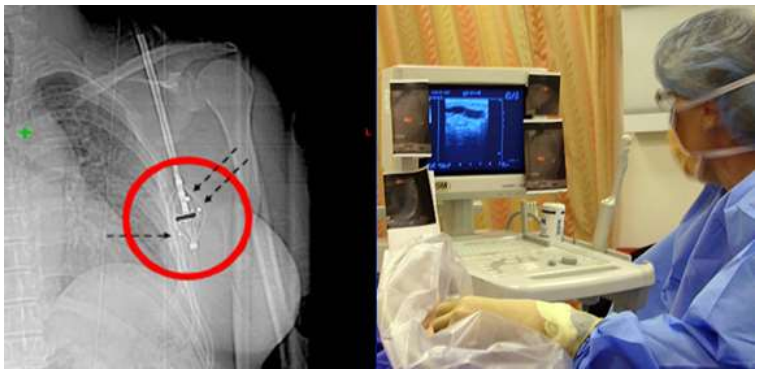
Pan H et al. Frameless real time surface guided-radiosurgery: clinical outcomes for brain metastases. *Neurosurgery* 2012;71:844

Nath S, et al. Single-isocenter frameless intensity modulated stereotactic radiosurgery for simultaneous treatment of multiple metastases: clinical experience. Int J Radiat Oncol Biol Phys 2010;78:91-7

Nath SK, et al. Optically-guided frameless linac-based radiosurgery for brain metastases: clinical experience. J Neurooncol 2010;97:67-72

BRACHYTHERAPY

UCSD Radiation Oncology has brachytherapy programs in multiple disease sites, including breast cancer, prostate cancer, gynecologic tumors, lung cancer and ocular tumors.



Dr. Catheryn Yashar, Chief of the Breast Oncology Service, and Medical Physicist Daniel Scanderbeg PhD, were pioneers in the treatment of early stage breast cancer patients using the novel brachytherapy SAVI device.

Another tumor frequently treated with brachytherapy at UCSD is prostate cancer. In 2009, Dr. John Einck, Chief of the Prostate Brachytherapy Service, was recruited to develop a new prostate brachytherapy program together with medical physicist Dan Scandereg PhD. Patients with early stage disease are treated with LDR brachytherapy and high risk patients undergo HDR brachytherapy in conjunction with external beam irradiation.

Recent Brachytherapy Publications

Yashar C, Scanderbeg D, et al. Initial clinical experience with the Strut-Adjusted Volume Impalnt (SAVI) breast brachytherapy device for accelerated partial breast irradiation: first 100 patients with more than 1 year of follow-up. Int J Radiat Oncol Biol Phys 2011;80:765

Eskander RM et al. Comparison of computed tomography and magnetic resonance imaging in cervical cancer brachytherapy target contouring. Int J Gynecol Cancer 2010;21:47-53

Yashar CM, et al. Initial clinical experience with the strut-adjusted volume implant brachytherapy applicator for accelerated partial breast irradiation. Brachytherapy 2009;8:367-72

IGRT AND IMRT IN GYNECOLOGIC CANCER

UCSD physicians have a long history and experience applying novel radiation approaches in gynecologic cancers. Dr. Arno Mundt pioneered the use of IMRT in gynecology patients over a decade ago. In a series of outcome series, he demonstrated that IMRT was highly effective at reducing the risk of long term side effects in these women.

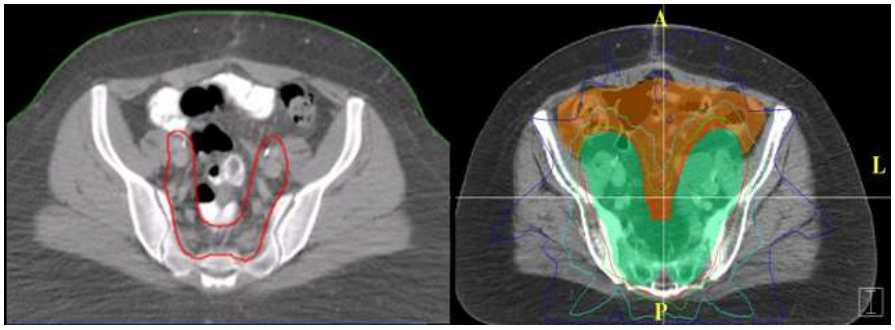


Illustration of the target volume (left) used in a cervical cancer patient undergoing IMRT and the treatment plan (right) in this patient.

Dr. Catheryn Yashar, Chief of the Gynecologic Oncology Service, and Dr. Loren Mell, Director of the Division of Clinical and Translational Research have built on this experience by incorporating novel imaging techniques for treatment planning and in-room imaging for optimizing treatment delivery. Drs. Mundt, Yashar and Mell are frequent invited lecturers on novel radiation technologies in cervical cancer and other gynecologic tumors at national and international symposia and conferences. In addition, all 3 are on the editorial board of the *International Journal of Radiation Oncology, Biology and Physics.*

<u>Recent Gynecologic IGRT and IMRT Publications</u>

Liang Y et al. Prospective study of functional bone marrow-sparing intensity modulated radiation therapy with concurrent chemotherapy for pelvic malignancies. Int J Radiat Oncol Biol Phys 2013;85:406

Hasselle MD, et al. Clinical outcomes of intensity-modulated pelvic radiation therapy for carcinoma of the cervix. Int J Radiat Oncol Biol Phys 2011;80:1436

Rose BS, et al. Normal tissue complication probability modeling of acute hematologic toxicity in cervical cancer patients undergoing chemoradioterhapy. Int J Radiat Oncol Biol Phys 2011;79:80

Tyagi N et al. Daily on-line cone beam computed tomography to assess interfractional motion in patients with intact cervical cancer. Int J Radiat Oncol Biol Phys 2011;80:273

PEDIATRIC ONCOLOGY

As the sole provider of radiation oncology services to Rady Children's Hospital, the UCSD Radiation Oncology Department treats all children undergoing radiotherapy in the San Diego region.

In collaboration with medical oncologists and surgeons at Rady Children's Hospital, Dr. Kevin Murphy, Chief of the Pediatric Oncology Service, is committed to

implementing novel radiation technologies in children, many of which while commonly used in adults are not used in children. UCSD has one of the largest experiences in the world using frameless cranial SRS and SBRT in children. UCSD pediatric patients are treated at the Scripps Proton Therapy Center.

Dr. Murphy with a child undergoing SBRT for metastatic medulloblastoma. A pediatric patient treated with frameless SRS on the Varian Trilogy Machine.

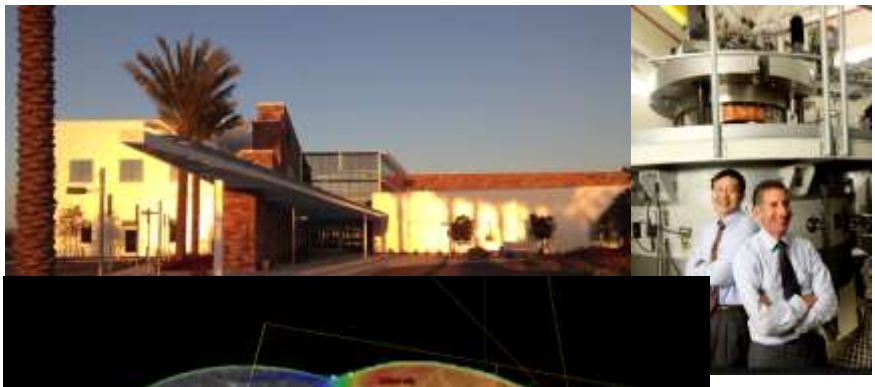
Recent Pediatric Publications

Nath SK, et al. Observed magnetic resonance imaging changes in pediatric patients treated with stereotactic radiosurgery. Childs Nervous Syst 2011;27:399

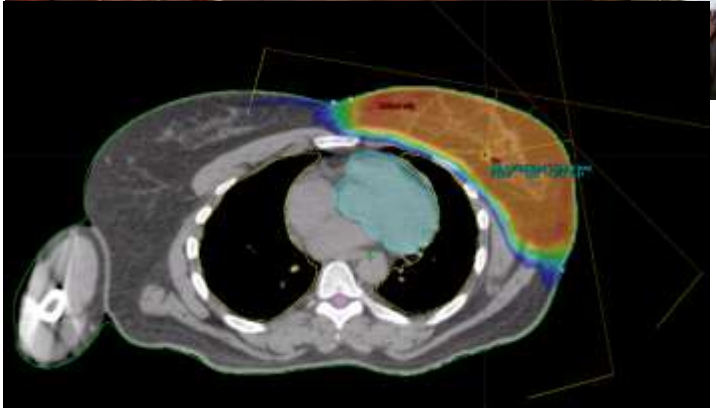
Keshavarzi S, Meltzer H et al. Initial clinical experience with frameless optically guided stereotactic radiosurgery/radiotherapy in pediatric patients. Childs Nerv Syst 2009;25:837

PROTON THERAPY

In 2013, UCSD formed a partnership with the Scripps Proton Therapy Center. Currently 8 UCSD radiation oncologists are credentialed at the Proton Center and all Scripps Proton Therapy physicians and physicists have department faculty appointments. Under the direction of Carl Rossi MD, Medical Director of the Center and Director of the Division of Proton Therapy and Particle Research, the center opened in later 2013 in near-by Mira Mesa and includes 5 treatment rooms (3 gantry, 2 fixed beam), making it one of the largest proton therapy centers in the United States. In addition, there are ancillary MRI and CT diagnostic imaging facilities on site. The UCSD-Scripps Partnership includes rotations for all the UCSD radiation oncology and medical physics residents and joint research programs.



The Scripps Proton Therapy Center (left) is an over $225M 100,000 square foot facility in near by Mira Mesa. Carl Rossi MD and Lei Dong PhD, Director of Physics at the Proton Center are shown at right in front of the cyclotron.



A proton treatment plan (left) in a patient with left-sided breast cancer.

This highly conformal approach allows treatment of the entire breast and internal mammary nodal region with virtually no dose to the underlying lung and heart.

Recent Proton Publications

Talcott JA, Rossi C et al. Patient-reported long-term outcomes after conventional and high-dose combined proton and photon radiation for early prostate cancer. *JAMA* 2010;303:1046

Yang et al. Comprehensive analysis of proton range uncertainties related to patient stopping-power-ratio uncertainties using the stoichiometric calibration. *Phys Med Biol* 2012;57:4095

VETERINARY ONCOLOGY COLLABORATION

The department is currently establishing clinical, research and educational collaborations with veterinary oncologists at the Angel Care Cancer Center in San Diego. To this end, faculty appointments have been proposed for two academic veterinarians specializing in oncology: Gregory Ogilvie DVM and David Proulx DVM. Joint educational programs, research grants and clinical trials are planned.

Radiation Oncology facilities at Angel Care Cancer Center: Left: a cat undergoing radiation therapy under general anesthesia and right: a state-of-the-art linear accelerator.

