ASTRO news
WINTER 2013

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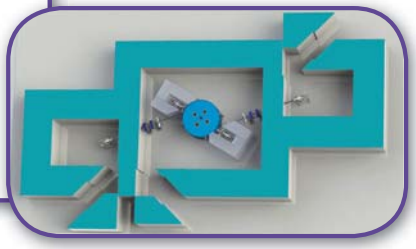

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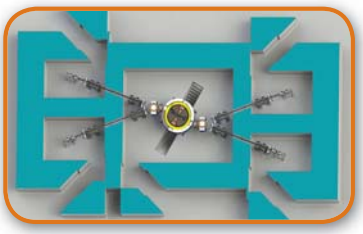

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WINTER 2013

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VOLUME 16 • NUMBER 4

ASTRO news

AMERICAN SOCIETY FOR RADIATION ONCOLOGY

ASTROnews (ISSN 1523-4185) is published quarterly at 8280 Willow Oaks Corporate Drive, Suite 500, Fairfax, VA 22031. Dues for individual membership in the American Society for Radiation Oncology are $525 (U.S.), which includes $38 for an *ASTROnews* subscription. Periodicals Postage Paid at Fairfax, VA 22030-9998 and at additional mailing offices.

POSTMASTER: Send address changes to *ASTROnews,* 8280 Willow Oaks Corporate Drive, Suite 500, Fairfax, VA 22031.
Telephone: 703-502-1550; Fax: 703-502-7852;
Website: www.astro.org/astronews.
Printed in the U.S.A., by Quad Graphics in Midland, MI

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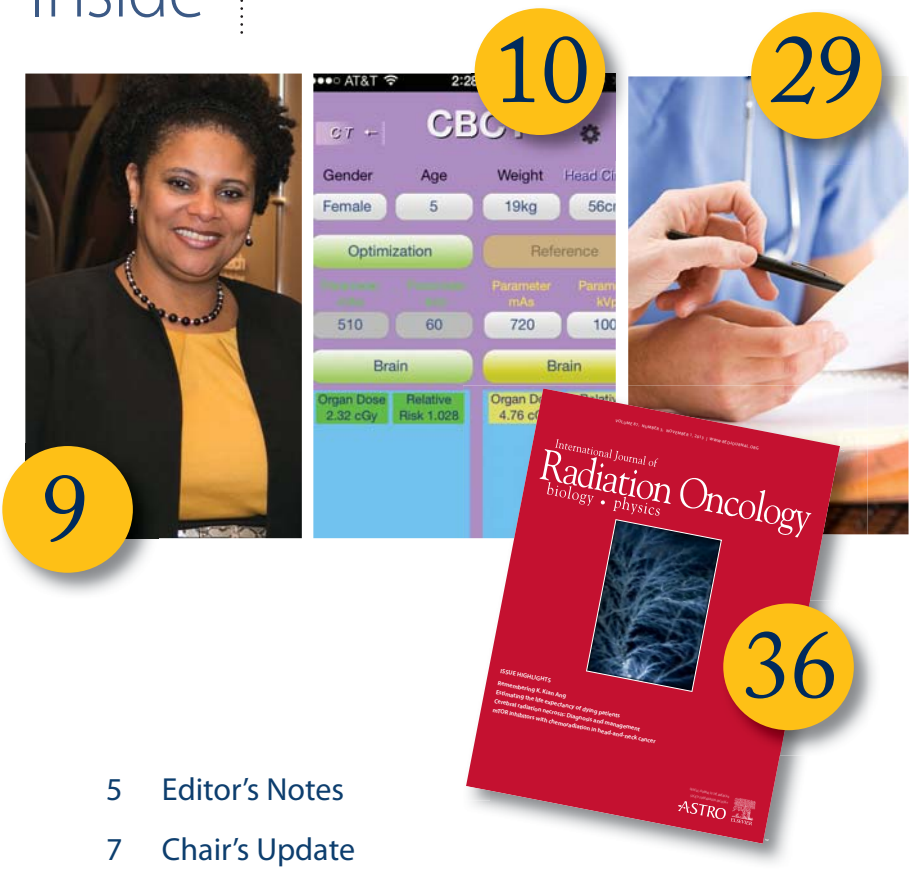
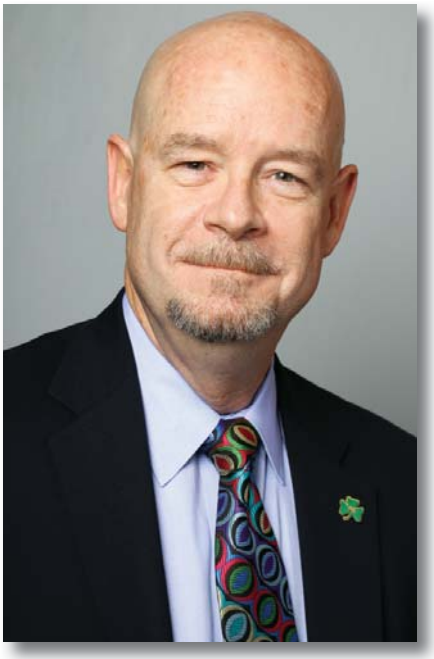


BY THOMAS EICHLER, MD, FASTRO

EDITOR'S*notes*



SECURING THE FUTURE

EVERY YEAR, THE ASTRO ANNUAL MEETING schedules hours of scientific and educational sessions to highlight refinements and advances in the field of radiation oncology. This year was no exception with nearly 70 such sessions held in Atlanta, many with overflow attendance. In retrospect, perhaps one of the most important sessions was one that was *not* held. If I were to go back and create that lecture, I would envision it being entitled "The ABCs of ROI."

The Radiation Oncology Institute (ROI) (www.roinstitute.org) was created in 2006 by the ASTRO Board of Directors as a philanthropic organization associated with but ostensibly separate from ASTRO with a mission "to enhance and promote the critical role of radiation therapy in the treatment of cancer by supporting research and education about the life-saving and quality-of-life benefits of radiation therapy." It set an ambitious goal of raising $10 million to create the infrastructure of ROI with $5 million committed by ASTRO—$1 million as a lead gift to the endowment, $1 million for initial research seed funding and $3 million to match dollar-for-dollar each ASTRO member gift of $12,500 or greater. Fundraising was slow going at the outset but after several stalwarts saw value in the mission of ROI and made substantial pledges to get things off of the ground, momentum built fairly quickly. ROI recently exceeded its original goal with a total of $10.4 million in endowment funds raised with approximately $500,000 remaining of the $3 million matching gift funds. The Institute has now reached the point of being able to award grants and support research—an achievement that seemed inconceivable just seven years ago.

The quest to raise money has been led by several committed individuals, including ROI Board of Trustees President Dr. Ted Lawrence, past Vice-president Dr. Colleen Lawton and current Vice-president Dr. Deborah Kuban. Other ROI leaders include Development Committee Chair Dr. Frank Wilson, Marketing and Communications Committee Chair Dr. Lou Harrison, Registry Executive Committee Co-chairs Drs. Chris Rose and Dick Fraass, and Research Committee Chair Dr. Reshma Jagsi and co-chair Dr. Justin Bekelman. Industry leaders have also made substantial contributions to ROI, adding both time and treasure. This dedicated group of individuals, as well as many of your colleagues, understand the notion that value-based purchasing, i.e., the wave of the immediate future, will demand validation of current practice patterns and processes of care with high quality evidence to support appropriate reimbursement. In other words, things

This is a critical initiative and affords you an opportunity to give something back to the specialty and to help secure its future.

I strongly urge you to support ROI and listen carefully to entreaties from the Development Committee and your friends who are donors. This is a critical initiative and affords you an opportunity to give something back to the specialty and to help secure its future.

like "better dose distribution" probably won't move the needle, whereas evidence-based outcomes will become the coin of the reimbursement realm.

The first steps in this regard have already been taken. An update on the National Radiation Oncology Registry (NROR) was provided at the Annual Meeting, and the NROR pilot sites also met for the first time. The mission of the NROR is "to improve the care of cancer patients by collecting reliable information on treatment delivery and health outcomes." Thirty facilities from around the country have been selected to participate in a prostate pilot study that will "yield invaluable benchmarking measures, best practices, comparative effectiveness treatments and 'patterns of care' and identify gaps in quality."

Both ASTRO and ROI continue to support various research efforts. ASTRO recently awarded $675,000 in junior faculty grants, in addition to ROI presenting the first Research Award for Safety and Quality: "IMRT Treatment Delivery Accuracy," a $200,000 grant awarded to Calvary Mater Newcastle Hospital in Newcastle, Australia.

As these early studies get underway and new RFPs are announced, the Development Committee will continue to lead the effort of soliciting the membership for financial support. As previously noted, there is still money left for matching gifts with many donors pledging funds over a five-year period. Some larger radiation oncology collectives have made substantial contributions in the name of their group, thereby generating even more bang for the buck. There are a number of creative ways to support ROI financially (www.roinstitute.org/Become-a-Donor/Index.aspx). No amount is too small for such a critical effort. I strongly urge you to support ROI and listen carefully to entreaties from the Development Committee and your friends who are donors. This is a critical initiative and affords you an opportunity to give something back to the specialty and to help secure its future.

And so now, with no easy segue, I have the unhappy task of walking away from the greatest volunteer job in the ASTRO spectrum: senior editor of *ASTROnews*. My recent election to the ASTRO Board of Directors, by which I am honored and humbled, necessitates that I pass the torch to the new Senior Editor, Lisa Kachnic, MD, from Boston Medical Center, who will assume her duties with the Spring 2014 edition. Dr. Kachnic brings a strong academic background to the job and will offer a fresh new perspective to the position. Please join me in wishing her the very best as she embarks on this exciting journey.

Each of us who have had the privilege of being the editor of this publication have left their own stamp on *ASTROnews* and, hopefully, introduced some new thinking about the non-scientific aspects of our specialty. Over the past three years, I've had the opportunity to talk to you about a wide variety of topics, ranging from self-referral to advocacy, from physician "coaches" to MOC for everyone, from the advantages of the French system of medical care to the need for involvement in global health care delivery. *ASTROnews* has grown considerably over the years. Special thanks to Dr. Mike Steinberg and Dr. Anthony Zietman for giving me the opportunity in the first place, ASTRO CEO and Publisher Laura Thevenot, and to our devoted Editorial Board of Joe Barthold, MD, Tomas Dvorak, MD, and Dirk Rades, MD, and our nursing member, Jeanne Sixta, OCN. None of this, however, is possible without the support of our superb ASTRO staff. Thanks to Editorial Director Anna Arnone, designer Kimberly Kerin and online edition guru Ben Reese. Last, but certainly not least, a very special "thank you" to the Managing Editor extraordinaire, Brittany Ashcroft. From the Editorial Board to Brittany and everyone in between, you're the best!! Thank you for all of your unparalleled assistance; none of this happens without you. I raise my glass to you all! *Sláinte!*

Dr. Eichler is the medical director of radiation oncology at the Thomas Johns Cancer Hospital in Richmond, Va. He welcomes comments on his editorial at astronews@astro.org.

COLLEEN A.F. LAWTON, MD, FASTRO,
CHAIR, BOARD OF DIRECTORS

CHAIR'S*update*

LEARNING FROM EACH OTHER TO IMPROVE PATIENT CARE

ENSURING PATIENT SAFETY AND IMPROVING OVERALL PATIENT CARE is of the utmost importance to all of us, especially at ASTRO. I strongly believe it is our responsibility to not only ensure patient safety and quality of care based on our current treatment options, but also to expand our knowledge and learn from our colleagues in order to constantly improve patient care.

As part of ASTRO's strategic plan, we are working to "shape the framework for the delivery of safe, high-quality, high-value health care to all patients by the radiation oncology team." Part of this effort includes making recommendations to improve patient safety and mitigating the potential for error in radiation therapy planning and delivery.

This strategic goal, combined with ASTRO's *Target Safely* initiative, prompted the creation of a specialty-specific medical error reporting system, or patient safety organization (PSO). The result is the first medical specialty-sponsored PSO, the Radiation Oncology Incident Learning System (RO-ILS).

The 1999 Institute of Medicine (IOM) report, "To Err is Human: Building a Safer Health System," highlighted a serious need to collect information that would improve health care quality and reduce harm to patients. From this report, the Patient Safety and Quality Improvement Act of 2005 (PSQIA) was established.

PSOs are entities established by the PSQIA to help improve safety and quality through the collection and analysis of errors, near-misses and other patient events. PSOs offer privilege and confidentiality protections under the PSQIA, which allows for the gathering of this important data that might otherwise go unreported. It also provides the opportunity to aggregate and analyze national data that can be shared with providers. This analysis of a wider range of events enhances the ability to more rapidly identify ways to improve quality and safety.

RO-ILS is a secure, electronic portal that supports both hospital radiation oncology departments and providers working in a freestanding clinic, allowing everyone involved in our specialty to contribute to this important learning database. The non-punitive environment that PSOs offer helps encourage wide participation of clinicians and health care organizations to collect, aggregate and analyze data to identify and reduce the risks and hazards associated with patient care. The more providers that participate in RO-ILS, the better analysis and information we can gather to advance cancer care.

This national medical error reporting system is an entirely voluntary effort. It allows for the collection of a broad set of events, from near-misses that do no or minimal harm, to serious lapses that cause serious harm to our patients. By aggregating and analyzing this wide range of data types, we can help prevent further errors by learning from the experiences in our own practice or institution and the experience of our colleagues across the nation, thereby continually working to improve patient care.

ASTRO is proud to partner with our colleagues at the American Association of Physicists in Medicine (AAPM), who have been an integral

Continued on Page 35

I strongly believe it is our responsibility to not only ensure patient safety and quality of care based on our current treatment options, but also to expand our knowledge and learn from our colleagues in order to constantly improve patient care.

SPECIAL*report*

BY LAURA THEVENOT, ASTRO CEO

WHAT WE'VE DONE AND WHERE WE'RE GOING

ASTRO HAS TAKEN SOME LARGE STEPS forward this year and made significant progress in various areas, particularly with ongoing, long-term initiatives that will help improve cancer care for patients worldwide.

As part of our efforts to ensure appropriate care for patients, we are participating in the national *Choosing Wisely* campaign, a multi-year effort of the ABIM Foundation to encourage discussions between physicians and patients about their care. ASTRO released our list of five treatments to question during a packed session at the Annual Meeting in Atlanta (see related story on page 31). ASTRO is proud to participate in this initiative to help ensure the highest level of patient-centered care.

Another key ASTRO initiative is the creation of a national medical error reporting system for radiation oncology. The Radiation Oncology Incident Learning System (RO-ILS), a patient safety organization (PSO), provides a non-punitive environment to help identify and reduce risks associated with patient care in radiation oncology. ASTRO has partnered with the American Association of Physicists in Medicine in this effort. RO-ILS is currently in beta testing. I hope that you will participate in RO-ILS to help your colleagues learn from and prevent errors to improve patient care (see related story on page 7).

The development of ASTRO's Accreditation Program for Excellence (APEx) was accelerated this year, and it officially debuted during the Annual Meeting with prospective surveyor training and a highlights luncheon. The program will gain even more traction in 2014 with the release of program standards and the acceptance of surveyor applications in January, followed by facility applications in May.

Additionally, ASTRO updated our public awareness research, last done in 2007. A key finding is that our world has changed since the last survey in a way that has direct repercussions for how people gather information and become engaged in their own treatment. The findings will be used to inform our patient advocacy and outreach efforts. More information on the results will be coming soon.

Finally, closing the self-referral loophole continues to be a main focus of our advocacy and government relations work. There were two key "wins" for ASTRO this year. First, in August, the Government Accountability Office (GAO) released its report on self-referral in radiation oncology. The report found that IMRT utilization increased 356 percent among self-referring groups, while IMRT utilization decreased by 5 percent among non-self-referrers, according to Medicare data from 2006-2010.

