



Radiation Oncology News

Winter 2015



Baldassarre Stea, MD, PhD
Department Head and Professor

Most physicians enter the medical field because of a strong desire to help fellow human beings. These days, technological advances in radiation oncology have made our job ever more rewarding. We provide new and innovative technology at The University of Arizona Medical Center to allow radiation oncologists to improve clinical outcomes. This new technology provides fertile ground for innovative research as well.

Inside this Issue:

- Welcome New Facultyp. 3
- Residency Program Updates.p. 4-5
- Botswana Africa Experience .p. 6-7
- Dosimetry and Radiation Therapy Training p. 8
- Clinical Highlights.....p. 10-11
- Research p. 12
- Physics Section
- Monthly Lecture Series p. 13
- UA Cancer Center – Orange Grove Campus.....P. 14

Message from the Chair

Dear Friends and Colleagues

I am happy to write this overview of major developments in the Department of Radiation Oncology during this past year.

Partnership with Banner Health

We had a monumental year, indeed, as our partnership with Banner Health officially commenced on February 27. The physicians of Banner – University Medical Group (BUMG) are transforming academic medicine across three academic medical centers, two medical schools and multiple clinics including a new state-of-the-art radiation oncology facility within the next two years as part of the north campus expansion near the intersection of Campbell Avenue and Allen Road.



Banner has proven to be a great partner who is already involved in providing solutions to facilitate work flow and increase patient satisfaction. We look forward to even more exciting changes to come as part of Banner – University Medical Center Tucson.

New faculty

We have two new additions to our faculty: Charles Hsu, MD, PhD, joined us in March as an Associate Professor and Yong Sook “Cecilia” Lee, PhD, just joined our physics faculty in November. Dr. Hsu, a University of California, San Francisco graduate, has taken up the lung cancer and mediastinal malignancies line of service and is working on several protocols. Dr. Lee is a graduate of the University of California, Davis residency program with several

years of experience at the University of Kansas. She replaced Georgi Georgiev, who took a private practice job in Sacramento, California. Read more about Drs. Hsu and Lee on page 3 of this newsletter.

Residency program

Our residency program continues to thrive under the new leadership of Sun Yi, MD, who received two teaching awards in June 2015. We continue have seven active residents who are engaged in their learning and exploring outside electives including: the BNI in Phoenix, the Scripps Proton Center, MD Anderson rotations as well as Joel Grow’s, M.D. humanitarian trip to Botswana Africa. We are very proud of our medical residents who continue to have an unbroken streak of successfully passing the oral board exams. This and last year’s resident alumni, Kristen O’Donnell, M.D. and Michael Cheung, M.D. passed their oral board and clinical exam respectively. We successfully graduated Dr. Cheung, and a medical physicist, Junhan Pan, MS, both of whom have found jobs out of state. Dr. Cheung is pursuing a fellowship at the University of Washington and Junhan Pan accepted a private practice position in Honolulu, Hawaii.

Our current residents have had a successful year in research. Two residents and one medical student (Steven Sckolnik, M.D., Uma Goyal, M.D., and James Knitter) from our program presented their research at the annual ASTRO meeting in San Antonio in October, and Dr. Goyal was awarded the Better Than Ever Grant for her project about an improved immobilization technique for specialized brachytherapy treatments in patients with cervical cancer. There have been two papers published this year with first authors who are past or current residents.

Continued on page 2



Continued from page 1

The residents and medical students rotating through our department are the engine of clinical research.

Visiting professors

We were fortunate to host guest professor Paul Wallner, M.D., the ABR Associate Executive Director for Radiation Oncology, who presented a lecture series that included "Implications of Healthcare Reform" and "The Economics of Healthcare and Radiation Oncology." We also hosted Terri Roberts, M.D. from MD Anderson, John Suh, M.D., from the Cleveland Clinic, and Carl Rossi, M.D., from the Scripps Proton Center.

Research

Our clinical trials and research office continue to grow. We currently have a record number of patients enrolled in clinical trials, ranging from GBM to breast cancers, and we continue to contribute to NRG trials.

Our Radiobiology lab focuses on elucidating the molecular mechanisms that cause radiation resistance in cancerous cells. Eric Weterings, Ph.D. has discovered several key interactions between proteins that mediate radiation resistance. The uncovering of these protein-protein interactions has yielded novel targets for radiation-sensitizing drugs. In addition, Dr. Weterings' lab has recently identified and patented two small molecular compounds that

inhibit the activity of a central mediator of radiation resistance: the Ku70/80 protein. These compounds are the first reported Ku70/80 inhibitors available world-wide and open up exciting perspectives for the development of radiation-enhancing drugs.

The past year has been really rewarding for me as I see a stable, productive and happy faculty with little turnover and the clinical research engine revving up. This coming year will be busier with the Academic Program Review, but thanks to the dedicated efforts of many individuals we will be ready by February 19, 2016, to open the door to a team of seven distinguished members coming from all over the U.S. to evaluate our program

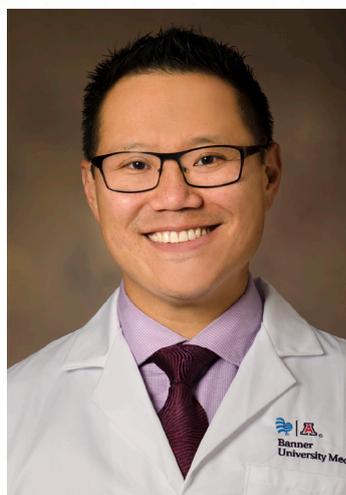
Thank you to all of those who have supported our department this past year. We look forward to continued success in research, education and outstanding patient care in the upcoming year. Wishing you a wonderful Holiday season and a healthy New Year.

*Baldassarre "Dino" Stea, MD, PhD
Department Head and Professor
Department of Radiation Oncology*

Welcome New Faculty

▶ Charles Hsu, M.D., Ph.D.