Stereotactic Radiosurgery on a dog (left) with a paranasal sinus tumor (right) performed at the Encinitas facility

Recent Veterinary Oncology Publications

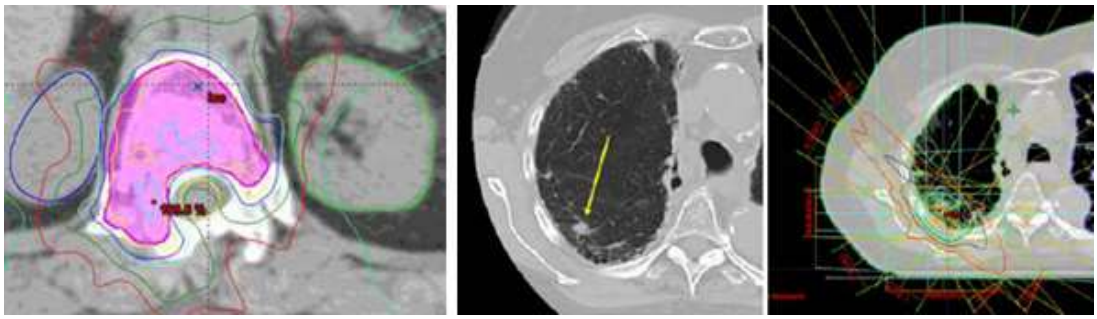
Rossi G, et al. Ex vivo evaluation of imatinib mesylate for induction of cell death on canine neoplastic mast cells with mutations in c-Kit exon 11 via apoptosis. *Vet Res Commun* 2013 (in press)

Gentschev I et al. Characterization and evaluation of a new oncolytic vaccinia virus strain LIVP6.1.1 for canine cancer therapy. *Bioengineered* 2013;4(2):84-9

Green M et al. Diagnosis and treatment of tracheal basal cell carcinoma in a Maine coon and long-term outcome. *J Am Anim Hosp Assoc* 2012;48(4):273

STEREOTACTIC BODY RADIATION THERAPY (SBRT)

SBRT is a common treatment approach at UCSD in a variety of tumor sites including lung, spine and liver tumors. All patients with lung and liver SBRT are planned using 4DCT and frequently treated with respiratory-gating.



Recent SBRT Publications

Park JC et al. Four-dimensional cone-beam computed tomography and digital tomosynthesis reconstructions using respiratory signals extracted from transcutaneously inserted metal markers for liver SBRT. Med Phys 2011;38:1028

Nath S et al. Locoregional and distant failure following image-guided stereotactic body radiation for early-stage primary lung cancer. Radiother Oncol 2011;99:12

Research

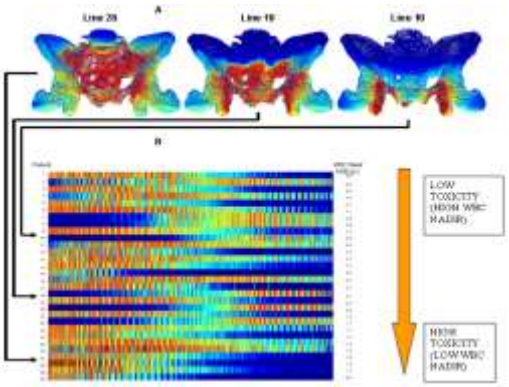
Department Research activities are divided into 3 main areas: Technology, Clinical and Basic Science. These efforts are under the direction of Todd Pawlicki, Loren Mell MD and Sunil Advani MD. For a more detailed description of on-going research programs see http://radonc.ucsd.edu/Research/index.asp. With the partnership with the Scripps Proton Therapy Center, the department's research activities have been expanded to include proton therapy and particle research.

CLINICAL AND TRANSLATIONAL RESEARCH

The Clinical Research division was established with the recruitment of Loren Mell MD in 2008. His primary focus has been on the development and application of

IRTOC
International Radiotherapy Technologies and Oncology Consortium

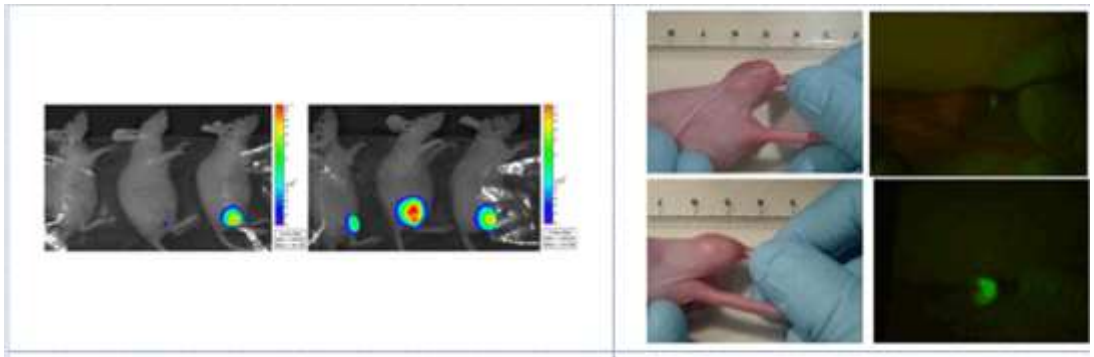
novel radiation approaches in patients with cervical cancer and other malignancies. He is the founder and Principal Investigator of an international radiation cooperative group focused on the use of advanced technologies in women with cervical cancer, with members throughout the United States and in 25 foreign countries.



Dr. Mell has developed novel planning approaches to reduce bone marrow toxicity in gynecologic and other cancer patients receiving chemoradiotherapy, a major barrier to increasing treatment intensity. An ASCO Young Investigator Award recipient, Dr. Mell has developed statistically-based approaches to identify critical BM areas which can be spared during treatment. He has also investigated, together with Graeme Bydder MD (Radiology), novel imaging approaches to characterize BM sub-regions, many of which were developed here at UCSD.

T2 Pulse Echo MR image (left) of a cervical cancer patient undergoing treatment used map areas of hematopoetically active bone marrow (middle).*

In 2009, Dr. Sunil Advani joined the Department launching our Basic Science Research Programs. His initial work focused on interactions of ionizing radiation and vaccinia viruses. Preliminary data suggest that irradiating tumors prior to virus administration significantly increases viral replication and cell kill. Experiments are underway to explore the mechanism of this interaction which laid the foundation for a clinical trial currently underway combining virus, chemotherapy and radiation in locally advanced head and neck cancer patients.



Demonstration of viral infection and replication within a human lung cancer tumor implanted on a mouse hind leg.

Demonstration of the difference between viral replication within a tumor which is not irradiated (top) vs irradiated (bottom)

Dr. Advani is also closely collaborating with other basic scientists in the Cancer Center including Santosh Kesari MD PhD (who holds a joint appointment between

Neurosciences and Radiation Medicine), David Cheresh PhD and Nobel Laureate Roger Tsien PhD.

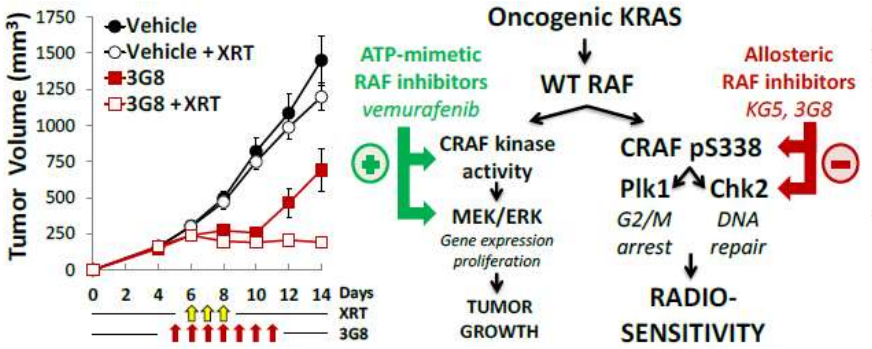
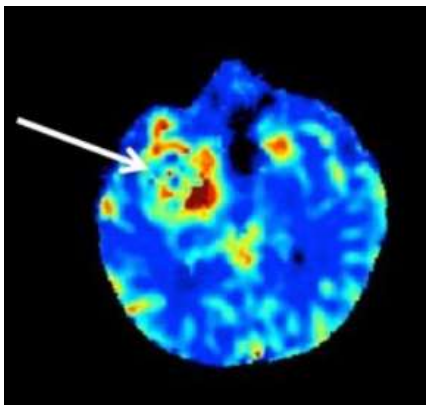


Figure 3: Combining 3G8 with low-dose XRT produces irreversible tumor growth arrest

- Mice bearing subcutaneous xenografts were treated with 3G8 (50 mg/kg p.o. for 7 days) +/- XRT (2 Gy x 3 fractions on Days 6-8). 3G8 alone was cytostatic, while 3G8/XRT was cytotoxic and produced a lasting response.
- 3G8 impacts cell cycle progression and DNA repair to sensitize pancreatic cancer to radiotherapy. In contrast, ATP-mimetic RAF inhibitors activate MEK/ERK in tumors with oncogenic KRAS / wildtype RAF.

Recently, several new faculty were recruited focusing on clinical translational research including James Murphy MD, Jona Hattangadi-Gluth MD and James Urbanic MD.

Dr. Hattangadi-Gluth's research focuses on the use of innovative functional MRI in radiation planning, measuring response to radiation in brain tissue, and neurocognition and quality of life after brain radiation therapy. Her current work involves the quantitative and neuro-anatomic analysis of radiation-induced white matter compromise in the brain and correlation to cognitive impairment.



This is an innovative and ground-breaking endeavor with direct implications on treatment planning and cognitive-sparing brain radiotherapy. Dr. Hattangadi-Gluth is a recent recipient of a K Award from the UCSD Clinical Translational Research Institute (CTRI) supporting her work.

Dr. Murphy's research interests revolve around improving healthcare delivery in radiation oncology, with a focus on three areas: eliminating treatment disparity, reducing cost, and increasing quality of care. With treatment disparity he has partnered with Elena Martinez on a large-scale epidemiology project in metastatic colorectal cancer where they have discovered that racial differences in referral patterns and subsequent treatment account for a substantial portion of the inferior survival that minority patients experience. This study will help identify barriers that once tackled will reduce racial disparity and improve outcomes and was accepted for publication in the prestigious *Journal of the National Cancer Institute* (JNCI). With cost, ongoing research will help define the magnitude and impact of patient out-of-pocket cost for health care in patients receiving radiation therapy. This research will quantify this potentially substantial underreported burden for cancer patients. Dr. Murphy is a

recent recipient of several research grants including a K Award from the Clinical Translational Research Institute and a Young Investigator Award from the NCCN.

Recruited from Wake Forest University in 2014, Dr. James Urbanic joins the Department as the Associate Division Chief for Clinical Trials in the Division of Clinical and Translational Research. He is actively involved in national cooperative group trials sponsored by the Alliance and NRG Networks. He serves as the PI (or co-PI) of multiple cooperative group trials including CALGB 31102 and RTOG 1328, both focusing on concomitant chemoradiotherapy in locally advanced lung cancer.