In addition, the long-awaited, ASTRO-funded study from Jean Mitchell, PhD, of Georgetown University, on urologists' use of IMRT for prostate cancer was published in the October 24, 2013 issue of the *New England Journal of Medicine*. Dr. Mitchell's comprehensive review of Medicare data from 45,000 patients from 2005-2010 concluded that nearly all of the 146 percent increase in IMRT among urologists with an ownership interest in IMRT was because of self-referral.

These two studies, combined with other research, confirm that the financial incentives of self-referral contribute to unnecessary spending and potentially inappropriate patient care. ASTRO will continue our efforts to close the self-referral loophole to ensure that patients are receiving proper care.

While we have implemented several new initiatives, ASTRO continues to enhance our current offerings for members. From reducing the publication time for the Red Journal and publishing six issues of *Practical Radiation Oncology* in 2014 to continuing the webinars on *e*Contouring, coding changes and other topics, and adding the new Best of ASTRO meeting this past fall, we are committed to providing our members the resources, support and education to help provide cancer patients with the highest quality and safest care possible.

Laura Thevenot is ASTRO's chief executive officer. She welcomes comments on this column at astronews@astro.org

SOCIETY NEWS

ASTRO awards two medical students with $6,000 in research stipends

BY BRITTANY ASHCROFT, COMMUNICATIONS MANAGER, BRITTANYA@ASTRO.ORG

ASTRO'S HEALTHCARE ACCESS AND TRAINING SUBCOMMITTEE (HATS) has selected two medical students to receive the 2013 Minority Summer Fellowship Award: Tyler Vestal of Columbia University Medical Center in New York (clinical research) and Paul Adenuga of Case Western Reserve University School of Medicine in Cleveland (basic science research).

Created in line with HATS' mission to advance the role of minorities within the field of oncology by increasing educational and professional opportunities for minorities, the award helps introduce students who are under-represented in medicine to radiation oncology.

The award, established in 2010, provides a $3,000 stipend to each recipient for an eight-week research training program at the institution of their choice and for attending and presenting their research at the next ASTRO Annual Meeting. Both 2013 awardees will submit an abstract for presentation at the 2014 ASTRO Annual Meeting.

Vestal is currently completing data analysis on his research project, "Impact of concurrent metformin or propranolol and radiation for locally advanced head and neck cancer," under the guidance of mentor Tony J. Wang, MD. The project is using the National Cancer Institute's Survival, Epidemiology and End Results Medicare database to evaluate patient outcomes, including disease specific and overall survival, for patients treated with radiation therapy with metformin and/or propranolol.

"We hope to add to a growing body of literature that identified additional agents that may be used in concert with radiation therapy for their anti-neoplastic activity," Vestal said.

Adenuga is in the data analysis phase of his project, "The role of deferoxamine in the prevention of osteoradionecrosis in the rat mandible due to radiation therapy and synergistic bisphosphonate osteonecrosis," under the mentorship of Davood Varghai, MD. The study's aim is to evaluate the role of deferozamine (DFO) in preventing or decreasing the breakdown of osseous tissue following radiation therapy exposure, which can lead to osteoradionecrosis.

"Ultimately, we will be evaluating the possibility of harnessing the angiogenesis-supporting properties of DFO in reducing the morbidity associated with radiation therapy for head and neck and other cancers," Adenuga said.

Karen Winkfield, MD, PhD, (left) HATS vice-chair, and Rosemary Wong, PhD, (right) HATS immediate past chair, congratulate Raymond Mailhot Vega, MD, MPH, on his 2012 ASTRO Minority Summer Fellowship Clinical Award. He presented his research during the Clinical Trials session at the 2013 ASTRO Annual Meeting.

Applications for the 2014 Minority Summer Fellowship Award are now being accepted. The deadline to submit applications is March 7, 2014. For more information, visit www.astro.org/minoritysummerfellowship.

In Memoriam

ASTRO has learned that the following members have passed away. Our thoughts go out to their families and friends.

William C. Constable, MD
Kathleen A. Kelly, MD
Joseph F. Montebello, MD

The Radiation Oncology Institute (ROI) graciously accepts gifts in memory of or in tribute to individuals. For more information, call 1-800-962-7876 or visit www.roinstitute.org.

Members develop apps for radiation oncology

BY BRITTANY ASHCROFT, COMMUNICATIONS MANAGER, BRITTANYA@ASTRO.ORG

THERE ARE A SEEMINGLY ENDLESS NUMBER OF SMARTPHONE and web apps available for a wide variety of uses, from productivity and reference to travel, news and medical topics—and radiation oncology is also included in that mix.

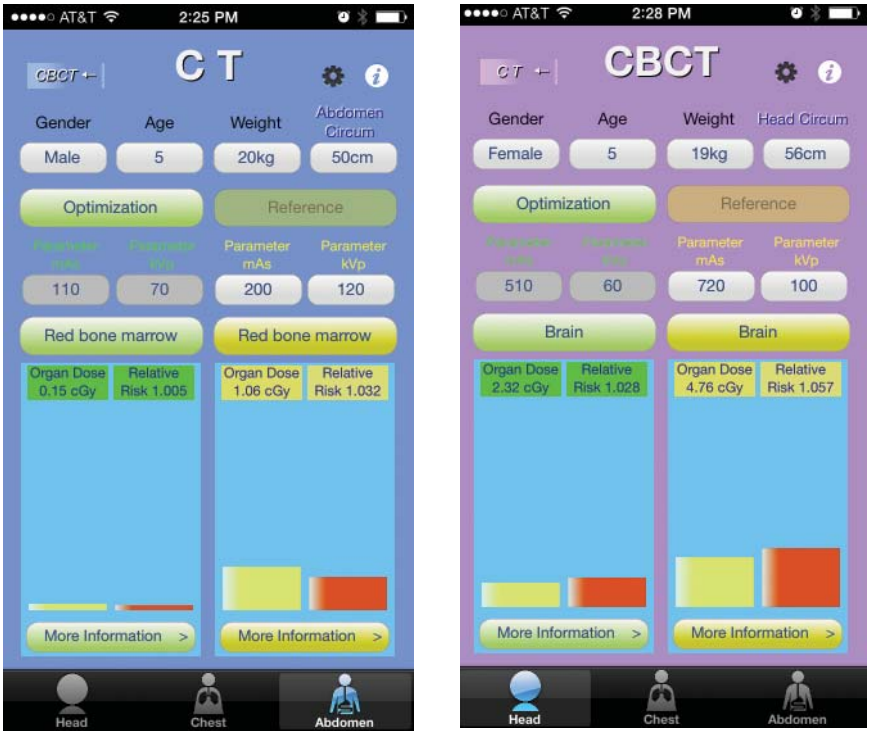
ASTRO member Jun Deng, PhD, a medical physicist and associate professor of therapeutic radiology at Yale University School of Medicine in New Haven, Conn., had an idea two years ago to develop an app that could be used to estimate organ doses and the associated cancer risk from computed tomography (CT) and cone-beam computed tomography (CBCT) scans based on individual anatomy after he was repeatedly approached by people asking about radiation doses of CT and CBCT scans.

The app, CT Gently, uses the gender, age, weight and circumference of three anatomic sites, which is entered by the user, to generate results on the organ doses and associated risks of the dose for either a CT or CBCT scan. In addition, the app can generate optimized settings for personalized low-dose CT and CBCT scans based on individual anatomy and scan mode. Dr. Deng designed the app in an easy-to-use format that is simplistic and efficient with the hope that patients and caregivers could also use the app and benefit from the information.

"With the concern of radiation dose and cancer risk in CT scans among clinicians and the general public, especially to children, CT Gently may help increase the awareness of safe and appropriate application of medical imaging in the clinic with improved benefit-to-risk ratio in the long run," he said.

CT Gently is currently available for free for the iPhone via iTunes at https://itunes.apple.com/us/app/ct-gently/id654734773?mt=8.

As part of his scientific presentation at ASTRO's Annual Meeting this year, ASTRO member Paul Sperduto, MD, MPP, co-director of the Gamma Knife Center at the University of Minnesota and a radiation oncologist at Minneapolis Radiation Oncology, launched a smartphone/Web app called GPA (Graded Prognostic Assessment) Index. The app is based on a study by Sperduto et al, published in the *Journal of Clinical Oncology* (Sperduto PW, Kased N, Roberge D, et al. Summary report on the graded prognostic assessment: An accurate and facile diagnosis-specific tool to estimate survival for patients with brain metastases. *J Clin Oncol* 30:419–425, 2012).



CT Gently uses the gender, age, weight and circumference of three anatomic sites to generate results on the organ doses and associated risks of the dose for either a CT or CBCT scan.

"This app should be very helpful to clinicians by making a complicated issue much simpler, quicker and user-friendly, allowing the GPA Index to be used for individualized management of patients with brain metastases."

The GPA Index estimates survival for patients with brain metastases. Users are asked what original diagnosis resulted in brain metastases (non-small cell lung cancer, small cell lung cancer, melanoma, breast cancer, renal cell carcinoma or gastrointestinal cancer at any site). Based on that selection, the app walks users through disease-site specific prognostic factors and provides the median and 25-75 percentile survival rates.

Dr. Sperduto explained that the Web app was developed to simplify the use of the GPA Index as it works on any smartphone or computer with Internet access.

"Outcomes for patients with brain metastases vary widely, and the clinical characteristics that predict outcomes vary by diagnosis," he said. "This app should be very helpful to clinicians by making a complicated issue much simpler, quicker and user-friendly, allowing the GPA Index to be used for individualized management for patients with brain metastases."

The GPA Index Web app is available for free at www.brainmetgpa.com.

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Emerging Technology Monitoring Subcommittee follows innovations on the horizon

BY ELEANOR HARRIS, MD, CHAIR, ETC, AND MARK BUYYOUNOUSKI, MD, MS, VICE-CHAIR, ETC

ASTRO'S EMERGING TECHNOLOGY MONITORING SUBCOMMITTEE (ETC) provides vital technical and clinical assistance to the Health Policy Council (HPC), informing work on code development and implementation. A group of 20 radiation oncologists and physicists, led by chair Eleanor Harris, MD, and vice-chair Mark Buyyounouski, MD, MS, monitor more than 20 distinct technologies, produce informative, short-form reports from the monitoring process and remain alert for any forthcoming progress and advances. Examples of just a few of the topics the ETC has tracked and reported on over the past year are summarized here.

VMAT

Volumetric modulated arc therapy (VMAT) is an arc-based dose delivery approach that produces highly conformal dose distributions by dynamically varying the dose rate, speed of the gantry rotation and position of the multileaf collimator (MLC) leaves. This treatment technique can be delivered with a linear accelerator equipped with a conventional MLC; however, adoption of VMAT requires special software, hardware and quality assurance (QA) processes.

Of important note, key differences exist between VMAT and IMRT related to delivery, optimization and quality assurance. The current VMAT technology only delivers one beam (aperture) at a single gantry angle with either a full arc rotation or partial arc. Multiple full or partial arcs with either coplanar or non-coplanar arrangement are also available dependent on treatment sites and complexity of target and critical organ volumes. VMAT directly optimizes each aperture at each gantry position for all arcs and all variables (dose rate, lead motion speed and gantry rotation speed), and as a result, the QA procedures for VMAT currently involve many more checks than IMRT. A QA device with 3-D dosimetric characteristics as well as software for dose analysis is highly desirable for patient-specific QA of VMAT treatment. Dosimetrically, the quality of VMAT treatment is comparable to IMRT but higher efficiency may translate into lower average treatment time, less organ motion concern and improved patient convenience.

RADIUM-223

Radium-223 dichloride ($^{223}RaCl_2$), a form of radionuclide therapy (RnT), is an alpha emitting particle that acts as a calcium mimetic, depositing radiation in bone areas of increased turnover, such as bone metastases. $^{223}Ra^{2+}$ acts similarly to strontium ($^{89}Sr^{2+}$) formed from one of the most commonly used RnT for bony metastases, beta emitter $^{89}SrCl_2$, with similar biodistributions. ^{223}Ra decay produces primarily 5-7 MeV alpha particles (Average 5.6 MeV, approximate range 50 μm) with relatively short-lived daughter products (^{219}Rn, ^{215}Po, ^{211}Bi and ^{207}Th all have half-lives of less than 5 seconds). One possible advantage of alpha particle-based RnT is that the short range in tissue, combined with the short half-life of the

more diffusible daughter products and the distribution of calcium throughout sclerotic bony metastases, can lead to an increased radiation dose to tumor cells as opposed to bone marrow cells. In addition, the high linear energy transfer of alpha particles may provide for increased biological efficacy for tumor cells with a relative sparing of normal cells.

A randomized $^{223}RaCl_2$ phase III ALSYMPCA trial of 922 patients with castrate resistant prostate cancer (CRPC) and painful bony metastases enrolled in four continents found an increase in overall survival and time until first symptomatic skeletal event. Due to these results, $^{223}RaCl_2$ received fast track designation and was granted Food and Drug Administration (FDA) approval on May 15, 2013 for patients with CRPC with symptomatic bony metastatic disease and no known visceral metastatic disease. As more clinical experience is gained and new clinical trials are performed, the therapeutic role of $^{223}RaCl_2$ in clinical practice is likely to evolve, especially with respect to its systemic use in place of or in conjunction with other systemic therapies.

PERIRECTAL SPACERS

The injection of a substance into the perirectal fat positioned between the denonvilliers fascia and anterior rectal wall increases the space between the prostate and rectum, which may allow for more flexibility in radiation delivery. The potential advantages include larger posterior margins (to account for prostate movement), higher prostate doses (for improved cancer control) and lower rectum doses (for reduced rectal toxicity).

Investigators have used saline, hyaluronic acid, autologous blood, collagen, polymer balloons and, more recently, absorbable polyethylene glycol hydrogels as perirectal spacers. Absorbable polymer balloons implantation resulted in an average prostate-rectum spacing of 19 mm, resulting in an average

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> Dosimetrically, the quality of VMAT treatment is comparable to IMRT but higher efficiency may translate into lower average treatment time, less organ motion concern and improved patient convenience.

rectal V70 reduction of more than 50 percent. In the case of absorbable hydrogels, the hydrogel formulation is designed to remain stable for three months, created an average of 10 mm prostate-rectum space and resulted in a decrease of rectal doses (e.g., V70 can be reduced from around 15 percent to 5 percent). There is currently no FDA approval for the polymer balloons or hydrogels, but studies have demonstrated the feasibility of significant space expansion between the prostate and rectum, considerably altering the dose plan and reducing rectal irradiation. In the treatment of localized prostate cancers, perirectal spacers may facilitate dose escalation to the prostate by minimizing rectal doses. Similar spacers are currently being considered in other anatomic locations.

HIFU

High-frequency ultrasound (HIFU) is a noninvasive treatment used for tissue and tumor ablation deep inside the body. For HIFU to be used as a stand-alone treatment, temperatures higher than 56°C are needed for ablation. These thermal exposures result in instantaneous cell death from protein denaturation and damage to cytosolic and mitochondrial enzymes that appear histologically, like coagulative necrosis. With the aid of ultrasound or MRI image guidance, HIFU delivery is done by site-specific units via direct skin contact (extracorporeal) or placed into a space (intracavitary). Currently, the most common technique used to shape the dose to a clinically defined target is a time-consuming process called "painting," placing individual ellipsoids side by side to fill the volume and thus achieving the desired therapeutic effect similar to the sphere packing used in stereotactic radiosurgery. The treatments can be uncomfortable and require the use of conscious sedation to successfully deliver the therapy.

The current clinical impact of HIFU is primarily related to the use in patients with prostate cancer and bone metastases, but other advances are being made. Due to the extended treatment times, the need for conscious sedation and the higher price, it is unlikely this device will replace conventional radiotherapy or stereotactic body radiation therapy, although it may have a significant impact on the treatment of functional tumors of the brain.