Associate Professor, Radiation Oncology

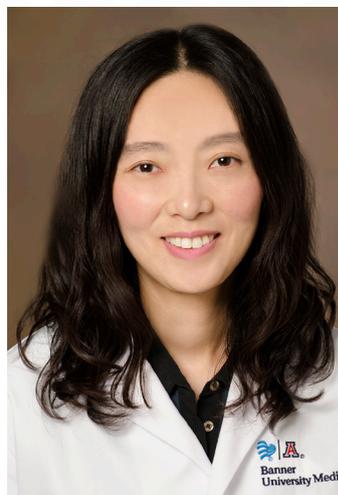


Charles Hsu began serving as an Associate Professor of Radiation Oncology at the University of Arizona College of Medicine – Tucson on March 30, 2015. His clinical and research interests focus on thoracic and cutaneous malignancies (lung and skin cancer), stereotactic body radiotherapy and HDR brachytherapy.

Dr. Hsu received his bachelor's degree with high honors from Princeton University followed by a Fulbright Fellowship pursuing hepatitis research. Dr. Hsu earned his medical degree and doctorate in epidemiology from the Johns Hopkins Schools of Medicine and Public Health in Baltimore, Maryland and also completed a post-doctoral fellowship in cancer epidemiology with the World Health Organization in Lyon, France. He completed his internship at Memorial Sloan-Kettering Cancer Center in New York followed by residency in radiation oncology at the University of California-San Francisco, where he also served as Chief Resident.

▶ Y. Cecilia Lee, Ph.D.

Assistant Professor, Medical Physics Section



Y. Cecilia Lee joined the University of Arizona College of Medicine – Tucson in November, 2015. Dr. Lee received her Ph.D. in medical physics from University of Texas Health Science Center at San Antonio (UTHSCSA) in 2010, completed her medical physics residency in Radiation Oncology at University of California Davis Medical Center in 2012 and served as medical physicist and clinical assistant professor in the Department

of Radiation Oncology at University of Kansas Medical Center until October 2015.

She holds a certification in therapeutic medical physics from the American Board of Radiology, and her research interests have focused on GYN and breast cancer treatments. Dr. Lee has served on the NRG medical physics subcommittee, served as NRG GYN physics liaison and been actively involved in NRG clinical trials as physics co-PI.

2014-15 FACULTY SELECT PUBLICATIONS

Krishna Howell, MD

Gospodarowicz M, Warde P, Catton C, Bristow RG, Ménard C. Phase 2 trial of guideline-based postoperative image guided intensity modulated radiation therapy for prostate cancer: toxicity, biochemical and patient reported health-related quality-of-life outcomes. *Pract Radiat Oncol* 2015; Apr 17 e-pub

Christopher Watchman, PhD

Published Abstract: A Moghadam, K Hadad, C Watchman, R Hamilton. "CT-Based 3D Dose Calculation Method Using Artificial Neural Networks (ANN)". *Medical Physics* 40(6) 474, 2013

Sun Yi, MD

He W, Luo J, Bourguet F, Xing L, Yi SK, Gao T, Blanchette C, Henderson PT, Kuhn E, Malfattie M,

Murphy WJ, Cheng RH, Lam KS, Coleman MA. Controlling the Diameter, Monodispersity, and Solubility of ApoA1 Nanolipoprotein Particles Using Telodendrimer Chemistry. *Protein Science*; 2013; 22(8); 1078-1086

Baldassarre Stea, MD, PhD

Welsh JW, Komaki R, Amini A, Munsell M, Unger W, Allen PK, Chang JY, Wefel J, McGovern S, Garland LL, Chen SS, Holt J, Liao Z, Brown P, Sulman E, Heymach JV, Kim ES, and Stea B; Phase II Trial of Erlotinib plus Concurrent Whole-Brain Radiation Therapy for Patients with Brain Metastases from Non-Small Cell Lung Cancer. *J Clin Oncol*. 2013 Mar 1;31(7):895-902. doi: 10.1200/JCO.2011.40.1174. Epub 2013 Jan 22. PMID: 23341526

Yongbok Kim, PhD

Kim Y and Trombetta MG. Dosimetric evaluation of multi-lumen intracavitary balloon applicator rotation in high-dose-rate brachytherapy for breast cancer. *J App Clin Med Phys* 2014; 15(1):76-89. PMID: 24423837

Russell Hamilton, PhD

Nguyen NP, Nguyen ML, Vock J, Lemanski C, Kerr C, Vinh-Hung V, Chi A, Khan R, Woods W, Altdorfer G, D'Andrea M, Karlsson U, Hamilton R, Ampil F. Potential applications of imaging and image-guided radiotherapy for brain metastases and glioblastoma to improve patient quality of life. *Frontiers in Oncology*, Vol. 3, Article 284, 2013

Residency Program UPDATES

After almost a decade of excellent leadership, **Shona Dougherty, M.B., Ch.B., Ph.D.**, stepped down as



program director of our medical residency program in July 2015, and **Sun Yi, M.D.**, has stepped in with great enthusiasm to serve as acting program director. Dr. Yi's effective, Socratic teaching style is well-known throughout the department. In June 2015, he received two

teaching awards: the 2014-2015 Faculty Teaching Award and the national ARRO Educator of the Year Award. Dr. Yi has been busy evaluating and restructuring our educational methods and resources in an effort to increase our residency program's national ranking.



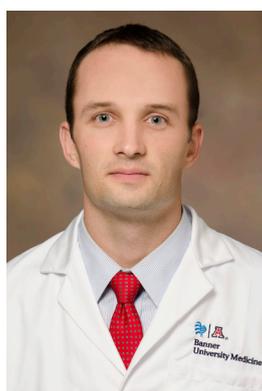
Since January 2015, **Kevin Severson** has served as our program coordinator. He will finish his third bachelor's degree in physiology in December 2015. Mr. Severson can be contacted at 520-626-0434 or kevin1@email.arizona.edu.

Our medical physics residency program continues to thrive with two residents under the direction of **Russell Hamilton, Ph.D.** Along with every other medical physics program in the nation, this was the first year that our medical physicist resident program participated in The Match process for candidates to be matched to our program (similar to the physician resident program).

new residents



Justin Famoso, MD, PGY II



John Gloss, PSM,
Clinical Physicist
Associate

Dr. Famoso is a first year resident in Radiation Oncology. He received his M.D. at West Virginia University School of Medicine in Morgantown, West Virginia. He completed an internship in internal medicine at University of Pittsburgh Medical Center - Mercy Hospital in Pittsburgh, Pennsylvania.

His interests include golfing, playing the guitar and piano, exercising, traveling, skiing, watching sports, and viticulture.



John received his Professional Science Master's degree in Medical Physics from the University of Arizona. His research during graduate studies focused on determination of heterogeneity correction factors for eye plaques using Monte Carlo simulations.