Recent UCSD Clinical/Translational Research Publications

Zakeri K et al. Competing event risk stratification may improve the design and efficiency of clinical trials: secondary analysis of SWOG 8794. *Contemp Clin Trials* 2013;34:74-9

Liang Y et al. Impact of bone marrow radiation dose on acute hematologic toxicity in cervical cancer: principal components analysis on high dimensional data. *Int J Radiat Oncol Biol Phys* 2010;78:912-6

Mell LK et al. Predictors of competing mortality in advanced head and neck cancer. *J Clin Oncol* 2010;28:15-20

Murphy JD et al. Patterns of care in palliative radiotherapy: a population-based study. *J Oncol Pract* 2013;9:e220

Advani SJ et al. Preferential replication of systemically delivered oncolytic vaccinia virus in focally irradiated glioma xenografts. *Clin Cancer Res* 2012;18:2579-90

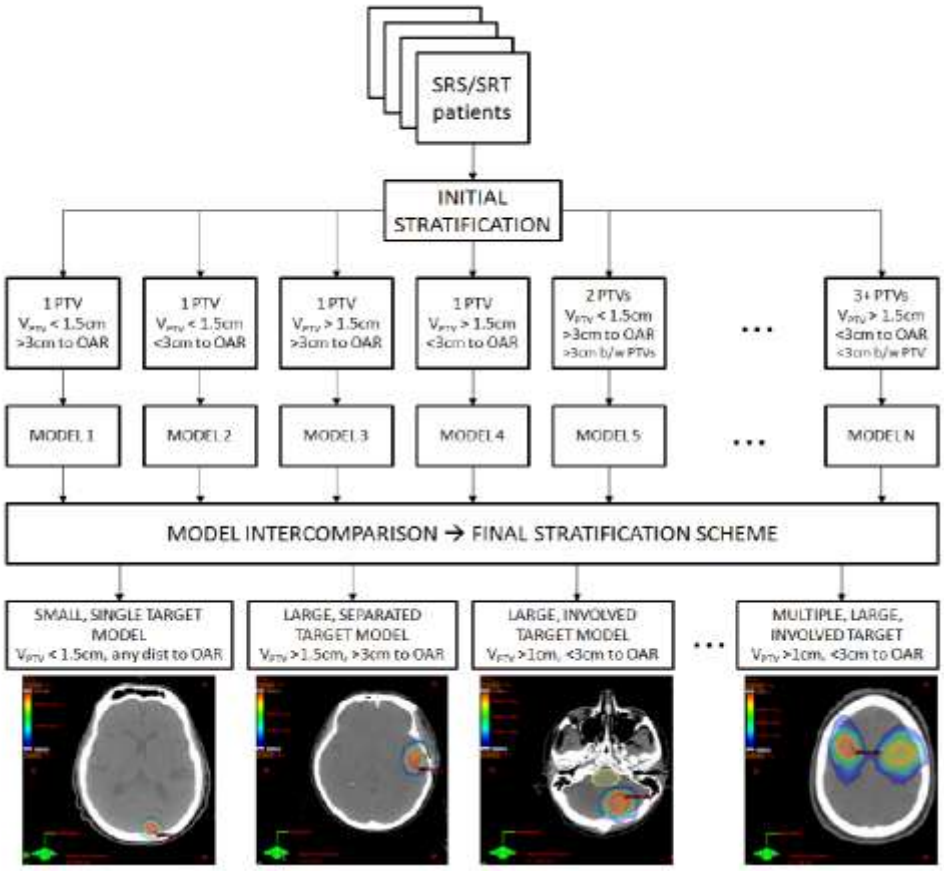
Mielgo A et al. A MEK-independent role for CRAF in mitosis and tumor progression. Nat Med 2011;17:1641-5

Advani SJ et al. Increased oncolytic efficacy for high-grade gliomas by optimal integration of ionizing radiation into the replicative cycle of HSV-1. Gene Ther 2011;18:1098

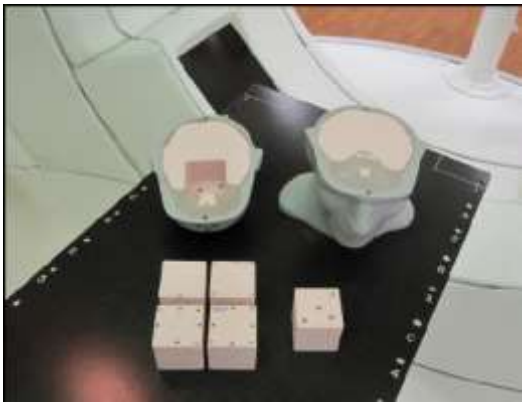
TECHNOLOGY RESEARCH

Technology Research efforts focus on a wide variety of topics ranging from novel treatment planning to novel brachytherapy approaches. Highlighted here are 2 translational technology projects: Knowledge-Based Treatment Planning and Single-Day MRI-based Stereotactic Radiosurgery.

Associate Division Director, Kevin Moore PhD, together with physicist and physician collaborators, is developing novel knowledge-based treatment planning approaches in stereotactic radiosurgery for benign and malignant tumors. Knowledge-based planning involves applying prior knowledge from large datasets of previously treated patients in order to optimize treatment planning of new patients, significantly improving plan quality. Initially applied to head/neck and prostate cancer patients undergoing conventional fractionation, Dr. Moore is currently applying this novel approach to patients undergoing single-fraction radiosurgery.



Director of Medical Physics and Technology, Dr. Todd Pawlicki together with physicist and physician collaborators, is working on a novel same-day MRI-based stereotactic radiosurgery technique which avoids the need for CT simulation. Using in-room cone-beam CT imaging, this approach allow treatment planning to be based prior MR imaging significantly increasing patient throughput.



Recent UCSD Clinical/Translational Research Publications

Liang Y, Kim GY, Pawlicki T, Mundt AJ, Mell LK. Feasibility study on dosimetry verification of volumetric-modulated arc therapy-based total marrow irradiation. JACMP 2013;14:3852

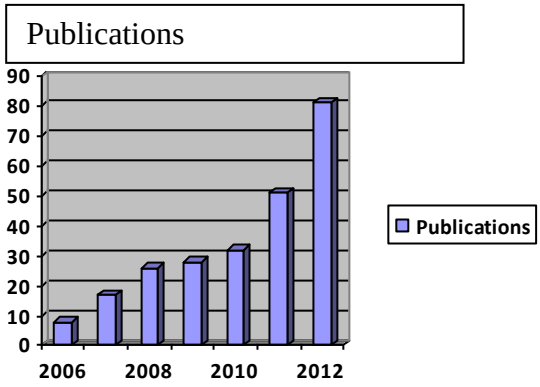
Marks LB, Adams RD, Pawlicki T, Blumberg AL, Hoopes D, Brundage MD, Fraass BA. Enhancing the role of case-oriented peer review to improve quality and safety in radiation oncology: Executive summary. Pract Radiat Oncol 2013 Jul;3(3):149-156.

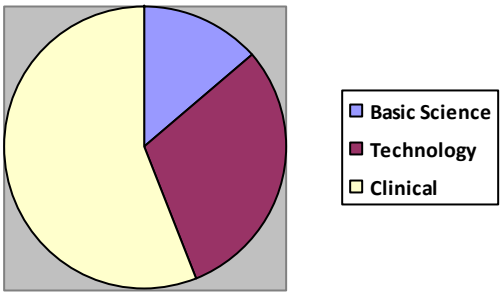
Sanghangthum T, Suriyapee S, Kim GY, Pawlicki T. A method of setting limits for the purpose of quality assurance. Phys Med Biol 2013;58:7025

Moore KL, Kagadis GC, McNutt TR, Moiseenko V, Mutic S Vision 20/20: Automation and advanced computing in clinical radiation oncology. Med Phys 2014 Jan;41:1

DEPARTMENT PUBLICATIONS AND ACADEMIC ACTIVITY

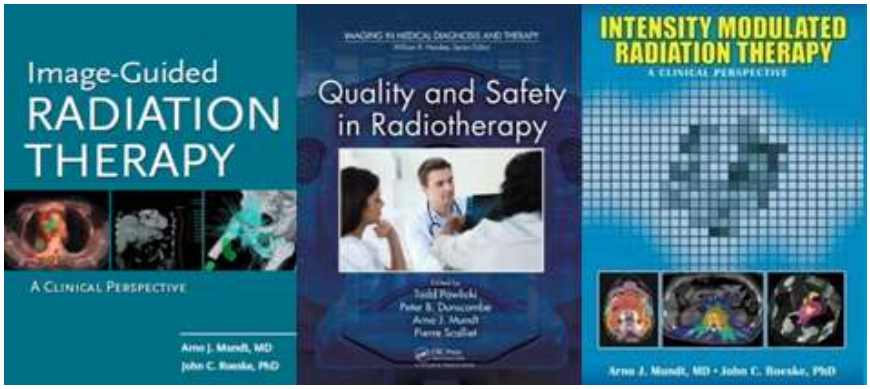
Since the founding of the department in 2006, Department researchers and other faculty have produced considerable academic output, in terms of journal articles (see graph), reviews and book chapters, many published in prestigious radiation oncology and physics journals including the *Journal of Clinical Oncology, Medical Physics, Physics in Medicine and Biology, International Journal of Radiation Oncology Biology and Physics,* and the *Journal of Applied Clinical Physics* among others. See Appendix II for a listing of departmental publications over the last 2 years.

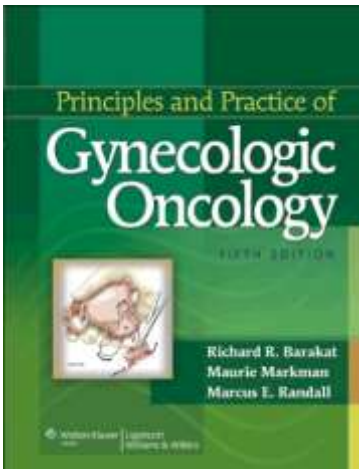




The majority of articles are clinical outcomes or clinical translational studies (56%), covering a wide range of clinical sites and procedures. The most common disease sites were CNS, gynecologic and breast cancers. The percentage of physics/technology and basic sciences articles were 30% and 14%, respectively.

Several faculty serve as Editors of prominent Radiation Oncology textbooks. Dr. Mundt is the Editor of two recent technology textbooks: *Intensity Modulated Radio-therapy: A Clinical Perspective* and *Image Guided Radiotherapy: A Clinical Perspective.* The later book includes over 275 contributors from 18 countries. In addition, Dr. Pawlicki and Dr. Mundt are Co-Editors of the first and only textbook focused on quality assurance in Radiation Oncology entitled *Quality and Safety in Radiotherapy.* The Department has also had a significant presence at national Radiation Oncology and Medical Physics meetings, including the American Society for Radiation Oncology (ASTRO) and the American Association of Physicists in Medicine (AAPM).





Dr. Catheryn Yashar (left), Chief of the Gynecologic Cancer Service, has been named an editor of the prestigious Principles and Practice of Gynecologic Oncology *textbook.*

Department Faculty serve as Editors of multiple prestigious Radiation Oncology journals including *Medical Physics, Physics in Medicine and Biology, American Journal of Clinical Oncology, Women's Oncology Review, Radiation Medicine Rounds, Journal of Biomedicine and Biotechnology,* and *Medical Dosimetry*.

Dr. Cate Yashar serves as the Senior Editor (Gynecologic Oncology) for the *Red Journal*. Drs. Mell has been named an Associate Editor.

Department faculty also are reviewers for numerous prestigious Radiation Oncology, Medical Physics and other journals including *International Journal Radiation Oncology Biology Physics, Medical Physics, Journal of Clinical Oncology, Gynecology Oncology, New England Journal of Medicine, Physics in Medicine and Biology, Cancer Research, American Journal of Obstetrics and Gynecology,* among others.

DEPARTMENTAL RESEARCH FUNDING

The Deaprtment was early on awarded a $750,000 Master Research Grant from Varian Oncology Systems, the largest manufacturer of Radiation Oncology equipment in the world. Varian Master Research Grants are awarded only to prominent academic departments, including those at Harvard and Stanford University. For a more detailed description of CART research programs see http://radonc.ucsd.edu/Research/index.asp

Funding has also been obtained from the National Institutes of Health (NIH) including several R21s and a R-01 focused on low-dose cone beam CT imaging. Other grants have been obtained from the American Society of Clinical Oncology (ASCO), Department of Defense, and industry (VisionRT, CIVCO, Cianna Medical and NVIDIA).

Department researchers are also recipients of a $1.5 M Grant from the UCOP (Lab Research Program) along with collaborators from the Lawrence Livermore National Laboratory and the San Diego Supercomputer Center.