MRI-GUIDED EXTERNAL BEAM RADIATION THERAPY

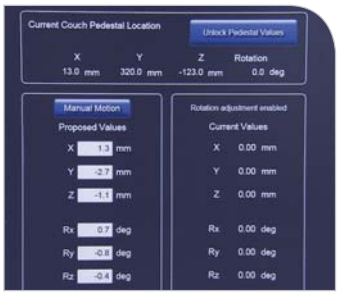
One of the newest innovations in image guided radiation therapy (IGRT) is the utilization of simultaneous magnetic resonance imaging (MRI) while delivering external beam radiation therapy (EBRT). This promising new technology aims to improve upon traditional IGRT techniques by providing accurate knowledge of the tumor and normal tissue positions during radiotherapy to facilitate real-time adaptive radiotherapy and by potentially giving information about tumor and normal tissue functional changes that are occurring during treatment.

Integrating MRI with EBRT is challenging as the MRI affects the EBRT beam generation and dose distribution, and the EBRT affects the MRI image quality. From a patient perspective, the magnetic field affects the dose distribution, and the impact of MRI on the dose distribution must be evaluated and considered during treatment planning.

Though MRI-EBRT is in its infancy, given the potential image guidance benefits offered by this emerging modality, it is expected to play a significant role in the treatment of cancer over the next five to 10 years, particularly for thoracic and abdominal cancers where respiratory motion limits the efficacy of current IGRT approaches.

We would like to acknowledge the ETC committee members who worked on the reports described: Fang-Fang Yin, PhD, Robert Timmerman, MD, Keith Cengel, MD, PhD, Patrick Kupelian, MD, Steven Feigenberg, MD, John Han-Chih Chang, MD, and Paul Keall, PhD, MS.

For more on these technologies and the ETC, visit www.astro.org/astronews.



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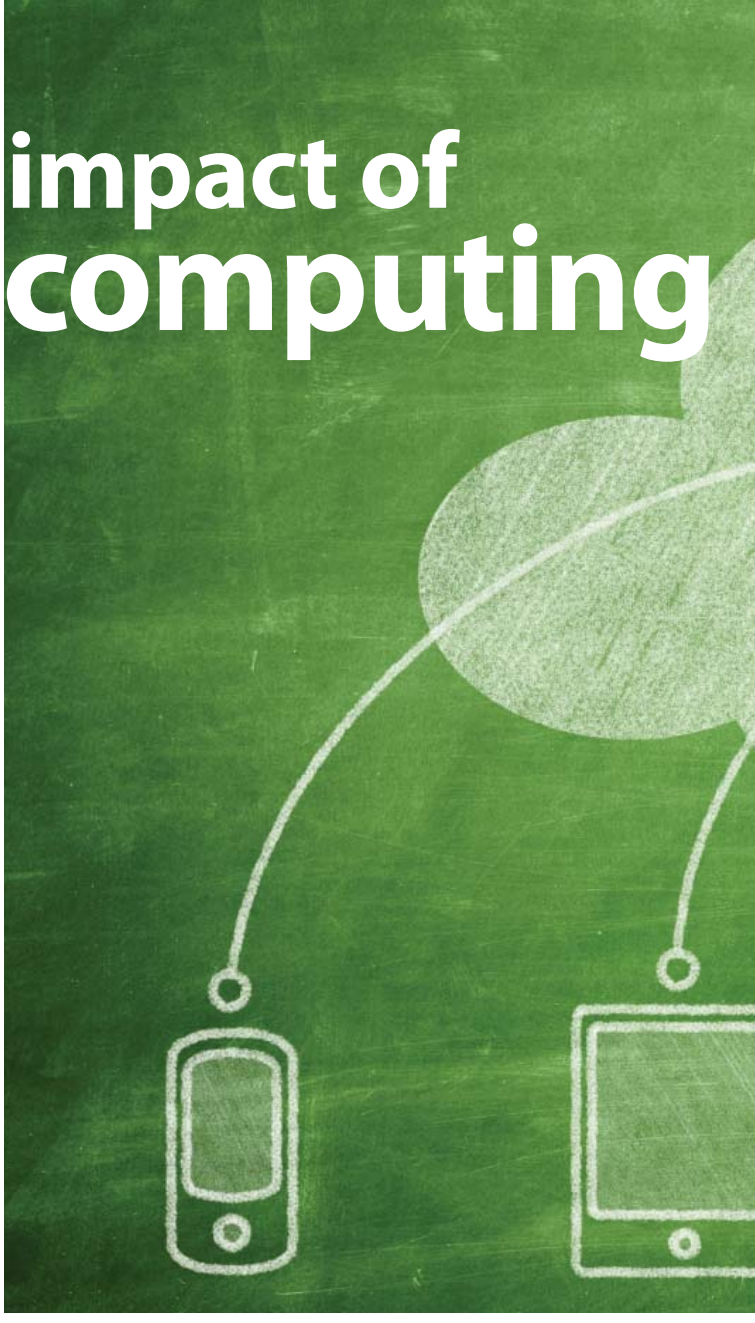
Radiation Oncology

The potential impact of cloud computing on radiation oncology



BY STANLEY BENEDICT, PHD, TODD MCNUTT, PHD, DAVID SCHLESINGER, PHD, KEVIN MOORE, PHD, STEVE GOETSCH, PHD, LEI XING, PHD, AND JING CUI, DSC

RADIATION ONCOLOGY has a distinguished history of early adoption of technology, including the implementation of Monte Carlo techniques to quickly and accurately compute doses, co-registration of radiologic anatomical and functional images for planning guidance, and megavoltage delivery of highly modulated fields to deliver therapeutic doses based on desired clinical outcomes. With the entry of powerful cloud computing services, our profession will soon experience more than new computing resources for improving calculations, storage and managing large databases, but rather a whole new way of performing our day-to-day services. Cloud computing will soon change the way we operate in the clinic, invest in our resources and provide the highest quality services to our patients.

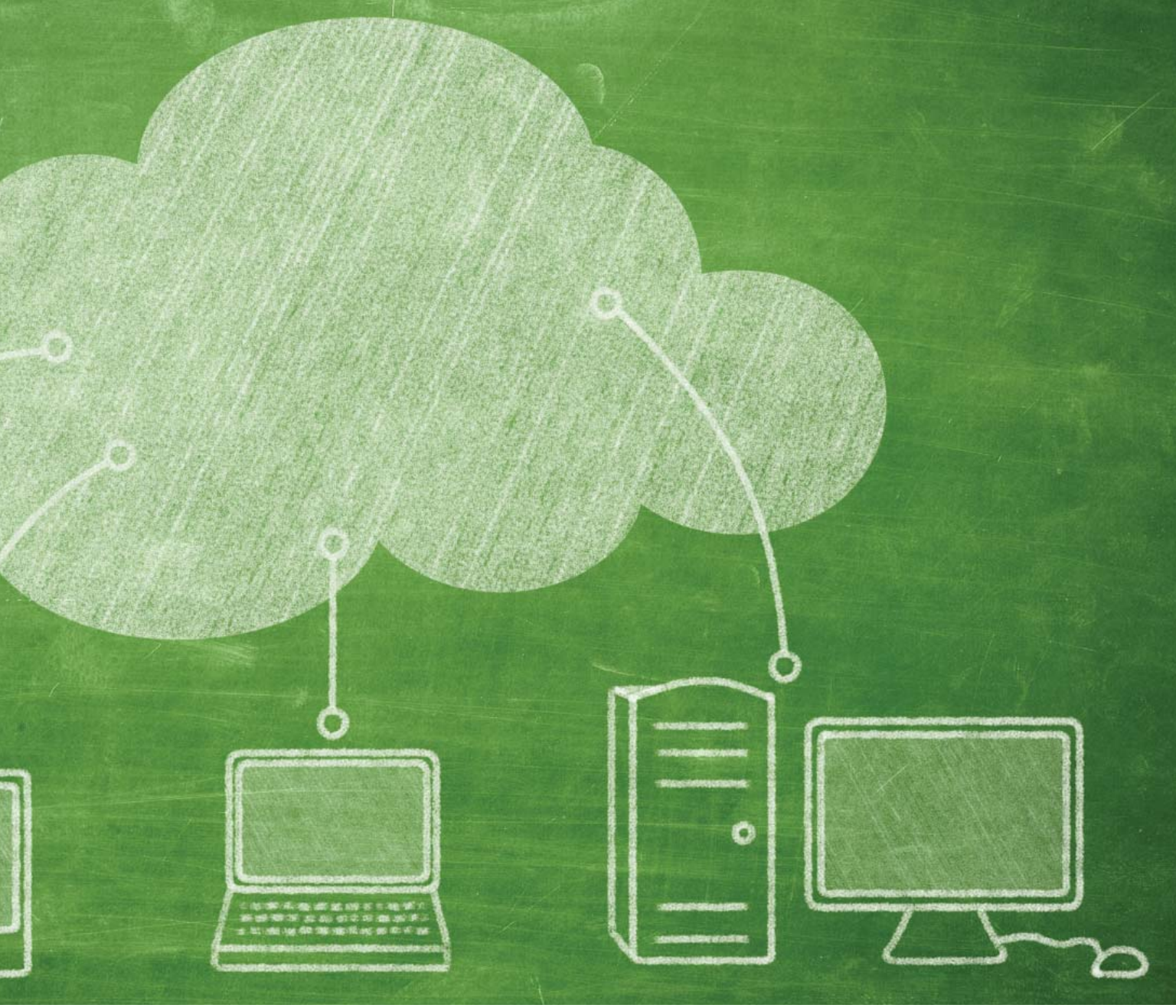
What is cloud computing?

In accordance with the National Institute of Standards and Technology definition, cloud computing is "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." Such systems have yet to be fully adopted into standard clinical radiation oncology software applications; however, the transition to such "on-demand network access" is underway.

What do medical physicists say about cloud computing?

Several physicists have been working on the question of where medical physics is headed in employing cloud computing strategies, and a consensus of recent publications suggests that the most likely developments will appear in the following areas:

- **Cloud-based service models:** Treatment planning systems and treatment management systems can be provided as needed by cloud services, and this allows for the use of software as a service modules optimized for treatment planning tools, deformation image registration for fusion, auto-segmentation for contouring, clinical research protocol tools and radio-biological analysis[1].
- **Aggregate data analyses:** Also known as "Big Data," aggregate data analysis is vital to clinical research, and this next generation of computing infrastructure investigations can be greatly enhanced by use of "Big Data." This aggregation can be designed to provide off-site storage for patient health information security with multiple institutions hosted together[2].
- **Parallel computation:** One of the major advances of cloud computing will be the adoption of massively



shared systems to improve calculation capabilities, image reconstruction and plan optimization[3].

- **Automation:** Although radiation oncology is much more computerized than most other areas of medicine, these computed-based systems are not fully integrated and often require individual systems. By combining all of the software functionalities we will be able to improve documentation, workflow, QA, management and a host of other services we provide[4].

Cloud computing and the era of "Big Data"

The large and complex data sets collected when using "Big Data" make it difficult to process the information with traditional database tools or data processing applications. Opportunities for its use in medicine are in practice quality improvements and identifying ways to improve care through medical research. Since the technology is mature, the challenge in medicine is in the capture of complete sets of structured patient data amenable to computerized analysis.

Radiation therapy is at the forefront of the collection of digital, structured information about patients for use in learning and advancing care through "Big Data" initiatives. The diseases that we treat are relatively focused; we know where our treatment is delivered, and we monitor the clinical status of our patients during treatment and in long-term follow up. The electronic infrastructure is such that much of this data is easily retrieved and aggregated for analysis for research and quality purposes. With additional efforts to integrate structured data collection into the clinical workflow, we have a great opportunity to generate even more comprehensive datasets about our patients.

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cloud computing

An important key to the utilization of "Big Data" is in understanding the types of questions we may ask of the data. In clinical trial research we focus on a specific question and make sure we collect the data required to answer that question. It is important in gathering clinical data to identify the types of questions that might be asked in the future, what data needs to be stored and then balance data collection efforts with practicality in the clinical workflow. If we may someday be interested in understanding our toxicity rates for a sub-group of patients to compare with our expectations we must have the foresight to collect appropriate data.

Initiatives such as the National Radiation Oncology Registry from the Radiation Oncology Institute, Oncospace at Johns Hopkins and EuroCAT at MAASTRO seek to pool multi-institutional clinical data. As these efforts mature, the wealth of data from our collective clinical experience will add significant knowledge about the realities of our clinical practice and teach us how best to apply our efforts to improve care for our patients[5].

Cloud computing and peer oversight

Centralized plan review and peer oversight in radiation therapy can trace its origin to techniques as simple as viewing snapshots of a dose distribution and tabular DVH output from the treatment planning system on paper, with a discussion conducted via telephony. Advances in computing power, hardware design and the creation of large redundant data centers have made virtualization (the practice of running multiple independent operating systems and applications on a single hardware node) financially viable[2].

Current visions of centralized plan review and peer oversight are a natural application of cloud technology to the clinical needs of modern radiation oncology practice. Cloud technology enables even small local centers to tap into clinical expertise that may not be found locally[6]. Centralized plan-review solutions exist that can allow an organization to standardize the treatment plans from a heterogeneous set of platforms into a unified view accessible in the cloud that can then be discussed by all stakeholders.

The goal is to provide cutting-edge care to patients regardless of where they are being treated, and if technology limitations prevent this, to efficiently transfer patient care to a more centralized location where the care may be more effectively delivered. At the same time, peer oversight, standardized quality assurance procedures and the accessibility of situation-specific expertise help increase patient safety, allow for more effective analysis and improvements of clinical processes and, hopefully, better patient outcomes[6].

References

1. Moore KL, Kagadis GC, McNutt TR, Moiseenko V, Mutic S. Automation and Advanced Computing in Clinical Radiation Oncology. *Med Phys* – In Preparation.
2. McNutt T, Wong J, Purdy J, Valicenti R, DeWeese T. OncoSpace: A New Paradigm for Clinical Research and Decision Support in Radiation Oncology. Proceedings of the XVIth Int'l Conf on Computers in Radiotherapy. June 1, 2010.
3. Wang H, Ma Y, Pratx G, Xing L. Toward Real-Time Monte Carlo Simulation Using a Commercial Cloud Computing Infrastructure. *Phys Med Biol.* 2011;56(17):N175–N181.
4. Kagadis GC, Kloukinas C, Moore K, et al. Cloud Computing in Medical Imaging. *Med. Phys.* 2013 Jul;40(7): doi: 10.1118/1.4811272.
5. Palta JR, Efstathiou JA, Bekelman JE, et al. Developing a national radiation oncology registry: From acorns to oaks. *Practical Radiation Oncology.* 2012 Jan; 2(1):10-17.
6. Palta JR, Frouhar VA, Dempsey JF. Web-based submission, archive, and review of radiotherapy data for clinical quality assurance: A new paradigm. *Int Journal Radiat Oncol Biol Phys.* 2003;57(5):1427–1436.

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Late Radiation Toxicity — The overall incidence of late radiation toxicities (any grade) was higher in Erbitux (cetuximab) in combination with radiation therapy compared with radiation therapy alone. The following sites were affected: salivary glands (65% versus 56%), larynx (52% versus 36%), subcutaneous tissue (49% versus 45%), mucous membrane (48% versus 39%), esophagus (44% versus 35%), skin (42% versus 33%). The incidence of Grade 3 or 4 late radiation toxicities was similar between the radiation therapy alone and the Erbitux plus radiation treatment groups.

Study 2: EU-Approved Cetuximab in Combination with Platinum-based Therapy with 5-Fluorouracil — Study 2 used EU-approved cetuximab. Since U.S.-licensed Erbitux provides approximately 22% higher exposure relative to the EU-approved cetuximab, the data provided below may underestimate the incidence and severity of adverse reactions anticipated with Erbitux for this indication. However, the tolerability of the recommended dose is supported by safety data from additional studies of Erbitux [see *Clinical Pharmacology (12.3)* in Full Prescribing Information].