John's interests include swimming, running, and reading.



The illuminated dots on the map above represent all of the geographic locations our graduates are currently practicing.

Congratulations Dr. Goyal! **Awarded Better Than Ever Grant**



Fourth-year resident Uma Goyal, M.D. was awarded a \$25,500 Better Than Ever (BTE) research grant for the 2015-2016 academic year to help further her study: *Improved Technique for Specialized Brachytherapy Treatments for Patients with Cervical Cancer*. For this study, Dr. Goyal is mentored by Professor of Radiation Oncology Shona Dougherty, MB, ChB, PhD, whose clinical focus is centered on gynecologic and genitourinary cancers.

The hypothesis for this study is that the use of inflatable balloons for immobilization of Tandem and Ovoid apparatus in patients undergoing brachytherapy radiation for cervical cancer has significant advantages over the traditional gauze packing techniques. For patients requiring the apparatus to remain *in situ* overnight, balloons have satisfactory reproducibility of positioning of the apparatus, adequate protection of normal tissue, decreased operating room time, and increased comfort for patients. This study is a combined retrospective and prospective study of this specialized brachytherapy approach using inflatable balloons to improve access of disadvantaged cervical cancer patients to critical brachytherapy applications. Building on preliminary data of reproducibility in paired CT scans, further data will be analyzed for dosimetry consistency of both target lesion and normal organs as well as for acute toxicity. A database will be created, which will allow for comparisons to standard brachytherapy techniques, and for long term follow-up of efficacy and toxicity.

The University of Arizona Cancer Center BTE training program is a fitness training and fundraising program designed to help make walking, running or biking a regular part of life. The program also raises funds to support investigator-initiated clinical trials focusing on breast and gynecologic cancers under the umbrella of Women's Cancers at the University of Arizona Cancer Center.

Botswana-Africa

By Joel Grow, M.D.



Earlier this year, I was among three residents in the country awarded a scholarship by the ASTRO/ARRO Global Health Scholar program to help fund my rotation in Botswana, Africa. This relatively new scholarship is part of the ARRO Global Health Initiative, supported by ASTRO, and seeks to help identify disparities in cancer prevention and treatment, improve international collaborative research, foster commitment to underserved populations,

and to expose residents to opportunities in global health.

I had watched classmates and colleagues in other specialties participate in medical charities that offer life-changing medical services and resources to those in developing countries, and I hoped to participate in some of these volunteer opportunities during my medical career, but when I decided to go into radiation oncology I thought this wouldn't be a possibility. However, I found out that in recent years, more and more institutions and organizations began doing what I thought was not possible. I learned of opportunities in radiation oncology and global health and eventually came in contact with Surbhi Grover, M.D., who is a faculty member and recent graduate of the University of Pennsylvania

Radiation Oncology department. In 2015, she began working fulltime in Botswana through the Botswana-UPENN Partnership (<http://www.med.upenn.edu/botswana/>) that was established in 2001 to primarily help fight the HIV/AIDS epidemic (affecting 21 percent of Botswana population). This partnership has provided training and resources to improve infectious disease care, and this relationship was used by Dr. Grover to expand to cancer care and collaborative research, which is still in its infancy.

I traveled to Botswana this past September to spend four weeks rotating at the two main hospitals in Gaborone, Botswana: Princess Marina Hospital (PMH) and Gaborone Private Hospital (GPH). PMH is the main public hospital and has its own oncology ward of about 24 beds and an oncology clinic that offers chemotherapy. They employ three medical oncologists, two of whom trained in radiotherapy, and they also have a palliative care physician and two general practitioners. GPH is the only radiation facility in the entire country (population of about 2.1 million) and has one Elekta linac, an HDR after loader unit, and a CT simulator. There is one radiation oncologist (Memory Bvochora-Nsingo, M.D.) with a patient load of about 60 to 70 patients per day, and she sees five to 10 consults per day. The linac does not have MLCs, so most of the fields are square or rectangular, and they infrequently use blocks. Incidence of HIV/AIDS is high and cervical cancer screening is low

Experience

in Botswana, which leads to cervical cancer as the most common female malignancy with locally advanced disease being common. Brachytherapy is a significant part of Dr. Bvochora-Nsingo's practice; she can perform four to five brachytherapy cases per day. I was amazed at the work Dr. Bvochora-Nsingo was able to do, as well as her dedication to her patients.

I contributed by seeing the patients (new consults and OTVs), contouring, and participating in brachytherapy cases. I saw diseases that are uncommon as well as locally advanced diseases that we rarely see in the U.S.

In November, they began to install a new linac with IMRT/SRS/SBRT capabilities, and the clinic will not be treating patients for about three months while they finish installation. This will be a significant change in the treatment planning process with increased time required for contouring, planning and QA. Fortunately, they will have a staff from MGH (physicians, physicists, dosimetrists, therapists) on-site to help train and assist them as they transition.

Botswana is considered a developing country, but it seems to be a unique situation compared to the majority of the other African countries. In recent years, money doesn't seem to be the

major issue; the country has a stable government which leads to stable economic growth. One of the major issues the Botswana government faces is what to do with the increase in money. How will its government utilize this effectively? How will they allocate resources to reduce the burden of cancer upon the rural population? With the help of those willing to give of their time and resources along with their dedicated physicians, Botswana will eventually succeed.



Dr. Grow with medical oncologist, Dr. Dawn Balang (far left) and radiation oncologist, Dr. Memory Bvochora-Nsingo (second from left). Both work at Gaborone Private Hospital in Botswana.