Education

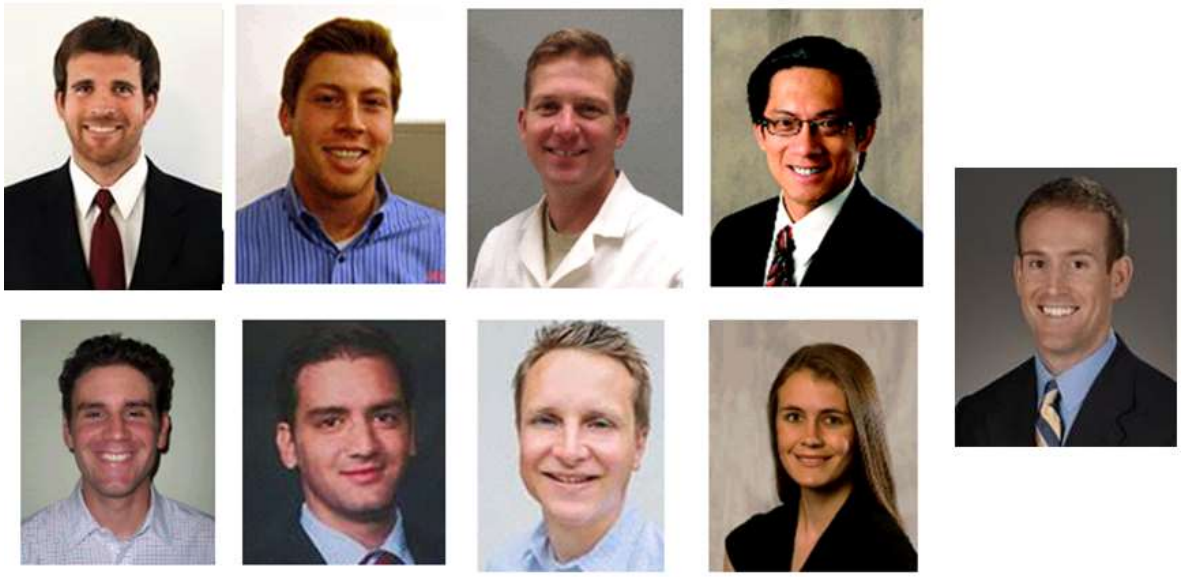
As the long-time Residency Program Director at the University of Chicago, Dr. Mundt was committed to establishing a Radiation Oncology residency program at UCSD upon his arrival. Moreover, as a member of the national accreditation committee for Medical Physics Residency Programs, he was also committed to developing a Residency Program in Medical Physics at UC San Diego.


The first physics resident was admitted in July 2007. Applications are now routinely received from throughout the United States and abroad. In 2014, Derek Brown PhD (lower left), a recent recruit from the University of Calgary, was named the Director of the Physics Residency Program. Current Physics residents are: Adam Yock PhD (right) and Ryan Manger PhD (left)


The application for a Radiation Oncology residency program was approved by in September 2010 initially with 4 residents. In 2012, the complement was increased to 8 and in 2014 the total complement was increased to 12.

Dr. John Einck (above right), who previously served as the Residency Program Director at the University of Washington, is as the Residency Program Director.

See Residency Website for more information http://radonc.ucsd.edu/training-education/residency/Pages/default.aspx



Current Medical Residents:
(Clockwise, upper far left):
Dan Seible MD, Danny Simpson MD MS, Steve Davis MD*, Nhat-Long Pham MD PhD*, Jeff Burkeen MD MS, Erin Gillespie MD, Tyler Seibert MD PhD. Kaveh Zakeri MD. Anthony Paravati MD MBA
*Co-Chief Residents

The Radiation Oncology faculty members are very involved with medical student education and oversee multiple courses including the 4th Year clerkship, the 3rd Year

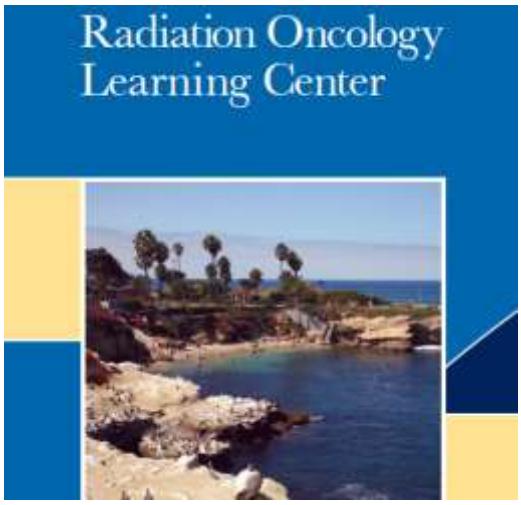
Selective rotation and two research electives. Radiation Oncology is part of the 2nd year curriculum as well. The Director of Medical Student Education is Jim Murphy MD.

Dr. Mell (far left) and Dr. Mundt (far right) with 4th Year Medical Students Brent Rose (2nd from left), Daniel Simpson (3rd from left) and Sameer Nath (2nd from right) who are currently radiation oncology residents at Harvard, Yale and UCSD. Dr. Mundt "hooding" Dr. Daniel Simpson.

Faculty members also participate in national education programs for Radiation Oncologists and Medical Physicists, sponsored by ASTRO and AAPM. Faculty education efforts even include yearly educational programs for San Diego High School students at a variety of schools. Each year, Dr. Yashar provides lectures and tours of the Department to high school girls interested in careers in medicine and science as part of the BE WISE (Better Education for Women in Science and Engineering) Program.

Catheryn Yashar MD, Associate Professor and Director of Medical Student Education, presenting to BE WISE students at the Moores Cancer Center

In 2010, the Department launched the UCSD Radiation Oncology Learning Center offering e-learning classes on a variety of cancer topics and treatment procedures to physicians and physicists worldwide. On-line classes are currently available on SBRT, SRS and Paperless Technologies. Dr. Derek Brown was named the Learning Center Director in 2014.



Learning Center Brochure
http://radonc.ucsd.edu/lc/index.asp

A component of the Learning Center is remote treatment planning, providing centers around the world the opportunity to offer their patients sophisticated treatment planning despite their lack of new software and experienced personnel.

In addition, the Department sponsors on-site training courses for the employees of vendors. The extremely popular *Cancer 101* course is held quarterly in the Department for new Varian employees, providing participants with an in-depth review of oncology focusing on the role of radiation oncology in the treatment of adult and pediatric patients.

Facilities

The Department consists of 5 treatment centers in San Diego including 4 photon therapy centers (La Jolla, Encinitas (Coastal North County), 4S Ranch (Inland North County) and South Bay) and a new state-of-the-art proton center (Mira Mesa).

The location of the 4 photon treatment facilities in San Diego operated by the Department is shown on the left.

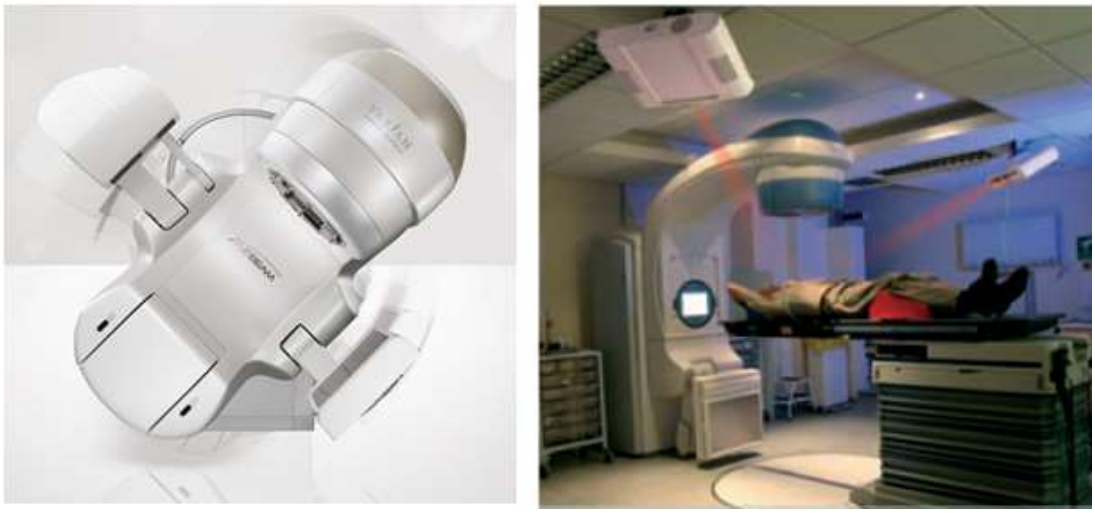
The main center is located in La Jolla with satellites in Coastal North County (Encinitas), In Land North County (4S Ranch), and South Bay (Eastlake). In 2013, the department also partnered with the Scripps Proton Therapy Center in Mira Mesa.

The La Jolla facility consists of administrative space, faculty offices, research and clinical space on the first floor of the Moores Cancer Center including a dedicated brachytherapy suite, wide bore CT simulator and 3Tesla MRI, as well as a conference center. Adjacent to the Cancer Center is a new 16,000 sq foot Department expansion consisting of additional clinical and administrative space including faculty offices, a PET/CT scanner and a dosimetry suite.

UCSD Moores Cancer Center (Main Building)

La Jolla Radiation Oncology expansion (Moores Cancer Center Building seen in the distance)

An exciting feature of the expansion facility is the installation of latest state-of-the-art Varian TrueBeam Linear Accelerator capable of cutting-edge treatment approaches including intensity-modulated radiotherapy (IMRT), image-guided radiotherapy (IGRT) and stereotactic radiosurgery (SRS). Another novel technology in the building is the AlignRT system, a video-based IGRT technology.



Varian Truebeam (left), AlignRT System (right)

In total, the department has 8 linear accelerators including 1 TrueBeam and 4 Trilogy Linacs. In collaboration with the Department of Radiology, PET-CT and 3T MRI machines in the La Jolla facility also used for simulation. In addition, a Xoft electronic brachytherapy machine was recently installed in the South Bay facility. The Scripps Proton Therapy Center includes 5 treatment rooms as well as PET/CT and MR imaging.

	La Jolla	North Coastal	North Inland	South Bay	Proton Center
Linacs	4	1	1	2	0
CT-Simulators	1	1	1	3	1
PET-CT[1]	1	0	0	1	1
3T MRI[1]	1	0	0	1	1
Proton Rooms	0	0	0	0	5
HDR Suite	Yes	No	No	No	No
Xoft	No	No	No	Yes	No
Radiosurgery	Yes	Yes	Yes	Yes	No
IMRT	Yes	Yes	Yes	Yes	Yes
IGRT	Yes	Yes	Yes	Yes	Yes

[1]Diagnostic unit equipped for simulation (shared with Radiology)

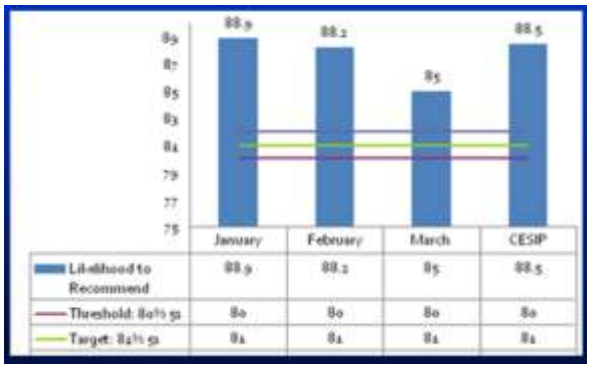
Encinitas (left) and South Bay (right) Radiation Oncology treatment centers

The patient waiting room at the new In-Land North County treatment facility in 4S Ranch.