Table 2 contains selected adverse reactions in 434 patients with recurrent locoregional disease or metastatic SCCHN receiving EU-approved cetuximab in combination with platinum-based therapy with 5-FU or platinum-based therapy with 5-FU alone in Study 2. Cetuximab was administered at 400 mg/m^2 for the initial dose, followed by 250 mg/m^2 weekly. Patients received a median of 17 infusions (range 1–89).

Table 2: Incidence of Selected Adverse Reactions (≥10%) in Patients with Recurrent Locoregional Disease or Metastatic SCCHN

	EU-Approved Cetuximab plus Platinum-based Therapy with 5-FU (n=219)		Platinum-based Therapy with 5-FU Alone (n=215)	
System Organ Class Preferred Term	**Grades 1–4**	**Grades 3 and 4**	**Grades 1–4**	**Grades 3 and 4**
	% of Patients			
Eye Disorders				
Conjunctivitis	10	0	0	0
Gastrointestinal Disorders				
Nausea	54	4	47	4
Diarrhea	26	5	16	1
General Disorders and Administration Site Conditions				
Pyrexia	22	0	13	1
Infusion Reaction[a]	10	2	<1	0
Infections and Infestations				
Infection[b]	44	11	27	8
Metabolism and Nutrition Disorders				
Anorexia	25	5	14	1
Hypocalcemia	12	4	5	1
Hypokalemia	12	7	7	5
Hypomagnesemia	11	5	5	1
Skin and Subcutaneous Tissue Disorders				
Acneiform Rash[c]	70	9	2	0
Rash	28	5	2	0
Acne	22	2	0	0
Dermatitis Acneiform	15	2	0	0
Dry Skin	14	0	<1	0
Alopecia	12	0	7	0

[a] Infusion reaction defined as any event of "anaphylactic reaction", "hypersensitivity", "fever and/or chills", "dyspnea", or "pyrexia" on the first day of dosing. [b] Infection – this term excludes sepsis-related events which are presented separately. [c] Acneiform rash defined as any event described as "acne", "dermatitis acneiform", "dry skin", "exfoliative rash", "rash", "rash erythematous", "rash macular", "rash papular", or "rash pustular". Chemotherapy = cisplatin + 5-fluorouracil or carboplatin + 5-fluorouracil

For cardiac disorders, approximately 9% of subjects in both the EU-approved cetuximab plus chemotherapy and chemotherapy-only treatment arms in Study 2 experienced a cardiac event. The majority of these events occurred in patients who received cisplatin/5-FU, with or without cetuximab as follows: 11% and 12% in patients who received cisplatin/5-FU with or without cetuximab, respectively, and 6% or 4% in patients who received carboplatin/5-FU with or without cetuximab, respectively. In both arms, the incidence of cardiovascular events was higher in the cisplatin with 5-FU containing subgroup. Death attributed to cardiovascular event or sudden death was reported in 3% of the patients in the cetuximab plus platinum-based therapy with 5-FU arm and 2% in the platinum-based chemotherapy with 5-FU alone arm.

Colorectal Cancer

Study 4: EU-Approved Cetuximab in Combination with FOLFIRI — Study 4 used EU-approved cetuximab. U.S.-licensed Erbitux provides approximately 22% higher exposure to cetuximab relative to the EU-approved cetuximab. The data provided below for Study 4 is consistent in incidence and severity of adverse reactions with those seen for Erbitux in this indication. The tolerability of the recommended dose is supported by safety data from additional studies of Erbitux [see *Clinical Pharmacology (12.3)* in Full Prescribing Information].

Table 3 contains selected adverse reactions in 667 patients with *K-Ras* mutation-negative (wild-type), EGFR-expressing, metastatic colorectal cancer receiving EU-approved cetuximab plus FOLFIRI or FOLFIRI alone in Study 4 [see *Warnings and Precautions*]. Cetuximab was administered at the recommended dose and schedule (400 mg/m^2 initial dose, followed by 250 mg/m^2 weekly). Patients received a median of 26 infusions (range 1–224).

Table 3: Incidence of Selected Adverse Reactions Occurring in ≥10% of Patients with *K-Ras* Mutation-negative (Wild-type) and EGFR-expressing, Metastatic Colorectal Cancer[a]

	EU-Approved Cetuximab plus FOLFIRI (n=317)		FOLFIRI Alone (n=350)	
Body System Preferred Term	**Grades 1–4[b]**	**Grades 3 and 4**	**Grades 1–4**	**Grades 3 and 4**
	% of Patients			
Blood and Lymphatic System Disorders				
Neutropenia	49	31	42	24
Eye Disorders				
Conjunctivitis	18	<1	3	0
Gastrointestinal Disorders				
Diarrhea	66	16	60	10
Stomatitis	31	3	19	1
Dyspepsia	16	0	9	0
General Disorders and Administration Site Conditions				
Infusion-related Reaction[c]	14	2	<1	0
Pyrexia	26	1	14	1
Infections and Infestations				
Paronychia	20	4	<1	0
Investigations				
Weight Decreased	15	1	9	1
Metabolism and Nutrition Disorders				
Anorexia	30	3	23	2

(Continued)

Table 3: Incidence of Selected Adverse Reactions Occurring in ≥10% of Patients with *K-Ras* Mutation-negative (Wild-type) and EGFR-expressing, Metastatic Colorectal Cancer[a] *(Continued)*

	EU-Approved Cetuximab plus FOLFIRI (n=317)		FOLFIRI Alone (n=350)	
Body System Preferred Term	**Grades 1–4[b]**	**Grades 3 and 4**	**Grades 1–4**	**Grades 3 and 4**
	% of Patients			
Skin and Subcutaneous Tissue Disorders				
Acne-like Rash[d]	86	18	13	<1
Rash	44	9	4	0
Dermatitis Acneiform	26	5	<1	0
Dry Skin	22	0	4	0
Acne	14	2	0	0
Pruritus	14	0	3	0
Palmar-plantar Erythrodysesthesia Syndrome	19	4	4	<1
Skin Fissures	19	2	1	0

[a] Adverse reactions occurring in at least 10% of Erbitux (cetuximab) combination arm with a frequency at least 5% greater than that seen in the FOLFIRI arm. [b] Adverse reactions were graded using the NCI CTC, V 2.0. [c] Infusion related reaction is defined as any event meeting the medical concepts of allergy/anaphylaxis at any time during the clinical study or any event occurring on the first day of dosing and meeting the medical concepts of dyspnea and fever or by the following events using MedDRA preferred terms: "acute myocardial infarction", "angina pectoris", "angioedema", "autonomic seizure", "blood pressure abnormal", "blood pressure decreased", "blood pressure increased", "cardiac failure", "cardiopulmonary failure", "cardiovascular insufficiency", "clonus", "convulsion", "coronary no-reflow phenomenon", "epilepsy", "hypertension", "hypertensive crisis", "hypertensive emergency", "hypotension", "infusion related reaction", "loss of consciousness", "myocardial infarction", "myocardial ischaemia", "prinzmetal angina", "shock", "sudden death", "syncope", or "systolic hypertension". [d] Acne-like rash is defined by the events using MedDRA preferred terms and included "acne", "acne pustular", "butterfly rash", "dermatitis acneiform", "drug rash with eosinophilia and systemic symptoms", "dry skin", "erythema", "exfoliative rash", "folliculitis", "genital rash", "mucocutaneous rash", "pruritus", "rash", "rash erythematous", "rash follicular", "rash generalized", "rash macular", "rash maculopapular", "rash maculovesicular", "rash morbilliform", "rash papular", "rash papulosquamous", "rash pruritic", "rash pustular", "rash rubelliform", "rash scarlatiniform", "rash vesicular", "skin exfoliation", "skin hyperpigmentation", "skin plaque", "telangiectasia", or "xerosis".

Erbitux Monotherapy — Table 4 contains selected adverse reactions in 242 patients with *K-Ras* mutation-negative (wild-type), EGFR-expressing, metastatic colorectal cancer who received best supportive care (BSC) alone or with Erbitux in Study 5 [see *Warnings and Precautions*]. Erbitux was administered at the recommended dose and schedule (400 mg/m^2 initial dose, followed by 250 mg/m^2 weekly). Patients received a median of 17 infusions (range 1–51).

Table 4: Incidence of Selected Adverse Reactions Occurring in ≥10% of Patients with *K-Ras* Mutation-negative (Wild-type), EGFR-expressing, Metastatic Colorectal Cancer Treated with Erbitux Monotherapy[a]

	Erbitux plus BSC (n=118)		BSC alone (n=124)	
Body System Preferred Term	**Grades 1–4[b]**	**Grades 3 and 4**	**Grades 1–4**	**Grades 3 and 4**
	% of Patients			
Dermatology/Skin				
Rash/Desquamation	95	16	21	1
Dry Skin	57	0	15	0
Pruritus	47	2	11	0
Other-Dermatology	35	0	7	2
Nail Changes	31	0	4	0
Constitutional Symptoms				
Fatigue	91	31	79	29
Fever	25	3	16	0
Infusion Reactions[c]	18	3	0	0
Rigors, Chills	16	1	3	0
Pain				
Pain-Other	59	18	37	10
Headache	38	2	11	0
Bone Pain	15	4	8	2
Pulmonary				
Dyspnea	49	16	44	13
Cough	30	2	19	2
Gastrointestinal				
Nausea	64	6	50	6
Constipation	53	3	38	3
Diarrhea	42	2	23	2
Vomiting	40	5	26	5
Stomatitis	32	1	10	0
Other-Gastrointestinal	22	12	16	5
Dehydration	13	5	3	0
Mouth Dryness	12	0	6	0
Taste Disturbance	10	0	5	0
Infection				
Infection without neutropenia	38	11	19	5
Musculoskeletal				
Arthralgia	14	3	6	0
Neurology				
Neuropathy-sensory	45	1	38	2
Insomnia	27	0	13	0
Confusion	18	6	10	2
Anxiety	14	1	5	1
Depression	14	0	5	0

[a] Adverse reactions occurring in at least 10% of Erbitux plus BSC arm with a frequency at least 5% greater than that seen in the BSC alone arm. [b] Adverse reactions were graded using the NCI CTC, V 2.0. [c] Infusion reaction is defined as any event (chills, rigors, dyspnea, tachycardia, bronchospasm, chest tightness, swelling, urticaria, hypotension, flushing, rash, hypertension, nausea, angioedema, pain, sweating, tremors, shaking, drug fever, or other hypersensitivity reaction) recorded by the investigator as infusion-related.

Erbitux in Combination with Irinotecan — The most frequently reported adverse reactions in 354 patients treated with Erbitux plus irinotecan in clinical trials were acneiform rash (88%), asthenia/malaise (73%), diarrhea (72%), and nausea (55%). The most common Grades 3–4 adverse reactions included diarrhea (22%), leukopenia (17%), asthenia/malaise (16%), and acneiform rash (14%).

Immunogenicity: As with all therapeutic proteins, there is potential for immunogenicity. Immunogenic responses to cetuximab were assessed using either a double antigen radiometric assay or an ELISA assay. Due to limitations in assay performance and sampling timing, the incidence of antibody development in patients receiving Erbitux has not been adequately determined. Non-neutralizing anti-cetuximab antibodies were detected in 5% (49 of 1001) of evaluable patients without apparent effect on the safety or antitumor activity of Erbitux.

The incidence of antibody formation is highly dependent on the sensitivity and specificity of the assay. Additionally, the observed incidence of antibody (including neutralizing antibody) positivity in an assay may be influenced by several factors including assay methodology, sample handling, timing of sample collection, concomitant medications, and underlying disease. For these reasons, comparison of the incidence of antibodies to Erbitux (cetuximab) with the incidence of antibodies to other products may be misleading.

Postmarketing Experience: The following adverse reactions have been identified during post-approval use of Erbitux. Because these reactions are reported from a population of uncertain size, it is not always possible to reliably estimate their frequency or establish a causal relationship to drug exposure.

- Aseptic meningitis
- Mucosal inflammation

DRUG INTERACTIONS

A drug interaction study was performed in which Erbitux was administered in combination with irinotecan. There was no evidence of any pharmacokinetic interactions between Erbitux and irinotecan.

USE IN SPECIFIC POPULATIONS

Pregnancy: Pregnancy Category C — There are no adequate and well-controlled studies of Erbitux in pregnant women. Based on animal models, EGFR has been implicated in the control of prenatal development and may be essential for normal organogenesis, proliferation, and differentiation in the developing embryo. Human IgG is known to cross the placental barrier; therefore, Erbitux may be transmitted from the mother to the developing fetus, and has the potential to cause fetal harm when administered to pregnant women. Erbitux should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

Pregnant cynomolgus monkeys were treated weekly with 0.4 to 4 times the recommended human dose of cetuximab (based on body surface area) during the period of organogenesis (gestation day [GD] 20–48). Cetuximab was detected in the amniotic fluid and in the serum of embryos from treated dams at GD 49. No fetal malformations or other teratogenic effects occurred in offspring. However, significant increases in embryolethality and abortions occurred at doses of approximately 1.6 to 4 times the recommended human dose of cetuximab (based on total body surface area).

Nursing Mothers: It is not known whether Erbitux is secreted in human milk. IgG antibodies, such as Erbitux, can be excreted in human milk. Because many drugs are excreted in human milk and because of the potential for serious adverse reactions in nursing infants from Erbitux, a decision should be made whether to discontinue nursing or to discontinue the drug, taking into account the importance of the drug to the mother. If nursing is interrupted, based on the mean half-life of cetuximab [see *Clinical Pharmacology (12.3)* in Full Prescribing Information], nursing should not be resumed earlier than 60 days following the last dose of Erbitux.

Pediatric Use: The safety and effectiveness of Erbitux in pediatric patients have not been established. The pharmacokinetics of cetuximab, in combination with irinotecan, were evaluated in pediatric patients with refractory solid tumors in an open-label, single-arm, dose-finding study. Erbitux was administered once-weekly, at doses up to 250 mg/m^2, to 27 patients ranging from 1 to 12 years old; and in 19 patients ranging from 13 to 18 years old. No new safety signals were identified in pediatric patients. The pharmacokinetic profiles of cetuximab between the two age groups were similar at the 75 and 150 mg/m^2 single dose levels. The volume of the distribution appeared to be independent of dose and approximated the vascular space of 2–3 L/m^2. Following a single dose of 250 mg/m^2, the geometric mean $AUC_{0\text{-}inf}$ (CV%) value was 17.7 mg•h/mL (34%) in the younger age group (1–12 years, n=9) and 13.4 mg•h/mL (38%) in the adolescent group (13–18 years, n=6). The mean half-life of cetuximab was 110 hours (range 69 to 188 hours) for the younger age group, and 82 hours (range 55 to 117 hours) for the adolescent age group.

Geriatric Use: Of the 1662 patients who received Erbitux (cetuximab) with irinotecan, FOLFIRI or Erbitux monotherapy in six studies of advanced colorectal cancer, 588 patients were 65 years of age or older. No overall differences in safety or efficacy were observed between these patients and younger patients.

Clinical studies of Erbitux conducted in patients with head and neck cancer did not include sufficient number of subjects aged 65 and over to determine whether they respond differently from younger subjects.

OVERDOSAGE

The maximum single dose of Erbitux administered is 1000 mg/m^2 in one patient. No adverse events were reported for this patient.