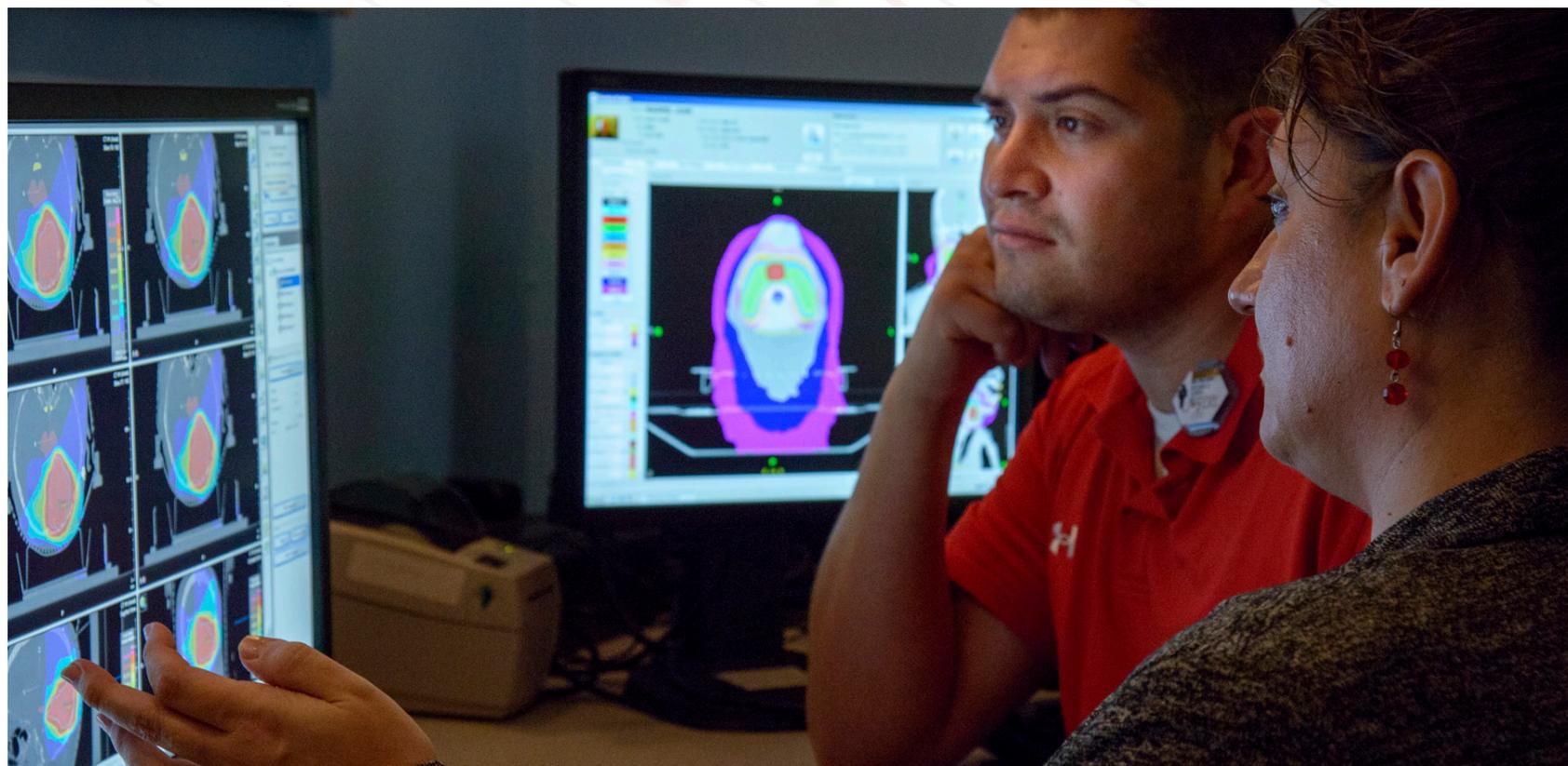
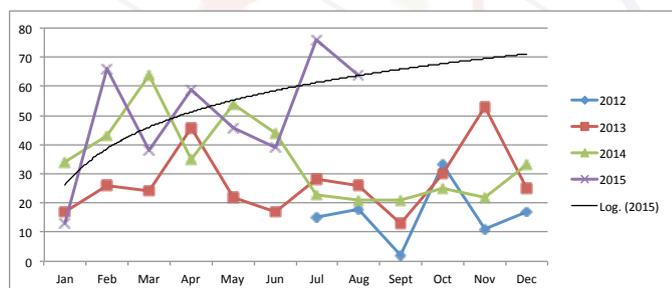
Dosimetry and Radiation Therapy Training

For many years, the Department of Radiation Oncology has been actively involved in training and educating both radiation therapists and dosimetrists for careers in cancer care. In 2004, a partnership with Washburn University in Topeka, Kansas, was established, with Washburn University providing the didactic education for Radiation Therapy students, and our Radiation Therapy staff providing the hands-on clinical training for students. Since the partnership's inception, 10 students have completed the program and passed their American Registry of Radiologic Technologists Board Exam to

become Licensed Radiation Therapists. Of those 10 students, seven are now employed in our Department.

In addition to this successful record of Radiation Therapy training, in September of 2014 the department began a partnership with Bellevue University, located in Seattle, Washington, to train Medical Dosimetrists. While the Radiation Oncology department had successfully trained three Certified Medical Dosimetrists in an on-the-job setting in the past, this is the first time the department has officially partnered with a university to provide Joint Review Committee on Education in Radiologic Technology (JRCERT) qualified education. We were able to offer this new educational opportunity to one of our own staff and expect his successful completion of the didactic program and passage of the Medical Dosimetry Certification Board exam in June 2016 and January 2017, respectively.

This opportunity for training new Medical Dosimetrists, as well as Radiation Therapists, is very important for the Department of Radiation Oncology. Treatment regimens are always evolving and over recent years have gone to a shortened course of treatment for cancer patients. This means that a patient that would have been treated with 30 days of radiation treatments can now be treated in just five with the same positive outcomes. However, this change in shorter courses of therapy requires a shorter turnaround in planning time which calls for a need for more Dosimetry staff to meet planning deadlines. The increase of these shortened courses of therapy has been documented here in our Radiation Oncology Department and is following national trends as well.



Scanning Beam Intensity Modulated Proton Therapy for Accelerated Partial Breast Irradiation

Uma Goyal: 2 Abstracts/Posters

Uma Goyal, MD; Shawn Ong, BS; Michael Cheung, MD; Jessica Simmons, MA; Jamie Holt; Shona Dougherty, MB, ChB, PhD; Kristen O'Donnell, MD. Assessment of Symptom Burden and Quality of Life in Radiation Oncology Patients.

Uma Goyal, Junhan Pan, Shona Dougherty. Reproducibility of Immobilization Balloons Used Sequentially for Cervical Cancer HDR Brachytherapy.