The Scripps Proton Therapy is an over 100,000 square foot facility in nearby Mira Mesa. This $225M state-of-the art facility consists of 5 treatment rooms including 3 gantry and 2 fixed beam rooms, making it one of the largest proton treatment centers in the world. The Scripps Proton center is the first in the United States to offer patients access to novel Varian proton technology. The Varian ProBeam system is a revolutionary proton therapy approach with capabilities similar to the TrueBeam system. The Varian Dynamic Peak technology was specifically designed for pencil beam scanning used in proton therapy. The center also includes CT and MRI diagnostic imaging.

Patient Volumes

Radiation Oncology has seen a tremendous growth in patient volumes over the last 5 years. Last year, the department was awarded an exclusive contract with Kaiser Permanente resulting in nearly a doubling of the patient consults. In 2012-2013, the department had over 3600 patient consults. The average on daily on treatment numbers throughout the center is currently approximately 260 (130 La Jolla, 50 South Bay, 40 Encinitas, 4S CCare). A further increase is anticipated with increasing volumes at the proton therapy center.



Staff

With significant growth of the faculty and facilities, there was also significant growth in clinical, research, and administrative staff. In total, the Department has grown to over 150 staff members. Patient satisfaction is also a priority in the Department and Radiation Oncology consistently ranks among the top departments at UCSD in this area.

"Team Building" Retreat at Mission Trials Reserve attending by the faculty and staff

Service

Radiation Oncology occupies a prominent role on committees throughout the Hospital, Cancer Center and University. Dr. Mundt recognizes the importance of raising the stature and visibility of Radiation Oncology and encourages all faculty to serve on a variety of committees. Dr. Mundt serves with other Department Chairs on multiple leadership committees including the Board of Governors, Council of Chairs, Dean and Chairs Committee, Funds Flow Committee, Medical Staff Executive Committee.

A summary of the Hospital, Cancer Center and University committees on which Radiation Oncology faculty serve is shown below:

Radiation Medicine and Applied Sciences Faculty Committee Membership

Hospital

- Medical Staff Executive Committee
- Patient Care and Peer Review Committee
- Quality Improvement Committee
- Credentialing Committee
- Strategic Planning Steering Committee
- Geographic Footprint Design Team
- Real-Time Localization Systems Committee

Cancer Center

- Protocol Review and Monitoring Committee (PRMC)
- Cancer Center Committee
- Cancer Center Operations Cabinet
- Cancer Council
- Cancer Executive Committee
- VA Cancer Committee
- Rady Children's Cancer Committee
- Rady Hospital ACGME Committee
- Gynecologic Oncology Associate Team Leader
- Lung Cancer Associate Team Leader
- Solid Tumor Therapeutics Committee
- Neuro-Oncology Committee
- Charity Care Committee
- South Bay Cancer Collaborative Oversight Committee
- San Diego Cancer Center Oversight Committee
- Quality Committee
- Patient Experience Oversight Committee

University

- Board of Governors
- Council of Chairs
- Clinical Funds Flow
- SOM Recruitment and Admissions Committee (RAC)
- Committee on the Status of Women
- GME Core Curriculum Committee
- Radiation Safety Committee
- Senior Health Physicists Committee
- CTRI Research Committee
- Medical Student Clinical Education Working Group
- Human Exposure Review Committee (HERC)

Appendix I
Department Faculty

Arno J. Mundt MD FACRO FASTRO
Professor and Chair
An internationally-recognized academic and expert in novel technologies, Dr. Mundt is the author of over 150 journal articles, reviews and book chapters. He is the editor of several textbooks including *IMRT: A Clinical Perspective* and *IGRT: A Clinical Perspective*. He is the President of the American College of Radiation Oncology and a former Senior Editor of the *International Journal of Radiation Oncology Biology and Physics.* Dr. Mundt also serves as the UCSD Medical Director of the Scripps Proton Therapy Center and has been named a "Top Doctor" by the *San Diego Magazine*.

Kevin Murphy MD
Associate Professor and Vice-Chair
Dr. Murphy is Vice-Chair for Strategy and Business Development and Chief of the Pediatric Oncology Service. A member of the Children's Oncology Group (COG), his clinical interests include the use of novel technologies in adults and children, notably real-time surface-imaging image-guided radiosurgery. He splits his time between La Jolla and 4S Ranch. He also serves as the UCSD Pediatric Radiation Oncology Medical Director at the Scripps Proton Therapy Center.

Todd Pawlicki PhD FAAPM
Professor and Vice-Chair
A graduate of the Medical College of Ohio, Dr. Pawlicki completed his post-doc fellowship at Stanford. He was on the faculty of both the University of Pittsburgh and Stanford prior to being recruited to UCSD. He is an accomplished medical physicist, whose focus is on quality assurance. He is the lead editor of the international textbook *Quality and Safety in Radiotherapy,*

Division of Clinical Radiation Oncology

Parag Sanghvi MD MS
Assistant Professor and Division Director
A graduate of OHSU, Dr. Sanghvi received a Master's Degree in Epidemiology prior to his residency. Recruited to UCSD in 2011, he serves as the Chief of the Leukemia/Lymphoma Service and the Skin Cancer Service. Based at both La Jolla, Dr. Sanghvi serves as the Director of the Division of Clinical Radiation Oncology and oversees the clinics and medical directors at all treatment sites.

Gina Mansy MD
Associate Professor and South Bay Medical Director
Recruited in 2011 to serve as Medical Director of the South Bay Treatment Facility, Dr. Mansy completed her residency at Tufts University in Boston. A dedicated clinician, she has been named a "Top Doctor" by the *San Diego Magazine.* Her clinical focus is on breast and gynecologic cancers.

Ajay Sandhu MD
Professor and La Jolla Medical Director
Recruited to UCSD in 2005, Dr. Sandhu serves as the Chief of the Lung and Genitourinary Cancer Services. He received his training at the University of Rochester and serves as the La Jolla Medical Director overseeing Clinical Policies and Procedures and Weekly Quality Assurance Rounds. His clinical interests include IGRT in the treatment of prostate and lung tumors. He has been named a "Top Doctor" by the *San Diego Magazine.*

David Hoopes MD
Associate Professor and 4S Ranch Medical Director
Recruited to UCSD in 2014, Dr. Hoopes received his Radiation Oncology Training at Indiana University. Prior to joining UCSD, he serves as the Chief of Radiation Oncology at Travis Air Force Base and the Chief Military Consultant to the USAF Surgeon General for Radiation Oncology. He serves on the ASTRO Radiation Oncology Health Advisory Council (ROHAC).

John P. Einck MD
Associate Professor
Dr. Einck received his training at the University of Washington. He subsequently served on the faculty and later became a partner in the X Ray Medical Group in San Diego. Recruited to UCSD in 2009, Dr. Einck serves as the Chief of the Prostate Brachytherapy and Sarcoma services. His clinical practice is comprised primarily of prostate and breast cancer patients. An accomplished clinician, he has been named a "Top Doctor" by the *San Diego Magazine*.

Catheryn M. Yashar MD
Associate Professor
Double-boarded in OBGYN and Radiation Oncology, Dr. Yashar also completed a 2-year fellowship in Gynecologic Oncology prior to switching to Radiation Oncology. Recruited to UCSD in 2006, she serves as the Chief of the Breast Cancer and Gynecologic Cancer Services. A noted expert in both breast and gynecologic brachytherapy, she is the Radiation Oncology editor for *Principles and Practice of Gynecologic Oncology* textbook. He also serves as a Senior Editor of *International Journal of Radiation Oncology Biology and Physics.*

Douglas Rahn MD
Assistant Professor
A graduate of UCSD, Dr. Rahn joined the faculty in 2014. His clinical practice is in the UCSD Radiation Oncology South Bay facility where he focuses on patients with CNS, head and neck, and leukemia/lymphoma.

Division of Clinical Translational Research

Loren K. Mell MD
Associate Professor and Division Director
A graduate of the University of Chicago, Dr. Mell's research interests include image-guided radiation therapy, intensity modulated radiation therapy and clinical trial design. The Chief of the Head and Neck Cancer Service, he is the Principal Investigator of multiple clinical trials, including cooperative group studies conducted by the RTOG, and oversees several industry-funded research grants. Dr. Mell is an Associate Senior Editor of the *International Journal of Radiation Oncology Biology and Physics.*

James D. Murphy MD MS
Assistant Professor and Associate Division Director (Outcomes Research)
Recruited in 2012, Dr. Murphy completed his residency at Stanford University where he also received a Master's Degree in Epidemiology. He serves as the Chief of the Gastrointestinal Tumor Service as well as the Palliative Care Service. A dedicated clinical researcher, Dr. Murphy has published numerous clinical and physics studies focused on pancreatic cancer and other gastrointestinal tumors.

Jona Hattangadi-Gluth MD
Assistant Professor and Associate Division Director (Imaging Research)
Recruited in 2012 to serve as the Chief of the Central Nervous System (CNS) Tumor Service, Dr. Hattangadi-Gluth completed her residency at Harvard. Her research interests include novel radiation planning for malignant gliomas, the use of functional MRI in radiation planning and monitoring radiation response, and quality of life. She also serves as the Chief of the Liver Stereotactic Body Radiotherapy (SBRT) Service.

James Urbanic MD
Associate Professor and Associate Division Director (Clinical Trials)
A graduate of Wake Forest University, Dr. Urbanic served on faculty in the Department of Radiation Oncology until he was recruited to UCSD in 2014 to serve as the Encinitas Medical Director. He also serves as the Associate Director of Clinical Trials in the Division of Clinical and Translational Research and is active in both the Alliance and NRG clinical trial networks.

Sunil Advani MD
Assistant Professor and Division Director
Following Medical School, Dr. Advani was a Research Fellow at the Kovler Virology Oncology Laboratory. He completed his Radiation Oncology Residency at the University of Chicago. His research focus includes oncolytic viral therapies, novel radiosensitizers including allosteric inhibitors targeting the RAF oncogene and molecular mechanisms that mediate radioresistance.

Aladar Szalay PhD
Professor
Dr. Szalay received his PhD in 1971 and since has held academic positions at Universities in Europe, Canada and the United States, including Cornell, Loma Linda and the University of Wurzburg. An author of over 160 scientific papers and holder of over 50 patents, Dr. Szalay is CEO and President of Genelux Corporation, a La Jolla-based Biotech Company.

Utz Fischer PhD
Research Scientist
Dr. Fischer received his PhD in Biochemistry from the Free University in Berlin. After postdoctoral work at the University of Marburg, he completed a research fellowship at the Howard Hughes Medical Institute at the University of Pennsylvania. Since 2003 he has been Chair of the Department of Biochemistry at the University of Würzburg. His research focus is on human diseases caused by defects in RNA-metabolism.

Division of Medical Physics & Technology

Todd Pawlicki PhD FAAPM
Professor, Vice-Chair and Division Director
A graduate of the Medical College of Ohio, Dr. Pawlicki completed his post-doc fellowship at Stanford. He was on the faculty of both the University of Pittsburgh and Stanford prior to being recruited to UCSD. He is an accomplished medical physicist, whose focus is on quality assurance. He is the lead editor of the international textbook *Quality and Safety in Radiotherapy*,

Kevin Moore PhD
Assistant Professor and Associate Division Director
A graduate of the University of California Berkeley, Dr. Moore completed his Medical Physics residency in the Department of Radiation Oncology at Washington University. Prior to joining UCSD, he was initially an Instructor and more recently an Assistant Professor at Washington University. In 2013, Dr. Moore was named Director of the Medical Physics Residency Training Program.