NONCLINICAL TOXICOLOGY

Carcinogenesis, Mutagenesis, Impairment of Fertility: Long-term animal studies have not been performed to test cetuximab for carcinogenic potential, and no mutagenic or clastogenic potential of cetuximab was observed in the *Salmonella-Escherichia coli* (Ames) assay or in the *in vivo* rat micronucleus test. Menstrual cyclicity was impaired in female cynomolgus monkeys receiving weekly doses of 0.4 to 4 times the human dose of cetuximab (based on total body surface area). Cetuximab-treated animals exhibited increased incidences of irregular or absent cycles, as compared to control animals. These effects were initially noted beginning week 25 of cetuximab treatment and continued through the 6-week recovery period. In this same study, there were no effects of cetuximab treatment on measured male fertility parameters (ie, serum testosterone levels and analysis of sperm counts, viability, and motility) as compared to control male monkeys. It is not known if cetuximab can impair fertility in humans.

Animal Pharmacology and/or Toxicology: In cynomolgus monkeys, cetuximab, when administered at doses of approximately 0.4 to 4 times the weekly human exposure (based on total body surface area), resulted in dermatologic findings, including inflammation at the injection site and desquamation of the external integument. At the highest dose level, the epithelial mucosa of the nasal passage, esophagus, and tongue were similarly affected, and degenerative changes in the renal tubular epithelium occurred. Deaths due to sepsis were observed in 50% (5/10) of the animals at the highest dose level beginning after approximately 13 weeks of treatment.

PATIENT COUNSELING INFORMATION

Advise patients:

- To report signs and symptoms of infusion reactions such as fever, chills, or breathing problems.
- Of the potential risks of using Erbitux during pregnancy or nursing and of the need to use adequate contraception in both males and females during and for 6 months following the last dose of Erbitux therapy.
- That nursing is not recommended during, and for 2 months following the last dose of Erbitux therapy.
- To limit sun exposure (use sunscreen, wear hats) while receiving and for 2 months following the last dose of Erbitux.

Roadmap for changes in the radiation oncology computer-based examinations

BY PAUL E. WALLNER, DO, FASTRO, DENNIS C. SHRIEVE, MD, PHD, AND ANTHONY L. ZIETMAN, MD, FASTRO

THE AMERICAN BOARD OF RADIOLOGY (ABR) trustees, staff and volunteers continuously review initial certification (IC) and Maintenance of Certification (MOC) programs and examinations to ensure that they meet the needs of candidates and diplomates, as well as the expectations of external stakeholders, while still retaining their critical levels of relevance. In this regard, significant changes in the IC qualifying (written) examination and the MOC Part III cognitive examination are forthcoming over the next few years.

The American Board of Medical Specialties (ABMS) and external stakeholders have indicated concerns regarding a lack of significant examination in a variety of "nonclinical skills" (NCS) on the IC qualifying examinations of the various ABMS member boards as well as on the MOC Part III examinations. In response to these concerns, new items (questions) are being prepared and validated for future examinations. Items under consideration include topics relating to system and equipment quality assurance, patient and staff safety, medical ethics and biomedical statistics. Some examples of potential NCS topics include:

- Items related to critical review of the literature, analyses of various endpoints and appropriateness of statistical conclusions.
- Informed consent in the impaired patient, emergent clinical situation or determination of issues related to research as opposed to a change in routine clinical policies.
- Patient and staff radiation safety procedures following oral I-131 administration for thyroid cancer.

There is also a concern that having all items related to actual pathology may skew examination validity, so new items based on "normal" content will be included in future examinations. These items could conceivably request identification of normal, rather than pathologic anatomy, normal tissue/organ tolerances or selection of treatment options including "no treatment." Future examinations will also be

Roadmap for changes in ABR exams

significantly more "image-rich," especially for identification of various normal and pathologic anatomic structures and appropriate tumor contouring.

Plans for the MOC cognitive examination include more significant and fundamental changes. For the majority of radiation oncology diplomates, timing for the first attempt at the MOC examination is typically after eight or more years of active practice. During that interval, many in academic or private practice will have limited their clinical care activities to specific areas of interest, and diplomates in general radiation oncology practices may not routinely care for the universe of patients covered by the eight ABR clinical categories (gastrointestinal, gynecologic, genitourinary, lymphoma/leukemia, head/neck/skin, breast, CNS/pediatric and lung/mediastinum/sarcoma). For time-limited and continuous certificate holders, this disconnect has produced significant anxiety, and for non-time-limited ("lifetime") certificate holders, concerns regarding a "general" radiation oncology clinical examination have actually dissuaded some from enrolling in the ABR MOC program.

Based on dialogue with the ABR MOC Advisory Committee and ABR trustees, as well as the experience to date with practice-profiled modular MOC exams in diagnostic radiology, ABR staff and volunteers are actively working to develop a modular-based radiation oncology examination that would allow diplomates to select specific clinical categories to populate their own examinations. Because the ABR issues only one general specialty certificate in radiation oncology, the examination must, of necessity, include a significant portion of general clinical care questioning. As currently envisioned, the initial MOC modular examination, which is tentatively scheduled for rollout in 2015, might include 200 scorable units (questions), which would continue to be entirely multiple choice. The examination would consist of five available modules:

Module A	Nonclinical skills	20 units	Required
Module B	General clinical	120 units	Required
Module C	General clinical	60 units	Optional
Module D	Specific clinical	30 units	Optional
Module E	Specific clinical	30 units	Optional

All diplomates would be required to take modules A and B (140 of 200 units). Diplomates who continue in general radiation oncology practice or simply prefer to take the general sections could then select module C to complete their required 200 units. The exam development group is committed to having a pool of questions relevant to routine clinical care and not to esoteric material. Physics and biology questions would not be included in this examination unless they related directly to everyday clinical decision making.

Diplomates who limit their clinical practice to a single or several anatomic sites could select modules D and E in either one or two sites, e.g., D and E in breast cancer only or D in breast cancer and E in gynecologic cancer. Thus, for all diplomates, modules for 60 out of 200 items would be personally selected. Modules would be available for selection in each of the eight current ABR clinical categories.

Finally, the nonclinical skills module of the MOC examination would mirror that utilized for the IC exam. We currently anticipate continuing to use the PearsonVUE testing facilities available throughout the country, and we are working actively with PearsonVUE to ensure a waiting time between modules of less than three minutes.

Future IC and MOC examinations will continue to be updated in parallel with decisions by the Accreditation Council on Graduate Medical Education (ACGME) Residency Review Committee (RRC) in radiation oncology. Several years ago, the RRC determined that stereotactic radiosurgery and stereotactic body radiation therapy should be introduced as an essential element of the curriculum for training in radiation oncology, and the ABR has begun to add items related to those modalities to our item inventories. In support of the MOC Pilot Program for Focused Practice Recognition in Brachytherapy, additional items related to that modality are also being developed and validated, and it is anticipated that by 2015 a specific module will be available for participants in that program. Participants could therefore select the brachytherapy module as one of their options (e.g., Module D or E selection). As in the past, as examinations change, details and study guides will be available on myABR at https://myABR.theabr.org and the ABR website at www.theabr.org.

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ASTRO KEEPS PACE WITH MEMBER NEEDS

RESULTS FROM THE 2013 MEMBER SURVEY

BY ANNA ARNONE, VICE-PRESIDENT OF MEMBER RELATIONS AND COMMUNICATIONS, ANNAA@ASTRO.ORG

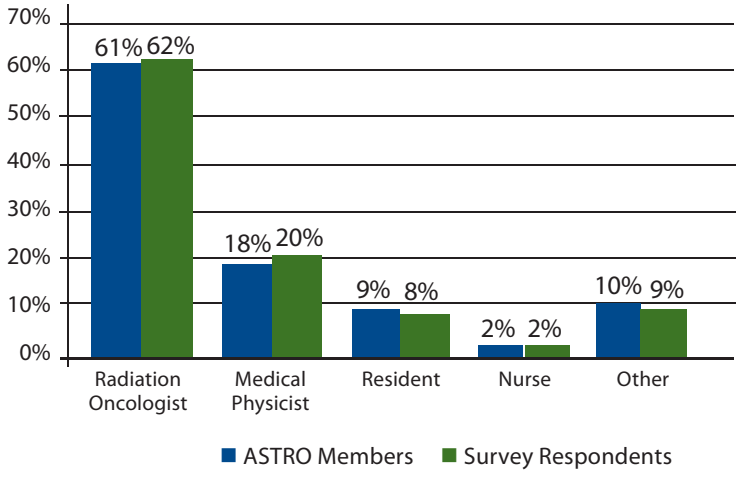
Just 10 years ago, ASTRO had 17 employees and was governed by a "loose web of committees" as described by 2001-2002 ASTRO Chair David A. Larson, MD, PhD, FASTRO. In 2003, ASTRO members approved a reorganization of the committees into four main councils that represented the areas in which members most consistently requested action by ASTRO: Education, Healthcare Economics, Government Relations and Research. ASTRO leaders felt that these councils would help the Society be proactive rather than reactive to member needs and position the Society to strengthen and increase activities in the four key areas. Today, ASTRO staff numbers 75, and while the governance structure implemented in 2003 has served ASTRO's mission well, slight modifications to the structure were made in 2012 to reflect the expanding efforts in the area of quality and patient safety. ASTRO's governance structure now includes five councils: Education, Government Relations, Health Policy (formerly Healthcare Economics), Science (formerly Research) and Clinical Affairs and Quality (new).

Members have always had a voice in the direction and focus of ASTRO. Not only do members have the opportunity to elect the Society's leaders (president-elect and secretary/treasurer-elect) and vote on changes to the bylaws, but they also have the opportunity to express their opinions in the Annual Member Survey. The 2013 Member Survey launched on July 19 and was open for 32 days. Members were notified by email with a link to the survey. Reminder notices were sent out weekly. The survey response rate was 21 percent with members reporting a high satisfaction with ASTRO's efforts on their behalf. A brief summary of the survey findings follows.

RESPONDENT DEMOGRAPHICS

Sixty-two percent of survey respondents describe themselves as radiation oncologists, 20 percent medical physicists, 8 percent radiation oncology residents, 2 percent oncology nurses and the remaining 9 percent included administrators, medical dosimetrists, clinical oncologists, nurse practitioners, radiation biologists, therapists, diagnostic radiologists, physician assistants, surgical oncologists and veterinarians. As shown in Figure 1, the respondent occupations correlate closely with ASTRO membership.

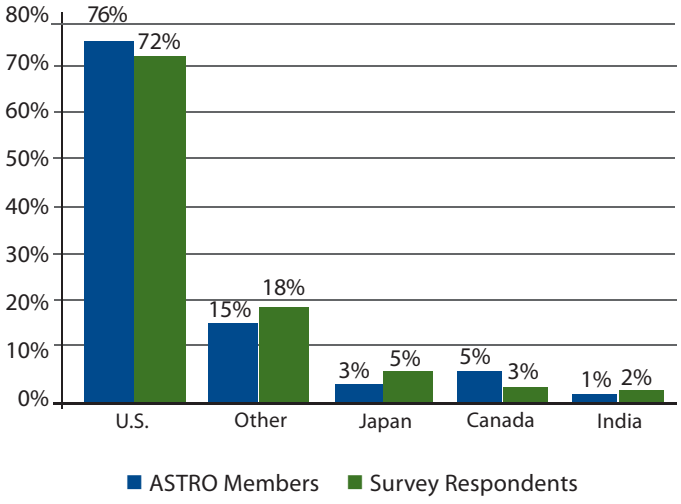
FIGURE 1: DEMOGRAPHICS – OCCUPATION



ASTRO KEEPS PACE WITH MEMBER NEEDS

Seventy-two percent of survey respondents indicate that their primary practice is located in the U.S. Of the 28 percent of respondents who indicate that their primary practice was located outside of the U.S., 5 percent report their practice is in Japan, 3 percent in Canada and 2 percent in India. The remaining respondents are from 53 countries throughout the world.

FIGURE 2: DEMOGRAPHICS – PRACTICE LOCATION



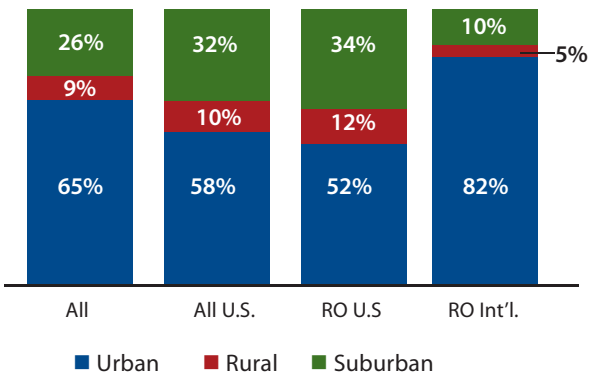
Similarly, 76 percent of ASTRO members are based in the U.S. and 24 percent are located outside of the U.S. (see Figure 2).

Overall, most (65 percent) radiation oncology personnel work in urban community settings. This is especially evident among international radiation oncologists where 82 percent of respondents work in an urban location. More than half of U.S. radiation oncologists (52 percent) indicate that their primary practice is located in an urban community (see Figure 3). Additionally, the majority of respondents report that they work in a hospital-based location at least three days per week. Specifically, 69 percent of U.S. radiation oncologists and 92 percent of international radiation oncologists report working in a hospital-based setting.

Respondents report the average number of years they have been in practice or worked in radiation oncology is 16.9 years. Radiation biologists and medical dosimetrists have the lengthiest tenure with 27.6 years and 22.6 years, respectively. U.S. radiation oncologists report 18.1 years, and international radiation oncologists report 18.5 years.

Radiation oncologists and physicists were asked to identify which modalities/technologies were currently in use in their practice. 3-D CRT, intensity modulated radiation therapy and image guided radiation therapy are the modalities cited as currently most in use. On average, 13 percent of radiation oncologist and physicist respondents report that they are planning to implement SRS, SBRT or proton/neutron particle beam therapy over the next 18 months.

FIGURE 3: DEMOGRAPHICS – COMMUNITY TYPE



MEMBERSHIP EXPERIENCE

Overall, ASTRO members are satisfied with their membership experience. Most members (87 percent) feel that ASTRO is a good use of their time. Notably, international members have a higher satisfaction level than any other group (see Figure 4). To maximize membership experience, members are encouraged to take advantage of the benefits and services offered by ASTRO and to

FIGURE 4: MEMBERSHIP EXPERIENCE – SATISFACTION

Respondents were asked to evaluate the following statement: Membership in ASTRO is a good use of my time. Domestic and international members agree that participation in ASTRO is a good use of their time.

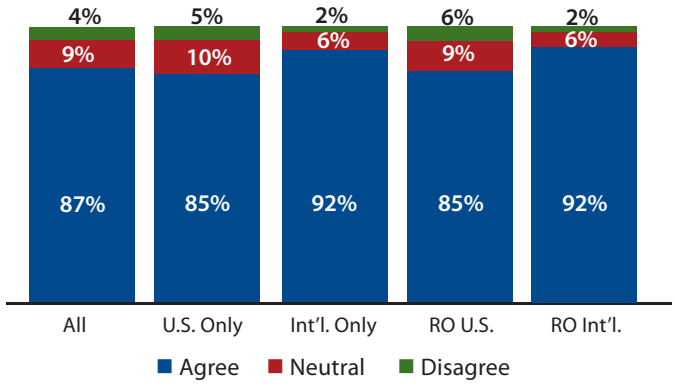


FIGURE 5: MEMBERSHIP EXPERIENCE – PARTICIPATION

Respondents were asked to identify in what way(s) they participate in ASTRO. Attendance at the Annual Meeting is a key means of participation in ASTRO.