Krishna Howell: 1 Abstract/Poster

Howell KJ, Babiker HM, Kovoor AI, Green MR, Dragovich T, Brown TD, Hazard L, Elquza E. Phase I Study of Concomitant Pemetrexed and Cisplatin Plus Radiation in Patients with Locally Advanced or Metastatic Esophageal or Gastroesophageal Junction (GEJ) Carcinomas: Updated Results.

Second Breast Cancer Risk Following Pediatric Whole-Lung Irradiation: Risk Estimates With 3-D Conformal Versus Helical Tomotherapy

Victor J Gonzalez MD¹; Rebecca Fega MD, PhD²; Darren Zuro MS³; Lexie Smith-Raymond CMD⁴; Georgie N Georgiev MS⁵; Ky-Nam B. Nguyen MD⁶; Victor J. Gonzalez MD⁷

Purpose / Objectives

Female childhood cancer survivors are at high risk for developing breast cancer following thoracic radiotherapy. A recent report of the Childhood Cancer Survivor Study (CCSS) found that patients who had received whole lung irradiation (WLI) in this population had the highest risk for secondary cancer development with a standardized incidence ratio (SIR) of 4.4. Given the potential for WLI in this population, the purpose of this study was to evaluate the excess relative risk (ERR) of radiation induced breast cancer by age group, methods of radiation exposure to breast tissue, and the potential to significantly improve long term patient outcomes with treatment planning techniques to evaluate the excess relative risk of breast cancer following whole lung irradiation with 3D conformal vs helical tomotherapy (HT) with breast avoidance.

Victor Gonzalez: 2 Abstracts/Posters

Victor J Gonzalez, MD; Rebecca Fega, MD, PhD; Darren Zuro, MS; Lexie Smith-Raymond, CMD; Georgie N Georgiev, MS.

Ky-Nam B. Nguyen, MD; Victor J. Gonzalez, MD. Daily Setup Reproducibility of Three-Field Breast Technique in Conjunction with Deep Inspiratory Breath Hold (DIBH). Second Breast Cancer Risk Following Pediatric Whole-Lung Irradiation: Risk Estimates With 3-D Conformal Versus Helical Tomotherapy.

ASTRO

The American Society for Therapeutic Radiology and Oncology (ASTRO)

ASTRO holds an annual meeting each year. The 2015 Meeting was held in San Antonio, Texas in October. We had three physician faculty, two physics faculty and four physician residents attend the conference. Many of them also contributed to the conference.

Steven Sckolnik: 1 Abstract/Poster

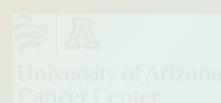
Steven Sckolnik, MD; Fantine Giap, BS; Daniel Simpson, MD; Anthony Mascia, PhD; Richard Lepage, PhD; Huan Giap, MD, PhD. Scanning Beam Intensity Modulated Proton Therapy for Accelerated Partial Breast Irradiation.

Baldassarre Stea: 1 Abstract/Poster

James Knitter, Gerald Lemole, William Erly, Abhay Sanan, Baldassarre Stea. Comparing Outcomes of Meningiomas Treated With Stereotactic Radiosurgery (SRS), Stereotactic Radiation Therapy (SRT), or Intensity Modulated Radiation Therapy (IMRT): A 10-Year Single-Institution Experience.

Parameter	3D Conformal	Helical Tomotherapy	P-value
Mean (Gy)	11.1	11.1	0.218
SD (Gy)	1.9	1.9	0.560
Max (Gy)	14.5	14.5	0.002
Min (Gy)	15.0	15.0	0.005
95th (Gy)	15.2	15.2	<0.001
99th (Gy)	15.3	15.3	<0.001
100th (Gy)	15.3	15.3	0.072
Mean (Gy)	10.3	10.3	0.008
SD (Gy)	1.7	1.7	<0.001
Max (Gy)	13.2	13.2	0.003
Min (Gy)	13.4	13.4	<0.001
95th (Gy)	13.0	13.0	0.044
99th (Gy)	13.0	13.0	<0.001
100th (Gy)	13.0	13.0	0.001
Mean (Gy)	5.8	5.8	0.057
SD (Gy)	1.4	1.4	0.002

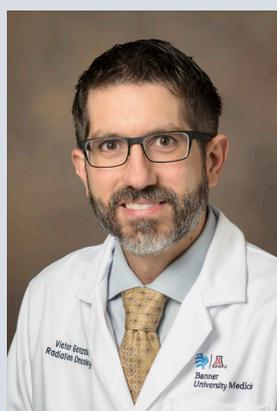
Table 1. Comparative dose metrics for entire group





Clinical Highlights

BREAST ONCOLOGY PROGRAM:



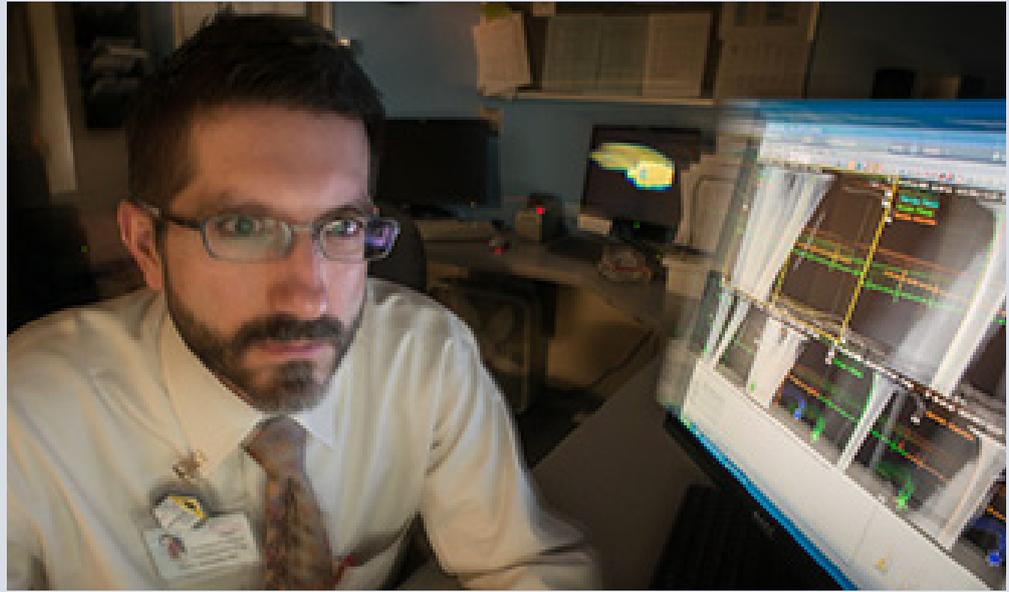
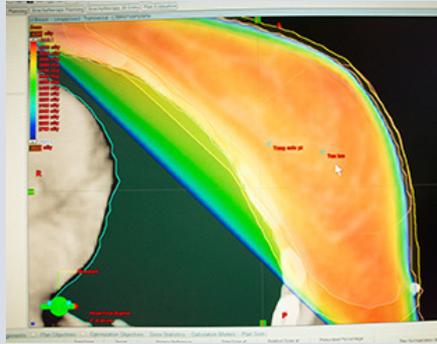
One size no longer fits all