Dan Scanderbeg PhD
Assistant Professor and Associate Division Director
Following completion of his PhD in Material Science and Engineering, Dr. Scanderbeg completed his residency at UCSD. He currently serves as the Technology Service Chief for Brachytherapy overseeing the brachytherapy treatment of patients with cervical cancer, prostate cancer, and choroidal melanoma.

Derek Brown PhD
Associate Professor and Associate Division Director
A graduate pf the University of Western Ontario, Dr. Brown joined the faculty of the University of Calgary prior to his recruitment to UCSD in 2014. He serves as the Program Director of the Medical Physics Residency Program, a role he also occupied at the University of Calgary. He has a strong interest in Global Health Care and is active in the organization *Radiating Hope* which is dedicated to bringing modern radiotherapy equipment to the developing world.

Steve Sutlief MD
Professor and Associate Division Director
Recruited to UCSD in 2014 to oversee the Department Satellite sites in Encinitas, South Bay and Rancho Bernardo, as well as to oversee QA programs in La Jolla, Dr. Sutlief most recently served as the Chief Medical Physicist of the VA Puget Sound and on faculty at the University of Washington. He is active on multiple AAPM committees and Task Groups, including the Work Group on the Prevention of Errors and TG 201.

Roger Rice PhD
Professor
A graduate of North Texas State University, Dr. Rice completed his post-doc fellowship in Medical Physics at Harvard. A long-time San Diegan, Dr. Rice joined UCSD in 1988 and with the establishment of the Department of Radiation Oncology was promoted to Full Professor. A dedicated clinical physicist and educator, he serves as the Chief of Physics at the Encinitas Treatment Facility.

Gwe-Ya (Grace) Kim PhD
Assistant Professor
A graduate of Yonsei University in her native Korea, Dr. Kim completed her post-doc fellowship in Medical Physics at Stanford University. Recruited to UCSD in 2009, Dr. Kim serves as the Technology Service Chief for Central Nervous System (CNS) and Pediatric Tumors. She also oversees Treatment Management for the Division.

Trent Ning PhD
Assistant Professor
Recruited to UCSD in 2008, Dr. Ning received his PhD from Indiana University. He currently serves as the Technology Service Chief for Leukemia/Lymphoma patients, particularly patients undergoing total body irradiation (TBI) in conjunction with high dose chemotherapy. In addition, Dr. Ning is in charge of Radiation Safety for the department.

Todd Atwood PhD
Assistant Professor
A graduate of Wake Forest University, Dr. Atwood completed his medical physics residency at Stanford University where he subsequently served on the faculty prior to his recruitment to UCSD in 2014 and served as the Deputy Director of the Medical Physics Residency Program.

Laura Cerviño PhD
Assistant Professor
Following completion of her PhD in Aerospace Engineering, Dr. Cerviño was a post-doctoral fellow in Medical Physics at UCSD in the Department of Radiation Oncology. She currently serves as the Technology Service Chief for both Breast and Gynecologic Cancers. Her research interest is in the application of surface-imaging image-guided radiotherapy (IGRT).

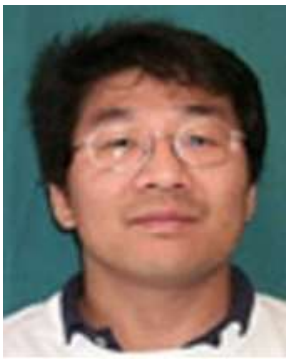
Vitali Moiseenko PhD FCCPM
Professor
Following completion of his PhD, Dr. Moiseenko did a post-doc fellowship at the National Radiological Protection Board in England. Prior to his recruitment to UCSD, he served as a Senior Medical Physicist at the British Columbia Cancer Agency. He is the Technology Service Chief for Genitourinary and Head/Neck Tumors and well as oversees Protocol, Calibration and Site Audits.

Irena Dragojevic PhD
Assistant Professor
Dr. Dragojevic completed her PhD at UC Berkeley and her residency in Medical Physics at UC San Diego. She is currently the lead physicist at the South Bay Treatment Facility in East Lake.

Jeremy Hoisak PhD
Assistant Professor
A native of Montreal Canada, Dr. Hoisak grew up in Ottawa and is a graduate of McMaster University and the University of Toronto. He is currently based at the South Bay Treatment Facility in East Lake.

Adam Paxton PhD
Assistant Professor
A graduate of the University of Wisconsin, Dr. Paxton completed his residency in Medical Physics at UCSD. His clinical interests focus on radiosurgery, SBRT and motion management. He is currently the chief physicist at the 4S Ranch Treatment Facility.

Amit Majumdar PhD
Associate Professor
A graduate of the University of Michigan, Dr. Majumdar is the Director of the Scientific Computing Applications group at the San Diego Supercomputer Center and a faculty member of the Center for Advanced Radiotherapy Technologies. His focus is on high performance computing applications in radiation oncology, specifically exploring the use of GPUs for real-time adaptive re-planning.



Dong Ju Choi PhD
Assistant Professor
Dr. Choi received his PhD in mechanical engineering and is a Senior Computation Scientist at the San Diego Supercomputer Center with a diverse expertise in high performance computing software, programming, optimization and visualization. His research focus is on the application of finite elements, acoustics, vibration, and control theory to nonlinear stress/strain analysis.

Bongyong Song PhD
Assistant Professor
A graduate of the University of California San Diego, Dr. Song is a Senior Staff Engineer at Qualcomm Research San Diego. His research interests include design, performance analysis and optimization of wireless networks, adaptive systems, and signal processing for communications. He is also interested in signal processing for bio-medical imaging and applications.

Division of Proton Therapy and Particle Research

Carl Rossi MD
Division Director
A graduate of Loyola University of Chicago, Dr. Rossi completed his residency at Loma Linda University. Prior to being recruited as Director of the Scripps Proton Therapy Center, Dr. Rossi was on faculty at Loma Linda University. A nationally-recognized leader in proton therapy, his clinical and research focus is on the application of proton therapy in genitourinary and lymphoma patients.

Huan Giap MD PhD
Dr. Giap received his MD PhD from the University of Texas MD Anderson Cancer Center and completed his Radiation Oncology Residency at Loma Linda University. Dr. Giap serves as co-chair of the publications committee of the Particle Therapy Co-Operative Group (PTCOG). His clinical and research focus is on the application of proton therapy in patients with GI, lung and breast cancers. He is also CEO of Strategic International Medical Business Alliance, an independent company which develops cancer centers in Southeast Asia.

Andrew Chang MD
Following his residency at Loma Linda University, Dr. Chang completed a fellowship in Pediatric Radiation Oncology at St. Jude Children's Research Hospital. Prior to being recruited to the Scripps Proton Center, Dr. Chang served as the Director of Pediatric Radiation Oncology at the Midwest Proton Radiotherapy Institute.

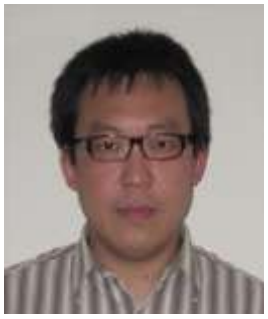
Ryan Grover MD
After receiving his MD from the Keck Medical School at the University of Southern California, Dr. Grover completed his Radiation Oncology residency at Loma Linda University. Prior to his recruitment to the Scripps Proton Therapy Center, Dr. Grover served as Chief of the Head and Neck cancer service at Loma Linda University. He now serves as the Director of the Head and Neck, Sarcoma, Gynecologic and CNS tumor programs.

Lei Dong PhD FAAPM
Dr. Dong received his doctoral degree in from the University of Texas MD Anderson Cancer Center in 1995. Prior to being recruited as the Director of Proton Therapy Physics, he was a tenured professor and Deputy Chair in the Department of Radiation Oncology at MD Anderson. He has conducted innovative research and clinical development in image guided radiation therapy and proton therapy

Anthony Mascia MS
After earning his Master of Science degree in Biomedical Physics from University of California, Los Angeles, Mr. Mascia worked at both the Indiana University Proton Center and the ProCure Proton Center in Oklahoma City. In Oklahoma, he led the development, integration and commissioning of ProCure's first proton therapy center.

Richard Lepage MS
After receiving his Master of Science in Radiologic Physics from San Diego State University, Mr. Lepage has practiced medical physics at multiple institutions throughout San Diego including Scripps and UCSD. Boarded in Radiation Oncology Physics, Diagnostic Radiology Physics and Nuclear Medicine Physics, he will be supervising the medical dosimetry team and the Proton Therapy Center.

Annelise Giebeler PhD
Prior to completing her doctorate degree in Medical Physics at the University of Texas MD Anderson Cancer Center, Dr. Giebeler worked as a dosimetrist at both the Loma Linda Proton Center and the MD Anderson Proton Center. At MD Anderson, she was also awarded a NIH pre-doctoral fellowship.



Gary (Yongbin) Zhang MS
Following completion of his Master's Degree in Electrical Engineering from the Ohio State University, Mr. Zhang worked as a computational scientist at the MD Anderson Cancer Center. An expert in medical image processing and mathematical modeling, he helped develop a high quality deformable image registration algorithm which was subsequently adopted by Varian.

Franko Puskulich MS
After receiving his Master of Science in Physics from California State University, Mr. Puskulich worked at the Loma Linda University Proton Center where he was responsible for machine quality assurance and dose verification.

Luis Perles PhD
Dr. Perles received his PhD in his native Brazil at the Universidade de Sao Paulo and completed his post-doctoral training at the MD Anderson Cancer Center in Houston Texas where he worked on proton Monte Carlo simulations and experimental measurements of proton dose with film, scintillators and ion

Division of Veterinary Oncology

Gregory Ogilvie DVM
Professor and Division Director
A graduate of Colorado State University, Dr. Ogilvie was on faculty at Colorado State University where he was a Tenured Professor and Director of the Medical Oncology. An author of 3 books including *Managing the Veterinary Cancer Patient*, he has authored over 200 articles and book chapters. He currently serves as the Director of the Angel Care Cancer Center and has been awarded two international patents and over $10M in research grants.

David Proulx DVM
Associate Research Scientist
A graduate of Tufts University School of Veterinary Medicine, Dr. Proulx completed residencies in both medical oncology and radiation oncology at North Carolina State University. During this training, he also earned a Master's Degree in Specialized Veterinary Medicine. Dr. Proulx is currently the head of radiation oncology at the Angel Care Cancer Center.

JOINT APPOINTMENTS

Santosh Kesari MD PhD
Associate Professor
Dr. Kesari earned a PhD in Molecular Biology and his MD from the University of Pennsylvania. He is the Director of Neuro-Oncology at the Moores Cancer Center, specializing in the treatment of brain tumors. He has a special interest in drug development, biomarkers for cancer detection and the behavior and potential therapeutic use of both normal and cancer stem cells.

Clark Chen MD PhD
Associate Professor
Dr. Chen is the Co-Director of Neurosurgical Oncology at UC San Diego. He is a neurosurgeon with dedicated interest in oncology and a leader in the study of DNA repair and genetic alterations in brain tumors. Prior to coming to UCSD, Dr. Chen led the brain tumor program at Beth Israel Deaconess Medical Center.

Appendix II
Department Publications
2010-2012

Dong B, Graves YJ, Jia X, Jiang SB. Optimal surface marker locations for tumor motion estimation in lung cancer radiotherapy. Phys Med Biol. 2012 Nov 23;57(24):8201-8215.

Haddad D, Zanzonico PB, Carlin S, Chen CH, Chen NG, Zhang Q, Yu YA, Longo V, Mojica K, Aguilar RJ, Szalay AA, Fong Y. A vaccinia virus encoding the human sodium iodide symporter facilitates long-term image monitoring of virotherapy and targeted radiotherapy of pancreatic cancer. J Nucl Med. 2012 Dec;53(12):1933-42.