Attend ASTRO Annual Meeting	81%
General member	64%
Attend online learning offerings	35%
Attend ASTRO specialty meetings (e.g., Spring Refresher, Head and Neck, etc.)	32%
Reviewer for the Red Journal/PRO	25%
Member of ASTRO committee/task force/workgroup	18%
Contribute to ASTRO PAC	15%
Faculty for ASTRO meetings (live or online)	10%
Participate in advocacy efforts (e.g., assist with grassroots, attend Advocacy Day)	6%
Volunteer/contributor/member to ASTRO affiliates (ROI, ARRO, ADROP, SCAROP, ARON)	5%
Leader of ASTRO or ASTRO committee/ task force/workgroup	5%
Other	2%

become involved in the Society. In addition to being a general member of ASTRO, the majority of members (81 percent) indicate their participation in ASTRO includes attending the Annual Meeting. Approximately one-third also attend ASTRO specialty meetings (32 percent) and participate in online learning offerings (35 percent) (see Figure 5).

Communication with our members is an important ASTRO responsibility. Eighty-seven percent of respondents feel that ASTRO keeps them well informed about ASTRO activities, benefits and services (see Figure 6). The ASTROgram, ASTRO's weekly e-newsletter, is an important member communication vehicle. Eighty-one percent of respondents read the ASTROgram. Members also stay informed by reading *ASTROnews* (65 percent) and visiting the ASTRO website (62 percent). The ASTRO website was updated during the last year to provide better service and information to members. The majority of respondents highly rate the functions and ease of use of the enhanced ASTRO website (see Figure 7).

FIGURE 6: MEMBERSHIP EXPERIENCE – KEEPING MEMBERS INFORMED

The ASTRO website, ASTROgrams, special emails and *ASTROnews* provide members information about what is happening in ASTRO and the specialty. To evaluate the level of communication ASTRO provides, respondents were asked to indicate the extent to which they agreed that ASTRO keeps them well informed on the topics listed.

	Agree	Neutral	Disagree
Educational opportunities	83%	12%	5%
Legislative issues	79%	16%	5%
Specialty news	79%	16%	5%
Medicare reimbursement and policy issues	75%	19%	6%
Member benefits and services	75%	17%	8%
Quality improvement	73%	18%	9%
Practice management	62%	27%	12%
Grants/award funding	50%	33%	17%

FIGURE 7: MEMBERSHIP EXPERIENCE – WEBSITE ENHANCEMENTS

ASTRO.org is one of the top resources members go to for information. The majority of members highly rate various functions of the website.

	Good	Neutral	Poor
Ability to renew membership online	91%	8%	2%
Ability to register for meetings	89%	10%	2%
Ability to submit abstracts	75%	22%	3%
Ability to navigate	74%	17%	9%
Ability to purchase ASTRO products	68%	27%	4%
Ability to find a member for patient referral	66%	26%	8%
Ability to access CME transcripts	62%	30%	8%

BENEFITS AND PROGRAMS

The *International Journal of Radiation Oncology • Biology • Physics* (Red Journal) is the premier radiation oncology journal and is an important member benefit. The impact factor for the Red Journal in 2012 is 4.524, ranking it among the top 10 journals in radiology, nuclear medicine and medical imaging. *Practical Radiation Oncology (PRO)* first appeared in 2011 as a quarterly, practice-oriented journal and in 2014 will increase its publication to six times per year. These scientific publications along with

educational offerings and clinical practice statements are ranked as the most important functions ASTRO provides members (see Figure 8). ASTRO's educational offerings continued to expand including the Annual Meeting, multidisciplinary meetings, webinars, online courses and SAMs. Overall, members continue to be very satisfied (79 percent) with ASTRO's educational programming. The topic and ability for CME are the highest influencing factors in deciding whether or not to participate in an educational program.

CHALLENGES

U.S. radiation oncologists and physicists rank reimbursement cuts and federal quality program incentives as the most challenging issues for practices in 2013 (see Figure 9). Consider that U.S. radiation oncologists report that 49 percent of their patients are Medicare patients. Ranked lower on the list of challenging issues confronting practices are malpractice and treatment-related adverse events. Write-in challenges include various administrative concerns and other regulatory issues.

Forty-two percent of U.S. radiation oncologists and administrators report having a freestanding radiation oncology practice owned by a non-radiation oncologist in their community. On average, the closest is within 13 miles of members' facilities. Fifty-eight percent of respondents report urologists as the owner of these practices.

Thank you

to all of the members who took the time to complete the 2013 ASTRO Member Survey. These highlights are just the tip of the iceberg. ASTRO leadership will continue to analyze the data and use it to inform our efforts to provide the kind of services and benefits our members deserve and expect from us.

A special thanks to Stephanie Stevens, Research and Evaluation Senior Manager, and Anum Habib, Research Analyst, for their help in compiling the data in this report.

FIGURE 8: ASTRO BENEFITS AND PROGRAMS – RANKINGS OF ASTRO FUNCTIONS

Respondents were asked to rank the functions that ASTRO performs. Scientific journals, educational programming and clinical practice statements get the highest marks.

	U.S.	Int'l.
Publish Red Journal and *PRO*	73%	89%
Education and professional development	67%	82%
Publish clinical practice statements	66%	89%
Advance science through research	55%	55%
Educate Congress on RO	50%	N/A
Advocate on behalf of members	46%	N/A
Advocate with insurers	44%	N/A
Raise public awareness of RO	40%	65%
Provide regulatory information	34%	N/A
Educate media on ASTRO positions	27%	60%
Educate on coding guidance	22%	N/A
Funding opportunities	20%	43%
Provide committee opportunities	13%	35%

FIGURE 9: CHALLENGES – TOP PRACTICE CHALLENGES

Respondents were asked to rank the challenges they face in their practices. These represent the top ten practice challenges ranked by radiation oncologists and physicists.

	Extremely Challenging	Moderately Challenging	Not At All Challenging
Reimbursement cuts	54%	37%	9%
Participating in federal quality incentive	34%	51%	15%
Self-referral arrangements	33%	38%	29%
Administrative burden	33%	52%	15%
Financing capital equipment	32%	47%	21%
Balancing patient care and research	30%	47%	23%
Integrating the use of "EHR"	29%	47%	24%
State and federal regulatory compliance	28%	52%	20%
Emerging technology in the field	27%	54%	19%
Physician "burn-out"	23%	51%	26%

RADIATION ONCOLOGY IN EUROPE:

Romanian Society for Radiotherapy and Medical Oncology working to improve quality of cancer care

BY VIORICA NAGY, MD, PHD, PROFESSOR AND HEAD OF THE ONCOLOGY-RADIOTHERAPY DEPARTMENT AT THE UNIVERSITY OF MEDICINE AND PHARMACY "IULIU HAȚIEGANU" IN CLUJ-NAPOCA, ROMANIA AND THE HEAD OF THE RADIOTHERAPY III DEPARTMENT AT THE ONCOLOGY INSTITUTE "PROF. DR. ION CHIRICUȚĂ" IN CLUJ-NAPOCA, ROMANIA AND DIRK RADES, MD, HEAD OF THE DEPARTMENT OF RADIATION ONCOLOGY, UNIVERSITY-HOSPITAL SCHLESWIG-HOLSTEIN, CAMPUS LÜBECK, GERMANY

This article is part of the "News from the Old World" series, created by *ASTROnews* Editorial Board member Dirk Rades, MD, to help build a bridge between radiation oncologists in Europe and North America.

ROMANIA IS A COUNTRY LOCATED at the intersection of Central and Southeastern Europe, bordering on the Black Sea. It shares a border with Hungary and Serbia to the west, Ukraine and Moldova to the northeast and east and Bulgaria to the south. It has the seventh largest population of the European Union (EU) with 20,121,641 people. The capital and largest city is Bucharest, the sixth largest city in the EU. Other cities with economic, cultural and educational significance include Cluj-Napoca, Timisoara and Iasi.

The Romanian Society for Radiotherapy and Medical Oncology (RSRMO), initially named the Romanian Society for Radiation Oncology, was established at the Institute of Oncology "Ion Chiricuta" Cluj-Napoca on October 8, 1991 under the initiative of Nicolae Ghilezan, MD, PhD, with 28 radiotherapists as founding members. It is a dedicated professional society for radiotherapy but open to individuals in all oncology specialties. In 2010, the society decided to change the name to RSRMO due to the increasing number of medical oncologist members and increased support from this branch of the profession.

Main objectives

The purpose of RSRMO is to bring together specialists in the field of medical oncology and radiotherapy to contribute to the increase in quality of oncological care. RSRMO aims to establish a high professional standard through supporting specialist education at all levels (university, post-graduate and doctoral) for all of its members. An important objective of the society is to protect the interest of its members and of oncology and radiotherapy in general in dealings with the organizations overseeing their activities, such as the Ministry of Health, the government, the Ministry of Education and county health departments. The society promotes equal and unrestricted access for all patients to optimal cancer treatment.

RSRMO aims to promote the collaboration of specialists in the field of oncology and radiotherapy, as well as the collaboration with specialists in other oncology-related fields. It promotes collaboration with international organizations of medical oncology and radiotherapy, cancer foundations, universities, patient groups and the representatives of the pharmaceutical and medical technology industries.

The society proposes to inform and educate patients, the civil society and the general public about the issues related to the prevention, diagnosis and treatment of all malignant disorders.

The members of the society meet at least once a year at the National Congress. Every year RSRMO organizes a

Continued on Page 28

Cluj-Napoca, located in central Romania, is the second most populous city in Romania.

congress for specialists in radiotherapy and medical oncology with the participation of its members as well as other specialists involved in RSRMO activities and specialists of oncology-related fields (surgeons, physicists, radiobiologists, pathologists, etc).

Significant activities

RSRMO participates in activities both nationally and internationally, promoting collaboration and mutual recognition of professional organizations in the field.

RSRMO organizes annual congresses focusing on contemporary topics to build relationships among the different specialists involved in cancer care and research. The society's publication is the *Journal of Radiotherapy and Medical Oncology*. The first issue was published in 1995 in Romanian and has been published in English since 2008, with four issues annually. The journal publishes papers that are of a high standard and that contribute to the advancement of knowledge in the field of radiotherapy and medical oncology. The journal also publishes review articles, case reports and brief communications, including book reviews, on those specific topics.

RSRMO develops and updates the national curriculum for radiotherapy and medical oncology in keeping with the European curriculum developed by ESTRO and ESMO. Similarly, RSRMO contributes to the development of medical education through courses for medical specialists organised by the University of Medicine and Pharmacy Cluj-Napoca or by the two National Romanian Cancer Institutes (of Bucharest and of Cluj-Napoca).

The society is involved in clinical practice through regular evaluations of the radiotherapy practice in Romania and analysis of clinical results in all cancer centers. The evaluation reports have been published in the society's journal.

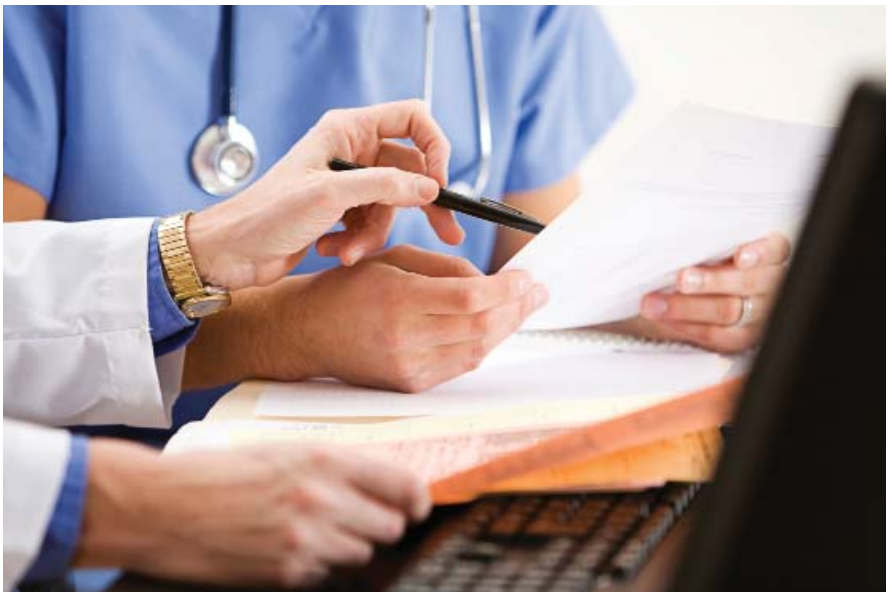
RSRMO has a close relationship with ESTRO. At the annual National Societies Meeting organized by ESTRO, RSRMO has an active presence through the participation of members of its executive board. The current Romanian national representative for ESMO is a member of RSRMO and is very active within ESMO. RSRMO also collaborates with various other national societies that have supported the society through continuous medical education programs conferences and courses given at various RSRMO events. There has been long-lasting collaboration (more than 20 years) and support offered by the French Society for Radiotherapy and Oncology (SFRO) and the major cancer centers from France (Institut Gustave Roussy, Villejuif, Paris and Hospital Universitaire Henri Mondor, Paris), the Italian Association of Oncological Radiotherapy (AIRO) and the European Institute of Oncology in Milan, Italy.

There are a number of unresolved problems facing radiation oncologists in Romania today. Nearly 28,000 patients are treated annually in Romania, but the lack of linear accelerators has made access to care a critical issue with only 30 percent of the patients who need radiotherapy actually receiving care. In addition, only two private clinics are using intensity modulated radiation therapy, and stereotactic radiotherapy is only available in a single center. Breast, lung, cervix and colorectal cancers are the most commonly seen malignancies. Other pressing issues include poor reimbursement for cancer therapy and the inconclusive dialogue between clinicians and the central authorities. RSRMO has made repeated appeals to the Ministry of Health, pointing out problems and offering potential solutions to improve that state of cancer care and radiation therapy services in Romania.

The city is a vibrant cultural and educational hub, and boasts several landmarks and historic churches.

BY ERIN YOUNG, MPP, HEALTH POLICY ANALYST, ERINY@ASTRO.ORG

WHAT'S NEW IN RADIATION ONCOLOGY CODING FOR 2014



NEW AND REVISED 2014 CPT CODE CHANGES

In August, the American Medical Association (AMA) released the CPT code changes that will go into effect January 1, 2014. The major changes for radiation oncology in 2014 involve updates to the simulation code set (77280 – 77295) that will better reflect changes in the process of care and technology. One new add-on code for respiratory motion management (+77293) was created, and one simulation code (77295) was revised and placed out of numerical sequence. In addition, the definitions of simple, intermediate and complex simulation (77280 – 77290) were changed, and the definition of "treatment area" was clarified. Changes in the process of care required redefining the levels of complexity in ways that reflect the real added work performed by radiation oncologists.

Clinical treatment planning (external and internal sources)

The former code set included four categories of simulation: simple, intermediate, complex and 3-D. Beginning in 2014, there will be three categories (Figure 1). The fourth simulation category that described computer-generated 3-D reconstruction (77295) was revised and moved to the Medical Radiation, Physics, Dosimetry, Treatment Devices and Special Services subsection of the CPT book (codes 77300 – 77370).

The new descriptors for the simulation categories will define level of complexity by the number of "treatment areas." Previously, these levels were defined by the number of ports, volumes, blocks, etc. Additionally, the codes will now include CT simulation; therefore, the technical charge of acquiring the CT (CPT code 77014 TC) will no longer be reported separately for simulation.

"Treatment area" is now defined in the guidelines as "a contiguous anatomic location that will be treated with radiation therapy. Generally, this includes the primary tumor organ or the resection bed and the draining lymph node chains, if indicated. An example is a breast cancer patient for whom a single treatment area could be the breast alone or the breast, adjacent supraclavicular fossa and internal mammary nodes. In some cases, a patient might receive radiation therapy to more than one discontinuous anatomic location. An example would be a patient with multiple bone metastases in separate sites (e.g., femur and cervical spine); in this case, each distinct and separate anatomic site to be irradiated is a separate treatment area.

A new add-on code for respiratory motion management (+77293—Respiratory motion management simulation (List separately in addition to code for primary procedure)) was created to describe the physician work involved in 4-D CT simulation or simulating a patient using motion (respiratory) tracking of a mobile target volume. The plus (+) symbol in front of the code number indicates that this is an add-on code that must always be reported in addition to the primary procedure. In the case of +77293, it must always be billed with either CPT code 77295 or 77301 on the same date of service, even though the work may take place over many days.