Since 1990, yearly deaths from breast cancer in the United States and Europe have decreased dramatically. These improvements have not been the result of a single medical breakthrough, rather the result of continuous, incremental improvements across all specialties. Improved surgical techniques, identification of pathologic risk factors, development of targeted

systemic therapy and advances in radiotherapy techniques have all played a part. Consequently, breast cancer is often considered the poster child for evidence-based, multi-disciplinary oncology.

At Banner – University Medical Center Tucson (BUMCT), the breast oncology team is key to bringing advances into daily practice. Each member of the breast cancer treatment team is exclusively dedicated to treating patients with breast cancer. In the rapidly evolving world of breast cancer research, this specialization allows members to quickly incorporate advances into patient care. This integrated team approach directly benefits patients as evidenced by exceptionally high rates of breast conserving surgery and low rates of “over-treatment” in favorable-risk patients.

While the ability to identify the best treatment option is important for individualizing patient care, having access to that treatment is fundamental. As the premier academic Radiation Oncology department in Arizona, BUMCT provides the most comprehensive array of specialized breast radiation techniques available. Treatment options we offer include intra-cavitary and external beam partial breast irradiation, single fraction intra-operative radiation therapy and multiple specialized forms of external beam radiation including helical tomotherapy and respiratory gated arc therapy. This diversity gives us the ability to tailor treatment to fit each patient’s specific needs.



Methods for reducing toxicity

As the effectiveness of breast cancer therapy has improved, a greater emphasis has been placed on techniques to reduce the side effects and inconvenience of breast radiation. Radiation techniques which have evolved include cardiac avoidance with breathing synchronized radiation treatment, short-course whole-breast radiotherapy, intensity modulated radiotherapy, and partial breast irradiation. Below are some highlights of recent advances that we are using in the clinic to improve patient outcomes.

Short-course/hypofractionated breast radiotherapy - Breast radiotherapy in the United States has traditionally been given once a day over 5-7 weeks. In other countries, shorter courses of 3-4 weeks have been routinely used. These two approaches have now been directly compared in research studies. The long-term (>10 year) outcomes from these trials clearly demonstrate that a shorter course of whole-breast radiation is as effective and safe as the traditional course. More recently, studies have demonstrated that hypofractionated breast radiotherapy is associated with improved patient reported quality of life and reduced skin reaction when compared to a longer course of radiation. Cardiac avoidance with Deep Inspiratory Breath-Hold - Recently published studies suggest that even low average doses of radiation to the heart can increase the risk of long-term heart disease. At BUMCT, we utilize the Varian Real-time Position Management (RPM) system in patients with left-sided breast cancer to completely exclude the heart from the radiation field. This system allows for radiation to be delivered at specific phases of the breathing cycle. Using an infrared camera, the system is able to track the patient's respiratory pattern. Video

goggles provide the patient with a real-time graph of the patient's respiratory cycle. Coupled with the imaging and treatment equipment, the RPM system electronically triggers the radiation beam only when the patient is breathing in deep enough for the heart to be out of the radiation field. With this technique, radiation dose to the heart can be reduced by up to 80 percent. This benefit is even more dramatic in patients who require radiation to the internal mammary nodes. Our Department is currently enrolling patients to a clinical trial combining Deep Inspiratory Breath Hold and prone positioning to further improve cardiac sparing.

Intra Operative Radiation Therapy (IORT) - IORT is a technique in which radiation is delivered directly to the tumor bed, at the time of surgery. IORT is the most conformal radiation delivery available and results in the lowest amount of normal tissues receiving radiation. IORT is being offered on a clinical trial at BUMCT. Women who qualify for this study receive a single dose of radiation at the time of their surgery. Radiation treatment is performed with the Xofigo Axxent device. This device uses a miniaturized X-ray source to produce low energy X-rays within the tumor bed. This technique allows for the lowest amount of radiation possible outside the tumor bed. The ultimate goal of this therapy is to reduce the inconvenience, toxicity and cost of traditional breast radiation in women with low-risk breast cancer.

In summary, personalized medicine has changed the landscape of breast cancer treatment. Tumor biology as well as individual patient characteristics and preferences must be considered when determining the optimal treatment for each patient.

Research

continues to grow in Radiation Oncology

We had a record year for enrollment in 2014, with a total of 44 patients enrolled in our research studies. This year, we will crush that record, as we currently have 67 patients enrolled in studies.

We are excited to be able to offer our patients the newest innovative approaches to treat their cancer. We currently have studies open for the following disease sites:

Primary Brain Tumor (GBM)

Randomized Phase II Trial of Hypofractionated Dose-Escalated Photon IMRT or Proton Beam Therapy versus Conventional Photon Irradiation with Concomitant and Adjuvant Temozolomide in Patients with Newly Diagnosed Glioblastoma

Randomized trial of veliparib or placebo in combination with adjuvant temozolomide in newly diagnosed GBM with MGMT promoter hypermethylation

A Randomized Phase II Trial of Concurrent Bevacizumab and Re-Irradiation versus Bevacizumab Alone as Treatment for Recurrent Glioblastoma

Breast

A Randomized Phase III Clinical Trial Evaluating Post-Mastectomy Chestwall and Regional Nodal XRT and Post-Lumpectomy Regional Nodal XRT in Patients with Positive Axillary Nodes Before Neoadjuvant Chemotherapy Who Convert to Pathologically Negative Axillary Nodes After Neoadjuvant Chemotherapy

Pilot Study for Prone Breath Hold Technique to Decrease Cardiac and Pulmonary Doses in Women Receiving Left Breast Radiotherapy