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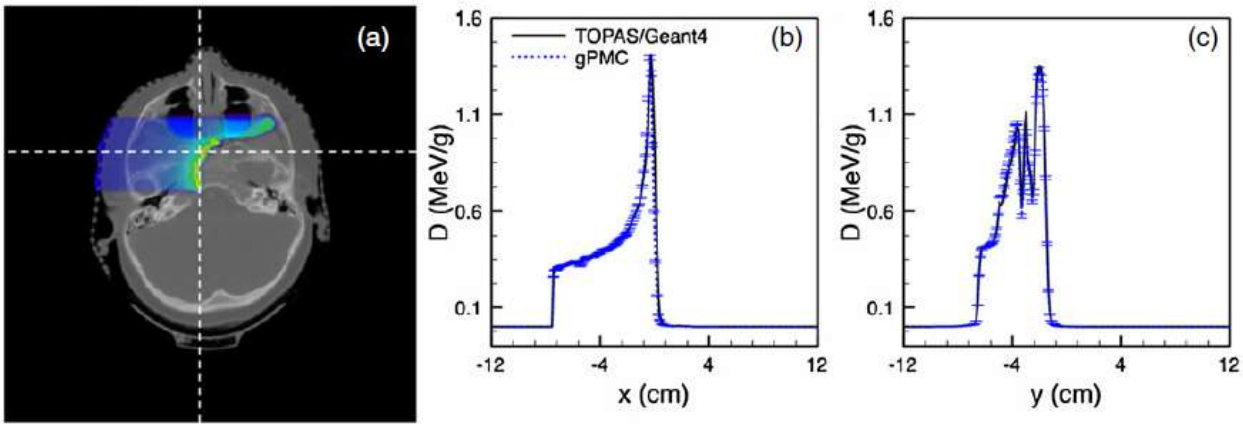

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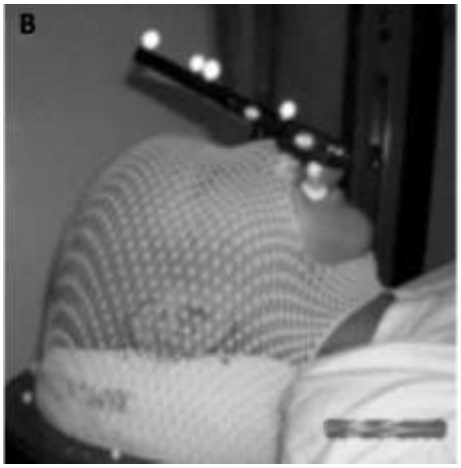

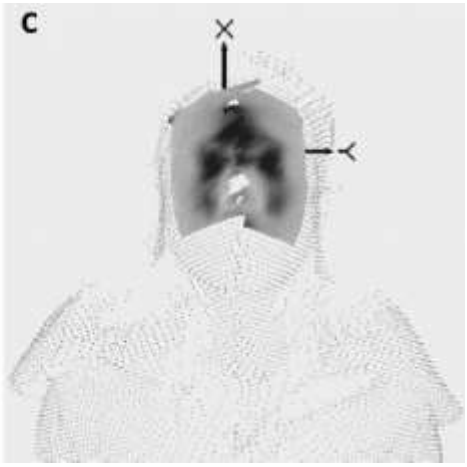

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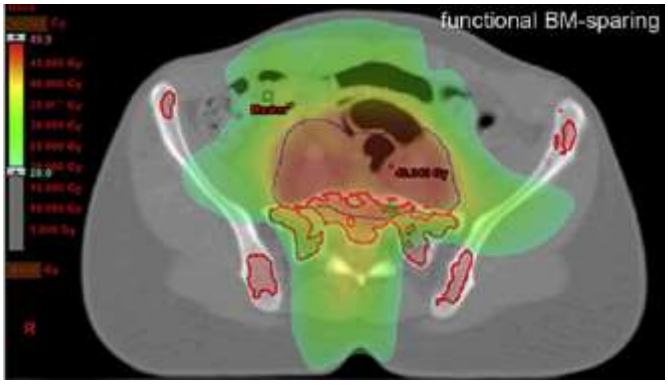

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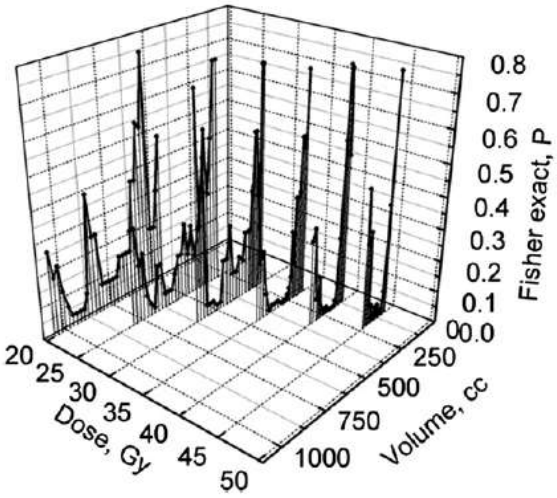

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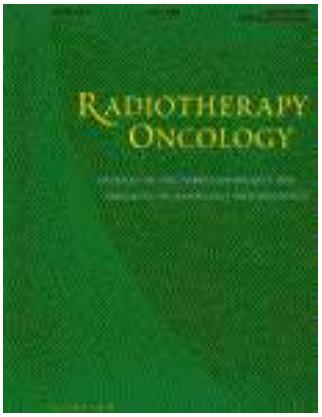

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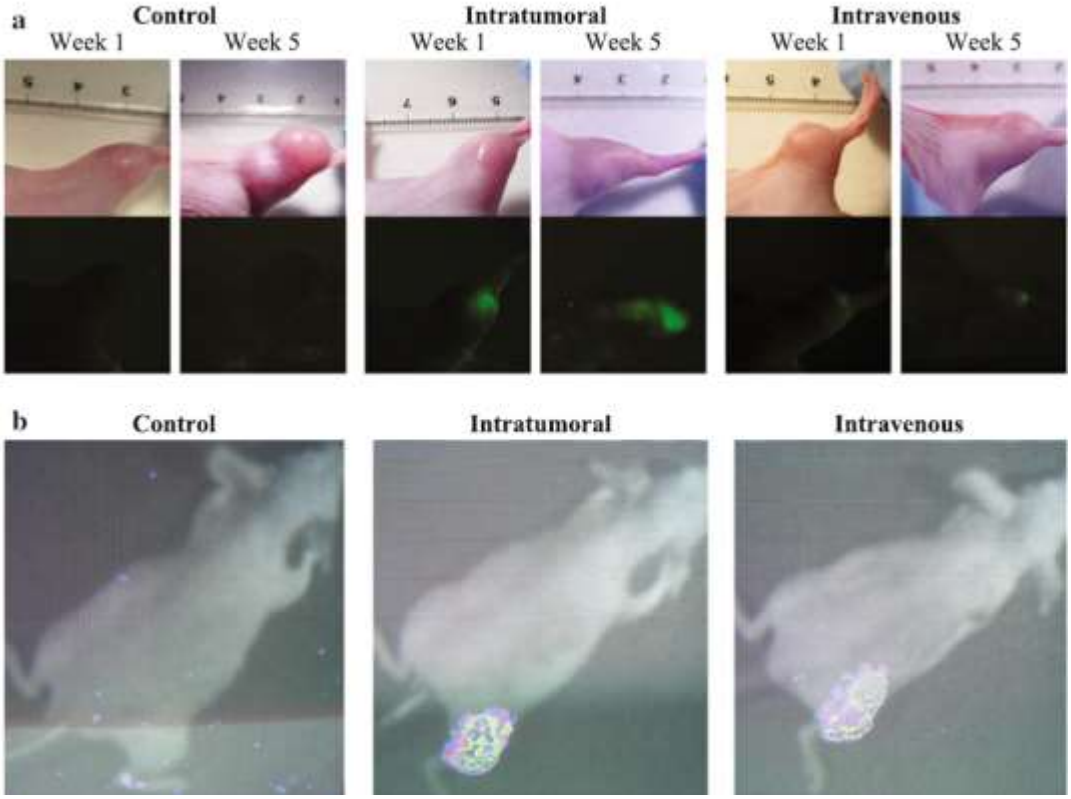

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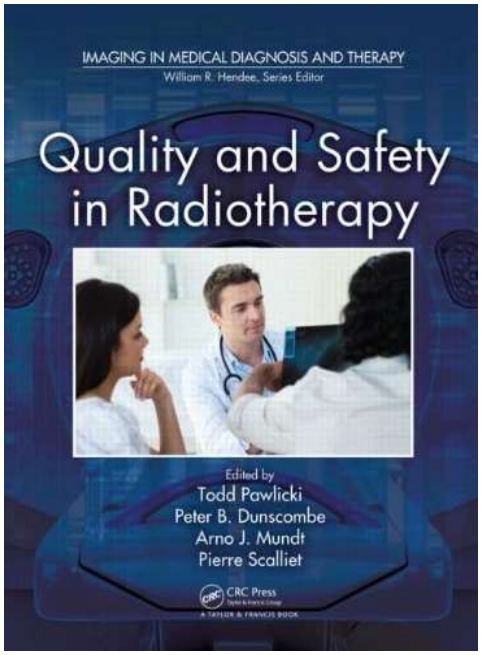

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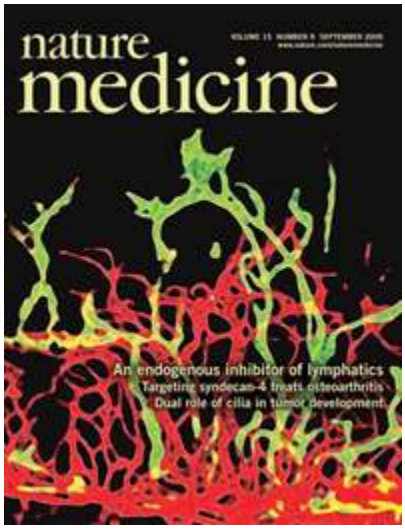

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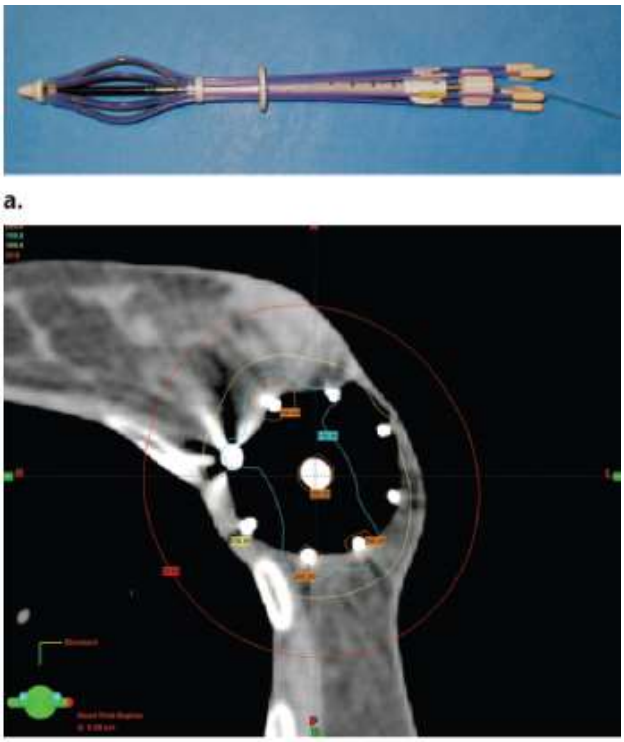