Medical Radiation Physics, Dosimetry, Treatment Devices and Special Services

CPT code 77295 (Three-dimensional radiotherapy plan, including dose-volume histograms) has evolved to

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represent the work of physics and dosimetry planning rather than the work performed in the simulation. As such, the descriptor for 77295 has been revised to reflect this change.

FIGURE 1

77280	Therapeutic radiology simulation-aided field setting; simple. (Simulation of a single treatment area).
77285	Therapeutic radiology simulation-aided field setting; intermediate. (Simulation of two separate treatment areas).
77290	Therapeutic radiology simulation-aided field setting; complex. (Simulation of three or more treatment areas, or any number of treatment areas if any of the following are involved: particle, rotation or arc therapy, complex blocking, custom shielding blocks, brachytherapy simulation, hyperthermia probe

CHANGES IN THE HOSPITAL OUTPATIENT PROSPECTIVE PAYMENT SYSTEM FINAL RULE

In the CY 2014 HOPPS final regulations, CMS announced that as of January 1, 2014, the agency will no longer differentiate between robotic and non-robotic linac-based SRS through HCPCS G-codes. For CY 2014, CMS will replace the existing four HCPCS codes with CPT codes. HCPCS code G0173 will be replaced with SRS CPT code 77372, and HCPCS codes G0251, G0339 and G0340 will be replaced with SRS CPT code 77373.

PHYSICIAN QUALITY REPORTING SYSTEM (PQRS) AND ELECTRONIC HEALTH RECORD (EHR) UPDATE

Oncology Measures Group included in PQRS

The Centers for Medicare and Medicaid Services (CMS) will continue to offer incentives for satisfactorily reporting in Calendar Year 2013 and 2014; however, a payment adjustment will be applied beginning in 2015. To participate in PQRS, individuals must provide services that are paid under or based on the Medicare Physician Fee Schedule and must satisfactorily report either a measures group or report on individual measures.

In 2013, the PQRS program included the Oncology Measures Group. Providers are only required to report on 20 unique patients, a majority of which must be Medicare Part B FFS patients. The 20 unique patients must be at least 18 years old and have a specific diagnosis of cancer. The following measures are included in the Oncology Measures Group:

- 71 Breast Cancer: Hormonal Therapy for Stage IC–IIIC Estrogen Receptor/Progesterone Receptor (ER/PR) Positive Breast Cancer
- 72 Colon Cancer: Chemotherapy Stage III Colon Cancer Patients
- 110 Preventive Care and Screening: Influenza Immunization
- 130 Documentation of Current Medications in the Medical Record
- 143 Oncology: Medical and Radiation – Plan Intensity Quantified
- 144 Oncology: Medical and Radiation – Plan of Care for Pain
- 194 Oncology: Cancer Stage Documented
- 226 Preventive Care and Screening: Tobacco Use: Screening and Cessation Intervention.

The ASTRO PQRS*wizard*, a CMS-qualified PQRS registry, is an online tool that helps guide professionals through a few easy steps to rapidly collect, validate and submit their results to CMS for payment. Participants using registry tools like the ASTRO PQRS*wizard* have a 95 percent success rate. Further details on the ASTRO PQRS*wizard*, implementation of incentive and payment adjustments, satisfactory reporting criteria and other details of the PQRS program are available on the ASTRO website at www.astro.org/pqrswizard.

2014 Medicare EHR Incentive Program

The Medicare and Medicaid EHR Incentive Programs are CMS programs that use a combination of incentive payments and downward payment adjustments to promote the adoption, implementation and meaningful use of certified EHR technology (CEHRT) by eligible professionals (EPs).

All providers, regardless of whether they are participating in Stage 1 or Stage 2 of the Medicare EHR Incentive Program, are only required to demonstrate meaningful use for a three-month EHR reporting period on a quarterly basis in 2014. EPs who have not participated in the Medicare EHR Incentive Program prior to 2014 must begin their 90-day EHR reporting period no later than July 1, 2014, and attest by October 1, 2014, to avoid the 2015 payment adjustment. The three-month reporting period is being offered so that providers can upgrade and adopt EHR technology that meets the 2014 criteria for CEHRT.

ADDITIONAL ASTRO CODING RESOURCES

ASTRO will offer a 2014 Supplement to the *ASTRO/ACR Guide to Radiation Oncology Coding 2010* that will include guidance on all changes to the simulation codes and new FAQs in addition to all coding changes that have occurred between 2011 and 2014. The 2014 Supplement will be available through the purchase of a Web license or a hard-copy version.

CHOOSING*wisely*

BY BRITTANY ASHCROFT, COMMUNICATIONS MANAGER,
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Choosing Wisely®

An initiative of the ABIM Foundation

ASTRO participates in national Choosing Wisely campaign

SOCIETY RELEASES LIST OF FIVE RADIATION ONCOLOGY TREATMENTS TO QUESTION

ASTRO joined the national *Choosing Wisely*® campaign, an initiative of the ABIM Foundation, with the release of the Society's list of five radiation oncology-specific treatments that are commonly ordered but may not always be appropriate. The list was released during a packed session at ASTRO's 55th Annual Meeting in Atlanta.

Choosing Wisely, first announced in December 2011, is part of a multi-year effort led by the ABIM Foundation to support and engage physicians in being better stewards of finite health care resources.

ASTRO's *Choosing Wisely* list identifies five targeted treatment options that ASTRO recommends for detailed patient-physician discussion before being prescribed.

ASTRO's five recommendations are:

1. *Don't initiate whole breast radiotherapy as a part of breast conservation therapy in women age ≥50 with early stage invasive breast cancer without considering shorter treatment schedules.*

   Whole breast radiotherapy decreases local recurrence and improves survival of women with invasive breast cancer treated with breast conservation therapy. Most studies have utilized "conventionally fractionated" schedules that deliver therapy over 5-6 weeks, often followed by 1-2 weeks of boost therapy. Recent studies, however, have demonstrated equivalent tumor control and cosmetic outcome in specific patient populations with shorter courses of therapy (approximately 4 weeks). Patients and their physicians should review these options to determine the most appropriate course of therapy.

2. *Don't initiate management of low-risk prostate cancer without discussing active surveillance.*

   Patients with prostate cancer have a number of reasonable management options. These include surgery and radiation, as well as conservative monitoring without therapy in appropriate patients. Shared decision-making between the patient and the physician can lead to better alignment of patient goals with treatment and more efficient care delivery. ASTRO has published patient-directed written decision aids concerning prostate cancer and numerous other types of cancer. These types of instruments can give patients confidence about their choices, improving compliance with therapy.

3. *Don't routinely use extended fractionation schemes (>10 fractions) for palliation of bone metastases.*

   Studies suggest equivalent pain relief following 30 Gy in 10 fractions, 20 Gy in 5 fractions, or a single 8 Gy fraction. A single treatment is more convenient but may be associated with a slightly higher rate of retreatment to the same site. Strong consideration should be given to a single 8 Gy fraction for patients with a limited prognosis or with transportation difficulties.

4. *Don't routinely recommend proton beam therapy for prostate cancer outside of a prospective clinical trial or registry.*

   There is no clear evidence that proton beam therapy for prostate cancer offers any clinical advantage over other forms of definitive radiation therapy. Clinical trials are necessary to establish a possible advantage of this expensive therapy.

5. *Don't routinely use intensity modulated radiation therapy (IMRT) to deliver whole breast radiotherapy as part of breast conservation therapy.*

   Clinical trials have suggested lower rates of skin toxicity after using modern 3-D conformal techniques relative to older methods of 2-D

Continued on Page 35

"We are committed to assuring that treatment options align with individual patient needs and patient expectations and that our patients have the information they need to make wise health care decisions."

BIOLOGY*bytes*

BY BRIAN MARPLES, PHD

FINGER ON THE PULSE?

NUMEROUS CELLULAR AND MICRO-ENVIRONMENTAL FACTORS affect tumor response to radiotherapy (RT). Classically, these have included inherent tumor cell radiosensitivity, damage signaling and DNA repair processes, tumor hypoxia and proliferation. More recently, other factors have been recognized, such as tumor stem cells, proliferation of tumor endothelial cells (angiogenesis), the intercellular interactions between malignant and non-malignant cells, and the recruitment and migration of hematopoietic-derived progenitor cells that support tumor regrowth (vasculogenesis). Despite these developments in our understanding, the effectiveness of RT at achieving local control is still constrained to a significant degree by the comparative radiosensitivity of tumor cells and adjacent normal tissues. Therefore, there is still a need to develop RT schedules that aim to increase local tumor control and limit mechanisms of tumor recurrence while lessening normal tissue injury.

Over the past decade, a new concept of pulsed radiation delivery has been developed from the concept of low-dose hyper-radiosensitivity[1]. In the clinic this concept has been implemented for tumor retreatments[2-5], while in the laboratory, the concept has been investigated at the mechanistic level[6-9]. Studies from the University of Wisconsin School of Medicine and Public Health in Madison, Wis. reported the application of pulsed dose RT in a number of tumor sites for re-irradiation to achieve tumor dosing with reduced radiation injury for normal tissues near to their radiation tolerance. Most notably the practice was adopted for glioblastoma multiforme (GBM) to provide a palliative and life-prolonging option. In the largest series[2], 103 patients with recurrent gliomas underwent re-irradiation using pulsed dose RT. Treatment was delivered using a series of 0.2 Gy pulses at three-minunte intervals, creating an apparent dose rate of 0.0667 Gy/min to a median dose of 50 Gy (range 20–60 Gy) delivered in 1.8–2.0 Gy fractions. The study demonstrated that the pulsed RT regimen was well tolerated, and no patient discontinued treatment because of associated toxicity, allowing for safe retreatment of larger target volumes to high doses with palliative benefit. Cumulative doses >100 Gy were well tolerated. This landmark clinical study has demonstrated the feasibility of the delivery of pulsed RT to treat human recurrent GBM. A logical extension of this work is to consider the strategy for first line therapy in GBM. The feasibility of delivering pulsed RT with accurate radiation coverage was demonstrated using volumetric modulated arc therapy compared to static intensity modulated radiation therapy[10].

In the laboratory, over the past decade using cell cultures, subcutaneous and orthotopic xenograft tumor models in mice the concept of pulsed dose RT has been evaluated as a novel method of delivering radiation to improve the therapeutic ratio and provide superior outcomes to conventionally delivered RT. Much of this work has focused on GBM tumors since this model represents a proliferating tumor surrounded by non- or slowly proliferating normal tissue. This distinction is important since the underlying biological mechanism that is exploited by the use of 0.2 Gy pulses relies on proliferating G2-phase cells harboring unrepaired DNA damage and progressing unconstrained into mitosis and dying as a consequence of ineffective activation of ATM-mediated cellular repair mechanisms[11]. Using an intracranial pre-clinical model of GBM the concept of pulsed RT for first line therapy has shown some promise. In the first instance, pulse RT was given alone using a clinical dosing schedule, and then with commitment temozolomide (TMZ)[8,9]. These studies demonstrated an improved tumor growth delay with less normal tissue injury. Interestingly, mechanistic studies indicated that pulsed dose treatment resulted in the sparing of tumor-associated vasculature, compared to conventional dose delivery,

which should be beneficial in terms of reoxygenation during fractionated radiation delivery as well as for TMZ delivery. If these initial observations are in fact validated, the efficacy of pulse RT may simply reflect improved tumor oxygenation, and therefore tumor radiosensitivity, which accounts for the better response rates. An interesting alternate hypothesis is that the maintenance of tumor oxygenation via the preservation of vasculature counteracts the process of tumor neovascularization that promotes tumor recurrence and lessens the hypoxic niche favored by cancer stem cells.

The potential of pulsed RT to spare tumor vasculature or prevent neovasculogenesis remains to be confirmed, although the preliminary preclinical data are promising. Although vascular proliferation is a pathological hallmark of GBM, blood perfusion rates in GBM are lower than that of the surrounding normal brain. Since the formation of tumor-associated vessels occurs early during tumor progression, anti-angiogenic approaches concomitant to conventional trimodality therapy are of interest. Vascular remodeling produced by anti-angiogenic therapy may increase tumor perfusion, improve the innate immune response and reduce tumor-associated hypoxia. This same mechanism of tumor vessel preservation may maintain a tumor microenvironment that abrogates hypoxia-dependent signaling events that promote tumor radiation resistance[12]. Conversely, the irregular blood vessels and inefficient perfusion associated with GBM tumors could mean that the elimination of blood vessels by anti-angiogenic therapy would reduce the availability of TMZ chemotherapy and further elevate tumor-associated hypoxia that reduces radiation sensitivity and drug effectiveness. Despite these concerns, exploiting the biology of tumor vasculature and tumor oxygenation by pulsed RT may provide a favorable approach of augmenting the therapeutic ratio for GBM.

The aim of ongoing preclinical studies evaluating pulse dose RT is to achieve tumor curability by radiation dose escalation and understand more fully the molecular mechanism of this alteration in radiation delivery, all within the context of the therapeutic ratio and tumor vascularity.

References

1. Marples B, Collis SJ. Low-dose hyper-radiosensitivity: past, present, and future. *Int J Radiat Oncol Biol Phys.* 70:1310-8, 2008.
2. Adkison JB, Tome W, Seo S, et al. Reirradiation of large-volume recurrent glioma with pulsed reduced-dose-rate radiotherapy. *Int J Radiat Oncol Biol Phys.* 79:835-41, 2011.
3. Cannon GM, Tome WA, Robins HI, et al. Pulsed reduced dose-rate radiotherapy: case report : a novel re-treatment strategy in the management of recurrent glioblastoma multiforme. *J Neurooncol.* 83:307-11, 2007.
4. Richards GM, Tome WA, Robins HI, et al. Pulsed reduced dose-rate radiotherapy: a novel locoregional retreatment strategy for breast cancer recurrence in the previously irradiated chest wall, axilla, or supraclavicular region. *Breast Cancer Res Treat.* 114:307-13, 2009.
5. Mohindra P, Robins HI, Tome WA, et al. Wide-field pulsed reduced dose rate radiotherapy (PRDR) for recurrent ependymoma in pediatric and young adult patients. *Anticancer Res.* 33:2611-8, 2013.
6. Dilworth JT, Krueger SA, Dabjan M, et al. Pulsed low-dose irradiation of orthotopic glioblastoma multiforme (GBM) in a pre-clinical model: Effects on vascularization and tumor control. *Radiother Oncol.* 108:149-54, 2013.
7. Krueger SA, Wilson GD, Piasentin E, et al. The effects of G2-phase enrichment and checkpoint abrogation on low-dose hyper-radiosensitivity. *Int J Radiat Oncol Biol Phys.* 77:1509-17, 2010.
8. Lee DY, Chunta JL, Park SS, et al. Pulsed versus conventional radiation therapy in combination with temozolomide in a murine orthotopic model of glioblastoma multiforme. *Int J Radiat Oncol Biol Phys.* 86:978-85, 2013.
9. Park SS, Chunta JL, Robertson JM, et al. MicroPET/CT imaging of an orthotopic model of human glioblastoma multiforme and evaluation of pulsed low-dose irradiation. *Int J Radiat Oncol Biol Phys.* 80:885-92, 2011.
10. Tyagi N, Yang K, Sandhu R, et al. External beam pulsed low dose radiotherapy using volumetric modulated arc therapy: Planning and delivery. *Med Phys.* 40:011704, 2013.
11. Krueger SA, Collis SJ, Joiner MC, et al. Transition in survival from low-dose hyper-radiosensitivity to increased radioresistance is independent of activation of ATM Ser1981 activity. *Int J Radiat Oncol Biol Phys.* 69:1262-71, 2007.
12. Kioi M, Vogel H, Schultz G, et al. Inhibition of vasculogenesis, but not angiogenesis, prevents the recurrence of glioblastoma after irradiation in mice. *J Clin Invest.* 120:694-705, 2010.