A Safety and Efficacy Study of Intra-Operative Radiation Therapy (IORT) Using the Xofigo® Axxent® eBx™ System at the Time of Breast Conservation Surgery for Early Stage Breast Cancer

Head and Neck

A Randomized Phase II Trial for Patients with p16 Positive, Non-Smoking Associated, Locoregionally Advanced Oropharyngeal Cancer

A Phase II Randomized Study of Short-Term Dexamethasone versus Placebo for Fatigue in Patients Receiving Radiation Alone or Radiation and Chemotherapy for the Treatment of Head and Neck and Non-Small Cell Lung Cancers

Lung

A Phase II Randomized Study of Short-Term Dexamethasone versus Placebo for Fatigue in Patients Receiving Radiation Alone or Radiation and Chemotherapy for the Treatment of Head and Neck and Non-Small Cell Lung Cancers

A Phase III Randomized Trial of Lobectomy Versus Sub-lobar Resection For Small (< 2 cm) Peripheral Non-Small Cell Lung Cancer

Randomized Phase II Trial of Concurrent Chemoradiotherapy +/- Metformin HCL in Locally Advanced NSCLC

Metastatic Disease

Multiple sites: A Phase 1 Study of Stereotactic Body Radiotherapy (SBRT) for the Treatment of Multiple Metastases

Brain Metastases: A Randomized Phase III Trial Of Memantine And Whole-Brain Radiotherapy With Or Without Hippocampal Avoidance In Patients With Brain Metastases

Multiple Myeloma or Metastatic Spine

A Phase 2 Study of Vertebral Augmentation and Radiotherapy in Painful or at Risk of Collapse Spinal Metastatic Cancer/Multiple Myeloma

Cervical Cancer

Improved Technique for Specialized Brachytherapy Treatments for Patients with Cervical Cancer

For more information: Contact the Research Staff at (520) 626-6800

Study Results ▶▶▶

“Prescribing to tumor apex in episcleral plaque iodine-125 brachytherapy for medium-sized choroidal melanoma: A single-institutional retrospective review”

David Thomas Vonk, Yongbok Kim, Cameron Javid, John D. Gordon, Baldassarre Stea

The clinical outcomes data of this retrospective single institution study confirmed that 125I episcleral plaque

therapy is an effective, low morbidity, treatment modality for medium-sized choroidal melanomas. For tumors with a height less than 5 mm, reducing the prescription depth to the tumor apex (instead of 5 mm) **enabled us to decrease the dose to all sensitive structures within the eye.** This dose reduction was feasible without any loss in local control. Although the dose rate varied from the ABS guidelines because of limited availability of operating room (i.e., weekly), there was no difference in either local tumor control probability or complication rates.

PHYSICS SECTION MONTHLY LECTURE SERIES

The Physics Section of our Department of Radiation Oncology launched a monthly lecture series to address concerns in several aspects of our clinic, including treatment machines, evolving treatment techniques, number of trainees, the need for continuing education and the importance of practice quality improvement. Recent lecture topics have included Motion management, 4DCT, Xofig Brachytherapy, HDR and Tomotherapy.



The topics are complex, so the lectures must be presented in a way that everyone can comprehend the topic and learn something new to apply to our clinical practice



Each month a physicist provides a one-hour seminar to the entire Department, discussing the technical details of a clinical topic or technique, covering the therapeutic goals, theoretical rationale, practical application and patient treatments.

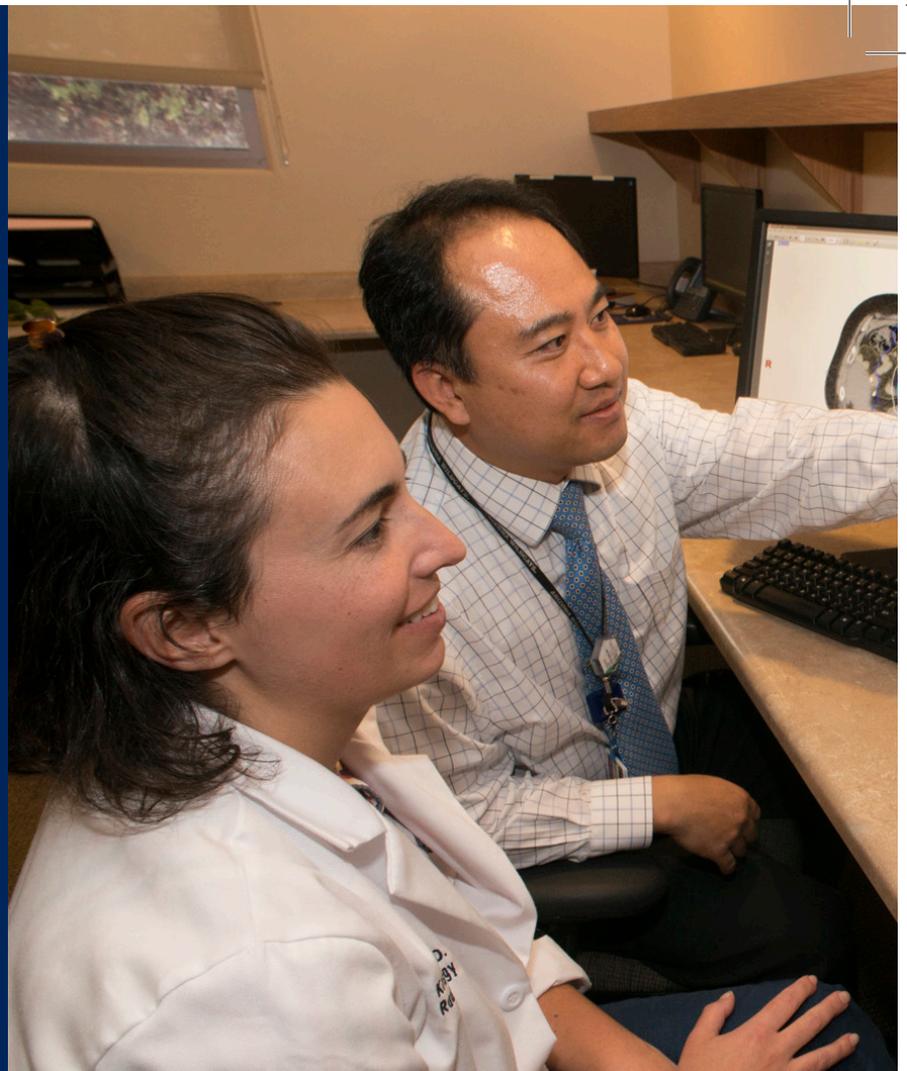
The topics are complex, so the lectures must be presented in a way that everyone can comprehend the topic and learn something new to apply to our clinical practice. The physicists are enthusiastic about the opportunity to explain the technical aspects of our operations to their colleagues. The Department personnel are equally enthusiastic – attendance has been excellent. The lectures are simultaneously broadcast to our Orange Grove clinic and are also recorded to DVD. Attendees are able to provide feedback on the effectiveness of the presentations through CME-type rating sheets completed immediately following the lectures.