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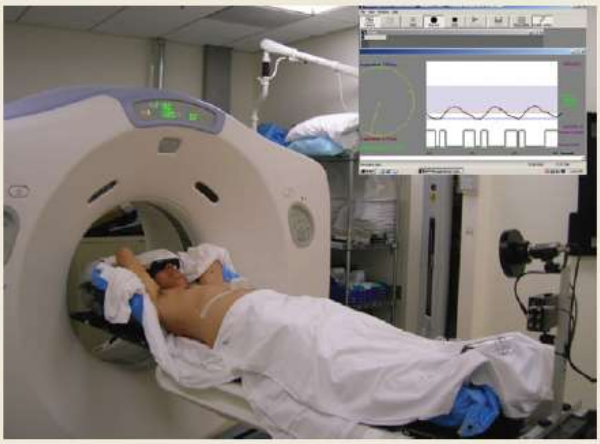
Figure 1 A Typical Patient Set up for 4-Dimensional Computed Tomography (4DCT) 4D Positron Emission Tomography/CT (4DPET/CT) Simulation. Image Inset Shows the Typical RPM Breathing Trace Obtained and Viewed by Patient through Video Goggle



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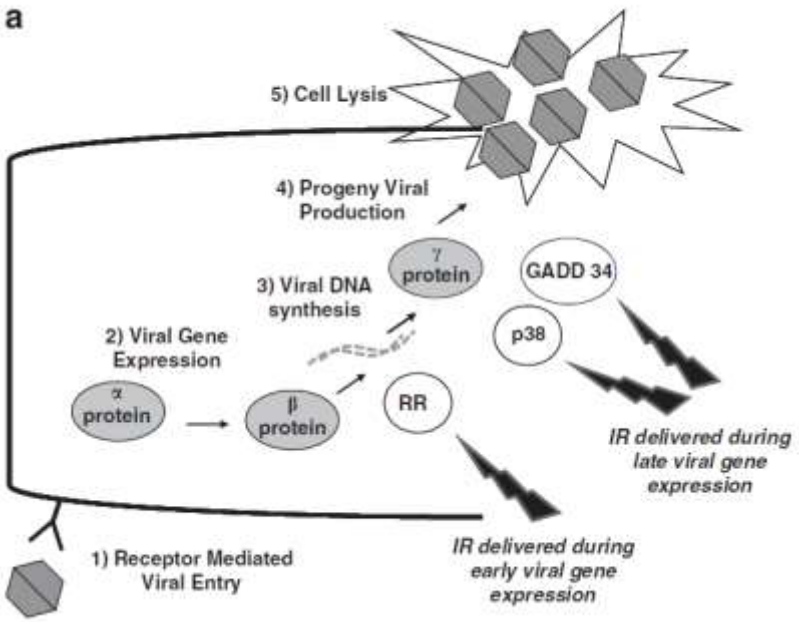

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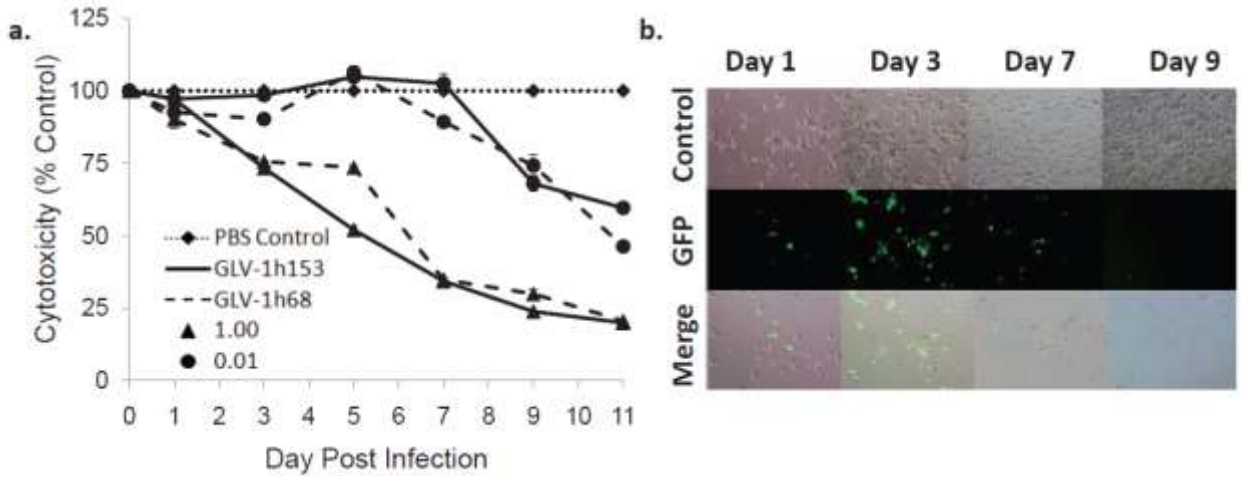

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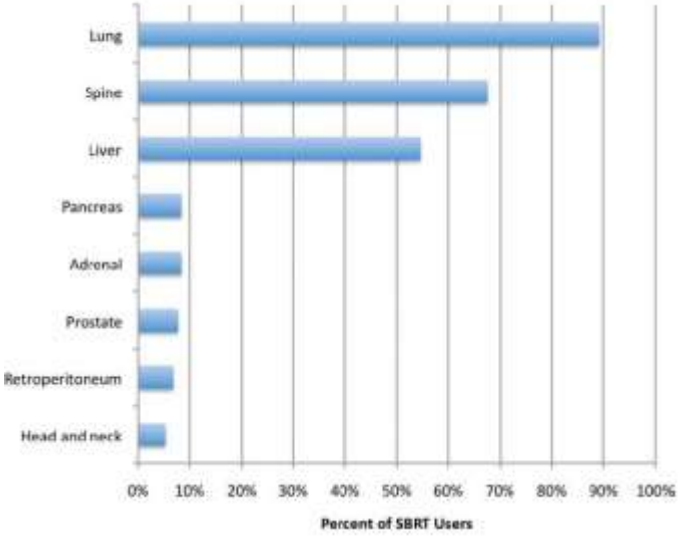

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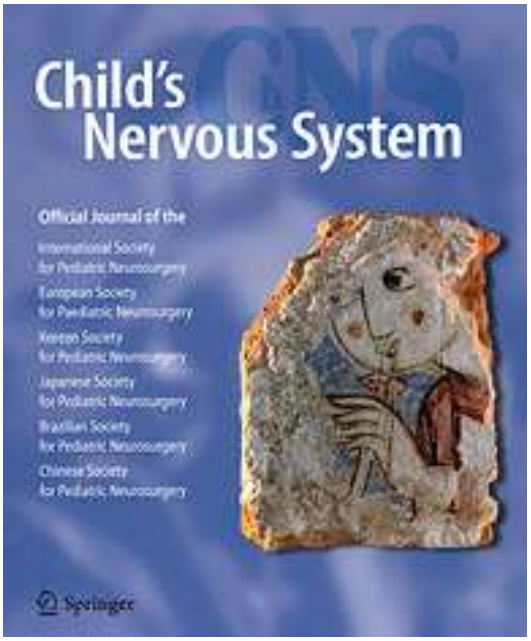

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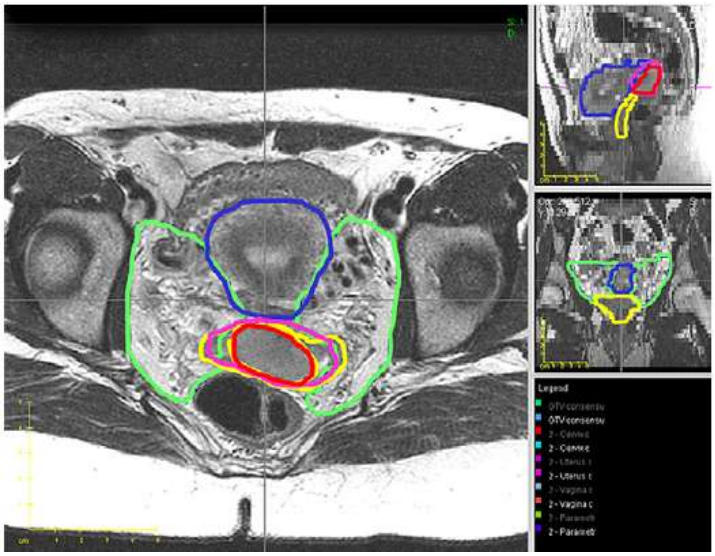

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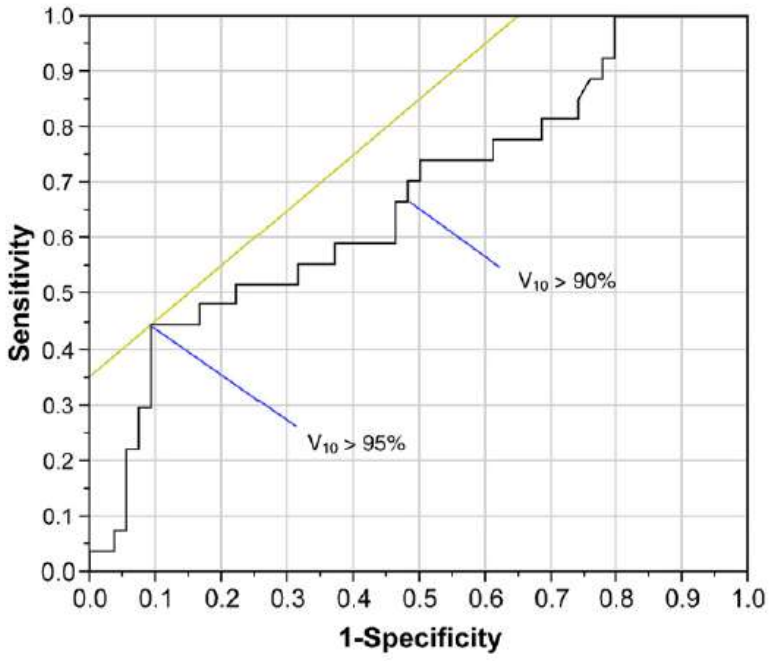

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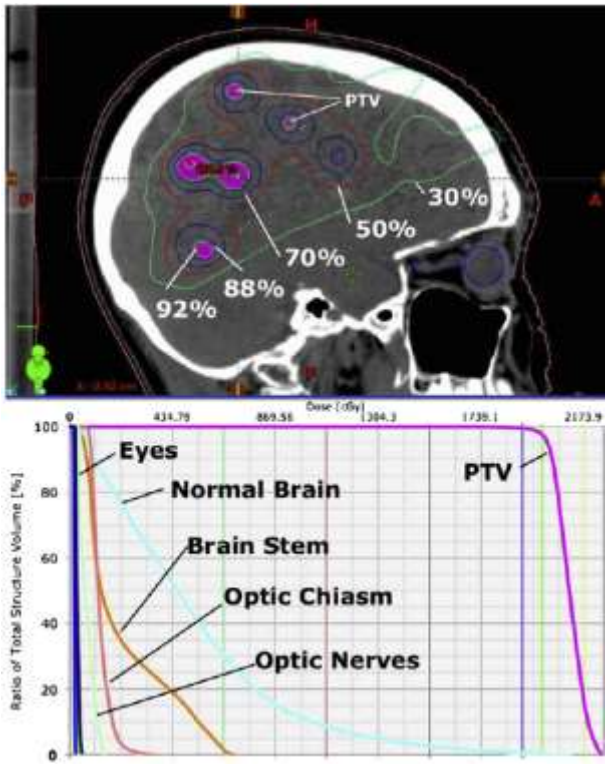

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