This article was submitted on behalf of the ASTRO Radiation and Cancer Biology Committee.

ASTRO*history*

BY RONALD DORN, MD, FASTRO

FOREBEARS OF ASTRO

INTELLECTUAL RIGOR AND AMBITION are important qualities of individuals who aspire to great and lasting contributions to a field of endeavor. These attributes can be significantly nurtured by interaction with influential mentors. In the summer issue of *ASTROnews*, this column discussed the founding of ASTRO. Thought leaders in this effort included Juan A. del Regato, MD (the driving force behind the founding), Simeon Cantril, MD (ASTRO's first president) and Franz Buschke, MD (ASTRO's sixth president). A review of the biographies of these three individuals reveals the common influence of two mentors and one institution: Henri Coutard, MD, Max Cutler, MD, and the Chicago Tumor Institute (CTI).

Dr. Coutard, born in 1876, received his medical education at the University of Paris. Early in his medical career, he became interested in the therapeutic potential of radium, presenting his first paper on the subject in 1912. After World War I, during which he met both Claudius Regaud, MD, and Marie Curie, Dr. Coutard joined Dr. Regaud and Antoine Lacassagne, MD, at the Radium Institute of Paris (later to evolve into the Institute Curie). His meticulous clinical care and observations resulted in a number of important breakthroughs in the application of radiation in the treatment of cancer. Arguably the most important was his demonstration of the superiority of the "protracted and fractional method" of radiation delivery, leading to the general use of fractionation in the delivery of therapeutic radiation still predominant today. Both Drs. del Regato and Cantril received training under Dr. Coutard in Paris, and Dr. Coutard had a continuing influence on Dr. del Regato throughout his career.

Dr. Cutler received his medical education at Johns Hopkins University in Baltimore and then trained in surgical oncology at Memorial Hospital in New York where he worked with James Ewing, MD. At Dr. Ewing's urging, Dr. Cutler moved to London to work with Sir George Lenthal Cheatle in the study of breast cancer. This collaboration resulted in the publication of Drs. Cheatle and Cutler's textbook *Tumours of the Breast,* published in 1931. Dr. Cutler then moved back to the United States to direct the tumor clinic at Michael Reese Hospital in Chicago. There he founded CTI with the intent of establishing a "Memorial-like" cancer hospital in the Midwest and recruited such luminaries as Drs. Cheatle and Coutard as staff members. Also recruited, after recommendation by Dr. Coutard, were Drs. del Regato and Cantril as well as Dr. Buschke. During this association, Drs. Buschke and Cutler authored the classic text *Cancer: Its Diagnosis and Treatment* with Dr. Cantril as a contributing author.

So it was that our protagonists, all founders of ASTRO, came together at CTI. Other important early radiation oncologists associated with CTI and Michael Reese Hospital were Henry Kaplan, MD (internship) and Carl F. Von Essen, MD (residency). Both CTI (Dr. Cutler left in 1952) and Michael Reese Hospital (closed in 2008) no longer exist, but their influence on the field of radiation oncology and ASTRO remains strong through generations of trainees.

For more information on the history of ASTRO, visit the History section of the website at www.astro.org/About-ASTRO/Society-History/Index.aspx.

This article was submitted on behalf of the ASTRO History Committee.

STATEMENT REQUIRED BY U.S. POSTAL SERVICE SHOWING THE OWNERSHIP, MANAGEMENT AND CIRCULATION OF *ASTRONEWS*

1. Publication Title: *ASTROnews*
2. Publication Number: 1523-4185
3. Filing Date: 10/1/2013
4. Issue Frequency: Quarterly
5. Number of Issues Published Annually: 4
6. Annual Subscription Price: $38
7. Complete Mailing Address of Known Office of Publication: 8280 Willow Oaks Corporate Drive, Suite 500, Fairfax, VA 22031
8. Complete Mailing Address of Headquarters or General Business Office of Publisher: 8280 Willow Oaks Corporate Drive, Suite 500, Fairfax, VA 22031
9. Publisher: Laura I. Thevenot, 8280 Willow Oaks Corporate Drive, Suite 500, Fairfax, VA 22031
   Editor: Anna Arnone, 8280 Willow Oaks Corporate Drive, Suite 500, Fairfax, VA 22031
   Managing Editor: Brittany Ashcroft, 8280 Willow Oaks Corporate Drive, Suite 500, Fairfax, VA 22031
10. Owner: American Society for Radiation Oncology, 8280 Willow Oaks Corporate Drive, Suite 500, Fairfax, VA 22031
11. Known bondholders, mortgages and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities: None
12. Tax Status: Has not changed during preceding 12 months
13. Publication Title: *ASTROnews*
14. Issue Date for Circulation Data: Winter 2013
15. Extent and Nature of Circulation:

a. Total Number of Copies:	7,937	8,272
b. Legitimate paid and/or Requested Distribution by Mail and Outside Mail		
i. Individual Paid/Requested Mail Subscriptions	7,218	7,795
ii. Copies Requested by Employers for Distribution to Employees by Name or Position Stated on PS Form 3541:	35	40
iii. Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Paid or Requested Distribution Outside USPS:	0	0
iv: Requested Copies Distributed by Other Mail Classes Through the USPS:	0	0
c. Total Paid and Requested Circulations:	7,253	7,835
d. Nonrequested Distribution (By Mail and Outside the Mail)		
i. Nonrequested Copies:	100	140
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e. Total Nonrequested Distribution:	200	280
f. Total Distribution:	7,453	8,115
g. Copies Not Distributed:	484	157
h. Total:	7,937	8,272
i. Percent Paid and/or Requested Circulation:	97.32%	96.55%

16. Publication of Statement of Ownership will be printed in the Winter 2013 issue of this publication.
17. Signature and Title of Design and Production Manager: Kimberly Kerin, 8280 Willow Oaks Corporate Drive, Suite 500, Fairfax, VA 22031.
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Continued from Page 7

CHAIR'S*update*

part of this effort to launch RO-ILS. ASTRO and AAPM have signed a Memorandum of Understanding in which AAPM has committed to providing subject-matter expertise as well as financial support. This collaboration further underscores the need for this data to help us achieve optimal outcomes for our patients.

As part of the radiation oncology treatment team, you have the opportunity to participate in this first-ever, medical specialty-sponsored PSO. RO-ILS is currently in beta testing and is expected to fully launch in the first quarter of 2014. As we move forward with this effort, I encourage you to take advantage of this unique opportunity to improve patient care by ensuring we are delivering the highest quality care and safest treatments to our patients.

Dr. Lawton is professor, program director and vice-chair of radiation oncology at the Medical College of Wisconsin in Milwaukee. She welcomes comments on her editorial at astronews@astro.org.

Continued from Page 31

CHOOSING*wisely*

planning. In these trials, the term "IMRT" has generally been applied to describe methods that are more accurately defined as field-in-field 3-D conformal radiotherapy. While IMRT may be of benefit in select cases where the anatomy is unusual, its routine use has not been demonstrated to provide significant clinical advantage.

"The five items on ASTRO's list represent important treatments that we believe need careful consideration; the list should serve as a starting point for detailed physician-patient conversations to ensure the optimal level of patient-centered care—a core principle of ASTRO," said Michael L. Steinberg, MD, FASTRO, immediate past chair of ASTRO's Board of Directors. ASTRO's list went through several stages of development and review before the final list of five was approved by the Board of Directors. To identify possible items for inclusion in the list, a survey was sent to the Health Policy Council, Health Policy Committee, Clinical Affairs and Quality Committee, the Guidelines Subcommittee, Best Practices Subcommittee, Measures Subcommittee and disease-site resource panels.

In addition, a seven-member workgroup was formed with representation from the Clinical Affairs and Quality, Health Policy and Government Relations councils. Each member of the workgroup selected their top eight items from the 34 suggested in the survey. From there, the highest ranking 13 items were chosen.

The list was defined further after several conference calls and input from ASTRO's Board of Directors. Once the list was determined, an extensive literature review was done to provide references for each topic. The final list, including references, was approved by ASTRO's Board of Directors.

"We are proud to be a part of the *Choosing Wisely* campaign and to issue our list of radiation oncology treatments we recommend for detailed conversation and evaluation by physicians and patients," Dr. Steinberg said. "We are committed to assuring that treatment options align with individual patient needs and patient expectations and that our patients have the information they need to make wise health care decisions."

For more information about the *Choosing Wisely* campaign, visit www.choosingwisely.org.

JOURNALS

HIGHLIGHTS FROM ASTRO'S JOURNALS

FROM THE OCTOBER-DECEMBER 2013 ISSUE OF *PRACTICAL RADIATION ONCOLOGY (PRO)*

Patterns of Regional Failure in Stage III Non-small Cell Lung Cancer Treated with Neoadjuvant Chemoradiation Therapy and Resection
by Garg et al
Treatment of locally advanced non-small cell lung cancer (LA-NSCLC) involves definitive chemoradiation therapy (CRT) or neoadjuvant CRT and resection, but radiation treatment volumes remain in question. With CRT, involved-field radiation therapy (IFRT) is replacing elective nodal irradiation, reducing toxicity and allowing dose escalation. This article suggests that IFRT does not compromise regional control in the neoadjuvant management of LA-NSCLC.

Subjective and Objective Quantification of Physician's Workload and Performance During Radiation Therapy Planning Tasks
by Mazur et al
Mazur et al quantify and compare physician workload for several common treatment planning tasks using objective and subjective tools. This study analyzes the relationship between workload and performance using these different tools to determine situations in which performance could be expected to decline.

HIGHLIGHTS FROM THE *INTERNATIONAL JOURNAL OF RADIATION ONCOLOGY • BIOLOGY • PHYSICS* (RED JOURNAL)

OCTOBER 1, 2013

ABR Examinations: The Why, What and How
by Becker et al
Every radiation oncologist and physicist in the United States has a relationship with the American Board of Radiology (ABR). One of ABR's primary tools is the secure proctored examination. This article summarizes the seven standards, based on the science of psychometrics, that are used in the development of these examinations.

Randomized Noninferiority Trial of Reduced High-Dose Volume Versus Standard Volume Radiation Therapy for Muscle-Invasive Bladder Cancer: Results of the BC2001 Trial (CRUK/01/004)
by Huddart et al
This phase III randomized trial from the U.K. takes a close look at an important technical aspect of therapy, asking whether or not reducing radiation dose delivered to the uninvolved bladder can reduce toxicity without compromising local control.

NOVEMBER 1, 2013

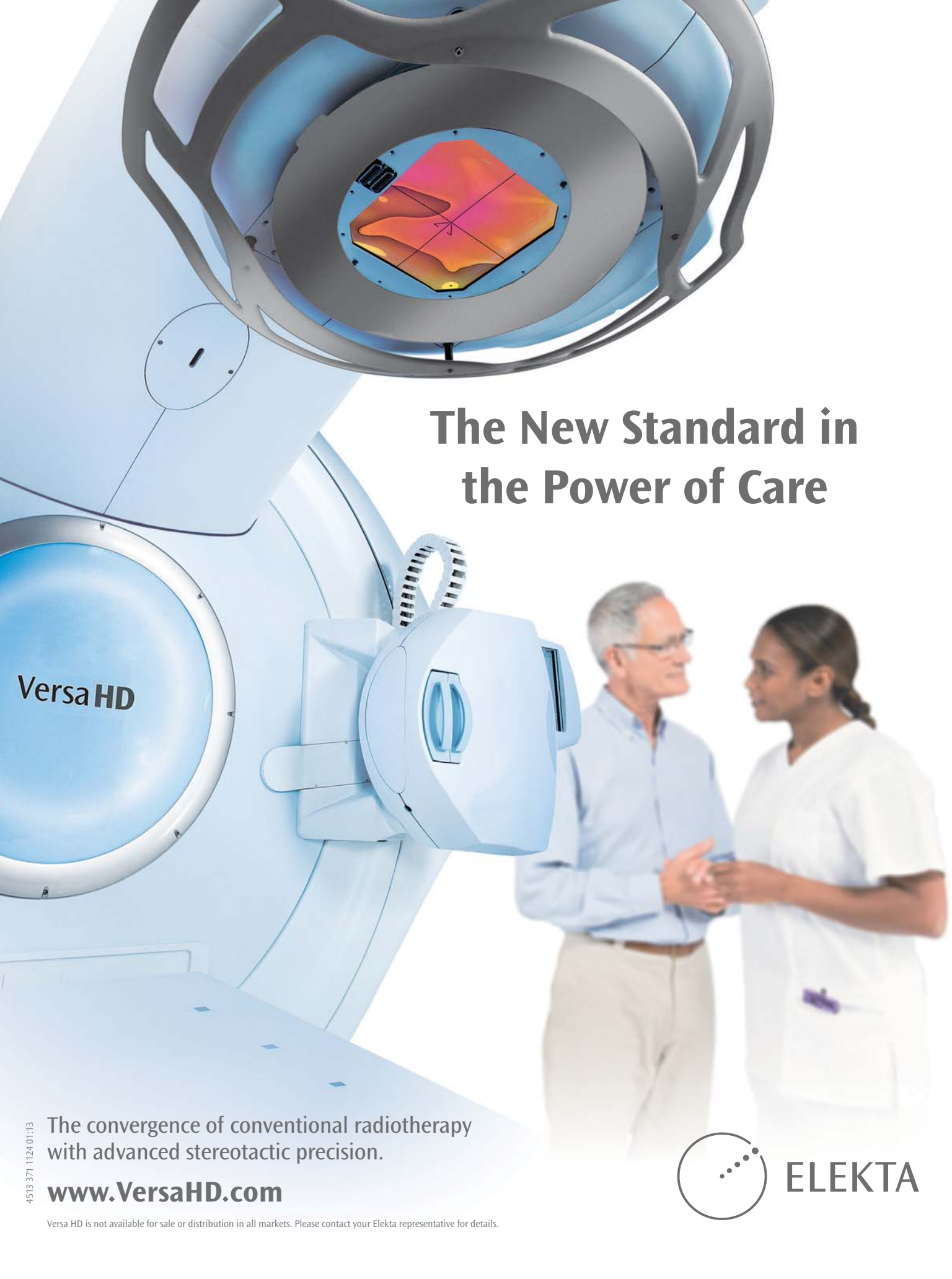
How Radiation Oncologists Evaluate and Incorporate Life Expectancy Estimates Into the Treatment of Palliative Cancer Patients: A Survey-Based Study
by Tseng et al
Although physicians frequently think about a patient's life expectancy estimates (LE) and have LE thresholds that guide treatment recommendations, physicians' LE estimates are largely inaccurate. An accompanying editorial by Ellsworth et al asks whether radiation oncologists, consciously or unconsciously, shield patients from bad news.

NOVEMBER 15, 2013

Anal Carcinoma: Impact of TN Category of Disease on Survival, Disease Relapse and Colostomy Failure in US Gastrointestinal Intergroup RTOG 98-11 Phase 3 Trial
by Gunderson et al
This study looks at data from RTOG 98-11 and tests the hypothesis that tumor node (TN) category has a meaningful impact on survival, colostomy failure and relapse in patients with anal cancer treated with concurrent chemoradiation.

An Anatomically Validated Brachial Plexus Contouring Method for Intensity Modulated Radiation Therapy Planning
by Van de Velde et al
In this cadaver study, brachial plexus contouring guidelines for intensity modulated radiation therapy planning are developed using anatomically validated imaging datasets incorporating the structures' natural variations.

For more article highlights from ASTRO's journals, visit www.astro.org/astronews. Access these articles and more on the *PRO* website at www.practicalradonc.org and the Red Journal website at www.redjournal.org.



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