University of Arizona
**Cancer
Center**
Orange Grove Campus



*Our Orange Grove
campus location is very
accessible to patients on
the Northwest side
of Tucson*

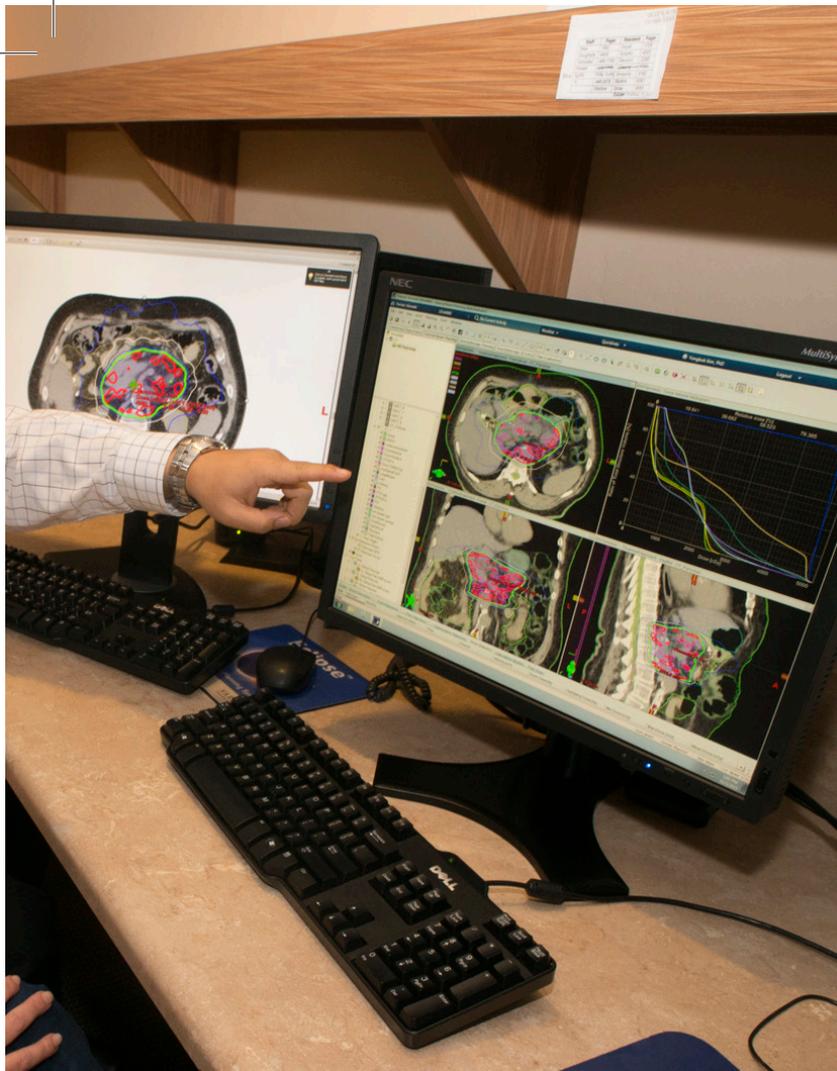


In addition to our main clinic at the Banner University Medical Center – Tucson (BUMCT), we also have a successful satellite clinic at the University of Arizona Cancer Center, Orange Grove Campus. Our Orange Grove campus location is very accessible to patients on the Northwest side of Tucson. The satellite clinic has been in operation since June of 2011 and is located just eight miles north of BUMCT. Dr. Gonzalez has been the clinic director since its inception. Most of our Physicians are available at the Orange Grove campus 1+ day weekly (see table). Though a smaller operation than our main clinic, it is fully staffed with physics, nursing, therapy and dosimetry support. The Radiation 101 class for new patients and their families is also offered.

This location treats patients with our newest technology, the Varian Trilogy Linear Accelerator. This machine has several advantages including the following:

- The power of the Trilogy yields treatment times that are shorter, thus making the experience more comfortable for the patient.
- The precision of Trilogy allows you to spare healthy tissues to an extent that was unimaginable only a few years ago.
- The versatility of Trilogy enables treatment of a wide variety of patients using a single machine.





**University of Arizona Cancer Center
Orange Grove Campus, Radiation Oncology
Contact information:**

1891 W. Orange Grove Rd.
Tucson, Arizona. 85704
Phone: 520-694-8960
Fax: 520-694-8996
Hours of operation: 8 a.m. - 5 p.m.



<i>Disease site</i>	<i>Physician</i>	<i>OG Clinic Days</i>
Breast, Lymphoma	Dr. Gonzalez	Mon, Tue, Wed, Thursday
GI, Sarcoma, Melanoma	Dr. Howell	Mon, Thurs, Friday
Prostate, GYN	Dr. Dougherty	Wed, Friday
Head & Neck	Dr. Yi	Tuesday

Meet the Current Radiation Oncology Medical and Physics Residents



Back row, left to right: Justin Famoso, M.D., John Gloss, PSM, Steven Sckolnik, M.D., Joel Grow, M.D., Rajayogesh Davuluri, M.D.

Front row, left to right: Uma Goyal, M.D., Tijana "Tina" Skrepnik, M.D., Justin Suszko, M.D., and Dan Goldbaum, Ph.D.

Guest Professor Dr. Carl Rossi (far left) engaging our residents on Proton Beam Therapy over lunch on September 18, 2015

Visit our website at, <http://rad-onc.arizona.edu/>

GIVE A GIFT

By giving to the Department of Radiation Oncology at the University of Arizona College of Medicine, you are helping our efforts to recruit and retain key faculty, support promising research doctors, and maintain laboratories and lectureships. Your donation is fully tax-deductible.

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